

COMPREHENSIVE REPORT

•

**ECONOMIC AND ENGINEERING
DEVELOPMENT OF BURMA**

•

**PREPARED FOR THE
GOVERNMENT OF THE UNION OF BURMA**

VOLUME I

AUGUST 1953

**KNAPPEN TIPPETTS ABBETT McCARTHY
ENGINEERS**
**IN ASSOCIATION WITH
PIERCE MANAGEMENT, INC.**
**AND
ROBERT R. NATHAN ASSOCIATES, INC.**

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ECONOMIC AND ENGINEERING DEVELOPMENT OF BURMA

KNAPPEN - TIPPETTS - ABBETT - MCCARTHY
ENGINEERS

(KNAPPEN TIPPETTS ABBETT ENGINEERING CO.)

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NEW YORK 36, N.Y.

PLAZA 7-8001

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August 7th, 1953

THE HONORABLE U WIN,
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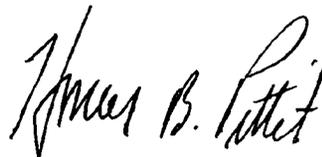
DEAR SIR,

The Consultants take pleasure in transmitting to you the accompanying "Comprehensive Report on the Economic and Engineering Development of Burma."

It is the earnest hope of all who have contributed to the preparation of the Report that it will be a trustworthy guide to social and industrial progress that will endure and strengthen through the years to come.

The Consultants desire to express their thanks and appreciation for the honor and opportunity afforded them to participate in the bold, creative, and historical measures being set in motion by the Union of Burma to secure for her people the full enjoyment of their rich resources.

Respectfully yours,



General Manager

COMPREHENSIVE REPORT

ECONOMIC AND ENGINEERING
DEVELOPMENT OF BURMA

PREPARED FOR THE
GOVERNMENT OF THE UNION OF BURMA

VOLUME I

INTRODUCTION
ECONOMICS AND ADMINISTRATION
AGRICULTURE AND IRRIGATION
TRANSPORTATION

AUGUST 1953

KNAPPEN TIPPETTS ABBETT McCARTHY
ENGINEERS

IN ASSOCIATION WITH
PIERCE MANAGEMENT, INC.

AND
ROBERT R. NATHAN ASSOCIATES, INC.

PRINTED AND BOUND IN GREAT BRITAIN BY
HAZELL, WATSON & VINEY, LTD.
AYLESBURY & LONDON

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FOREWORD

AUTHORITY

This Comprehensive Report is being submitted to the Government of the Union of Burma as the concluding service in the fulfillment of the contract dated August 8, 1951, and terminating on August 8, 1953, between the Government of the Union of Burma and Knappen Tippetts Abbett Engineering Company of New York City. As provided in the contract, the Knappen Tippetts Abbett Engineering Company has associated itself with Pierce Management, Inc., of Scranton, Pennsylvania, Coal and Metal Mining Engineers, and Robert R. Nathan Associates, Inc., Washington, D.C., Economists. The dollar costs under this contract are being paid by the Technical Cooperation Administration of the United States.

Article I, Section C, subsection 1c of the contract provides that "at the conclusion of the term of this contract, the Consulting Engineer will present a written report recommending a comprehensive, integrated program for the over-all development of the resources of Burma and governmental and private measures in addition to those which may already have been taken, designed to place such program into operation . . ." The recommendations shall be made "in the light of the desire of the Government to improve the productivity, production, and standard of living of the people of Burma as rapidly as possible and to achieve a diversified and balanced economy appropriate to the national and economic independence of Burma." This Report is now presented in fulfillment of that requirement.

SCOPE

The responsibilities of Knappen Tippetts Abbett Engineering Company and its associates under the contract fall into six categories:

1. Surveys and Reports
 - a. Preliminary Survey and Report.
 - b. Project Surveys and Reports.
 - c. Comprehensive Report.
2. Preparation of Applications for Financing.
3. Services Relative to Specific Projects.
4. Continuous Engineering, Consulting, and Economic Advisory Services.
5. Purchasing Services.
6. Training of Burmese technicians.

Under category 1a, Knappen Tippetts Abbett Engineering Company, following a preliminary survey of the resources and the national economy

of Burma, submitted a written Preliminary Report on January 31, 1952. Subsequently, a large number of detailed reports on specific projects have been submitted. Many services have been rendered relative to specific projects; continuous engineering, consulting, and economic advisory services have been rendered and on occasion purchasing services have been performed. A number of Burmese technicians have assisted in the work, and have received training in various engineering and economic fields and in office procedures. No preparation of applications for financing has been requested.

In the foreword to the Preliminary Report it was observed that "because of the shortage of time and insufficient primary information, it has not been possible to achieve the degree of precision or balance in the proposed program which it is hoped will characterize the Final Report . . . Likewise these limitations have prevented the establishment of a final order of priorities for projects and final judgements concerning policies." This Comprehensive Report recommends a balanced program of public and private investment for the entire economy, together with measures to train the necessary skilled, professional, technical and managerial workers, indicates the feasibility of the program, recommends priorities and indicates the measures necessary to carry it out.

ORGANIZATION

The following principals have visited Burma to initiate and supervise the survey, furnish consulting and advisory services during its course and assist in the preparation of the Preliminary and Comprehensive Reports:

- Ernest F. Tippetts, Partner, Knappen Tippetts Abbett Engineering Company.
- Robert W. Abbett, Partner, Knappen Tippetts Abbett Engineering Company.
- Gerald T. McCarthy, Partner, Knappen Tippetts Abbett Engineering Company.
- James H. Pierce, Chairman, Pierce Management, Inc.
- John S. Marshall, President, Pierce Management, Inc.
- Robert R. Nathan, President, Robert R. Nathan Associates, Inc.

The General Manager of the survey is Homer B. Pettit, and the Deputy General Manager and Chief Engineer is John B. Alexander.

The following have served in Burma as Consultants:

Economic Geologist: Stuart St. Clair.
 Economist: Louis J. Walinsky.
 Editorial: Donald P. Barnes.
 Hydroelectric Engineer: Frank P. Fifer.
 Industrial Engineers: Donald F. Othmer,
 Lawrence E. Peterson.
 Mining Engineer: Evan Bennett.
 Transportation Engineer, Ports and Waterways:
 Francis B. Wilby.
 Transportation Engineer, Railways, Highways,
 Airways, and Communications: Ewart G.
 Plank.

The following have been members of the field staff:

Frank D. Ahern, Construction Engineer.
 Carleton W. Bacon, Communications Engineer.
 Thomas H. Baker, Highway Engineer.
 B. A. Blanchard, Management Administrator.
 Charles MacA. Carman, Industrial Engineer.
 J. B. Chadwell, Office Manager.
 Donald E. Cupp, Industrial Engineer.
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 Kenneth A. Lambert, Mining Engineer.
 Irving H. Licht, National Income Economist.
 Homer E. Montgomery, Office Manager.
 Howard S. Nelson, Agronomist.
 Jack W. Ninneman, Aerial Survey Engineer.
 Henry R. Norman, Ports and Waterways
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 Arnold A. Olsen, Chief Driller.
 Philip A. Parry, Industrial Engineer.
 C. M. F. Peters, Mining Engineer.
 Ernest J. Petersen, Chief Draftsman.
 Arthur R. Reitter, Irrigation Engineer.
 Benjamin P. Robinson, General Civil Engineer.
 Alfred A. Strauss, Industrial Engineer.
 Shigeharu Takahashi, Agricultural Economist.
 William W. Tamplin, Economic Geologist.
 George M. Tapley, Hydroelectric Engineer.
 Eugene P. Tubman, Construction Engineer.
 Peter N. Vukasin, Economic Analyst.
 Paul A. White, Industrial Engineer.
 Donald Wilhelm, Jr., Industrial Economist.
 Kenneth B. Wolfskill, Highway Engineer.
 George O. Zalkind, Ports and Waterways
 Engineer.

The following members of the home office staffs have devoted a large part of their time to the survey during the period of the contract:

Volney A. Poulson, Project Engineer.
 A. J. Creshkoff, Project Economist.

ACKNOWLEDGEMENTS

Heartfelt appreciation is expressed to the Hon. U Nu, Prime Minister of the Government of the Union of Burma, whose effective consecration to promoting the welfare of Burma has been an inspiration to the survey group and whose steady support of the aims of the survey has facilitated the work throughout the contract period. Gratitude is expressed also to all of the Ministers of the Government, whose unflinching courtesy and cooperation has opened the resources of their agencies to the survey staff members and greatly increased the effectiveness of their work.

All of the Ministries and other agencies of the Government of the Union of Burma from whom information and other help has been sought have been extremely cooperative, as have the personnel of the Special Technical and Economic Mission of the United States Technical Cooperation Administration in Rangoon, the personnel of the various missions of the United Nations and its affiliated organizations, and a large number of other individuals and firms. Because of the many sources from which aid has been received, the absence from Burma as this Report is being prepared of some persons who earlier served as members of the field staff, and human error, it has been necessary to omit from acknowledgement the names of some from whom important aid was received. To all of these as well as to the individuals hereinafter listed are extended the deepest appreciation of the associated firms and their staffs.

OFFICE OF THE PRIME MINISTER

U Win Pe, Secretary.

Economic and Social Board

U Hla Maung, Executive Secretary.
 U Ba Sein, Joint Secretary.
 U Kyaw Sein, Statistician.

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 U Maung Maung Kyaw, Executive Officer,
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 U Kyaw Khaing, Census Commissioner.
 R. C. Barber, Officer on Special Duty.
 Lt.-Col. Ba Han, Officer on Special Duty.

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U Tha Tun Oo, Deputy Director.
 U Thet Tun, Assistant Director (Economics).
 U Nyunt We, Assistant Director (Economics).
 Daw San Shin, Assistant Director (Statistics).
 And the entire staff of the department. 

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U Ohn Tin, Engineer.

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U Aung Baw, Conservator of Forests, Hlaing and Utilization Circle.

U Tun Ngwe, Conservator of Forests, Research and Training Circle, Ahlone.

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Saw Tun Pe, Executive Engineer, Eastern Shan State.

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U Tun Thwin, General Manager.

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 U Kyi Win, Chief Engineer.
 U Yone Mo, Chief Engineer (Mechanical).
 U Aye Maung I, Traffic Manager.
 U Han Tin, Controller of Railway Accounts.
 Saw McCarthy Gyaw, Statistical Officer.
 U Shwe Thane, Deputy Chief Engineer (Permanent Way).
 U Hla, Deputy Chief Mechanical Engineer (Locomotive).
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Mr. Ong Htgin Shu, Manager, National Rubber Works.

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PART I
INTRODUCTION

CHAPTER I

RESOURCES FOR BURMA'S DEVELOPMENT

A. INTRODUCTION

A full inventory and understanding of Burma's available natural and human resources is an essential prerequisite to a plan of development which will yield maximum results in minimum time. Burma is richly endowed with natural resources. She is less fortunate with respect to the availability of modern machines and equipment. Although the level of human abilities is generally high, there is a scarcity of technically trained and experienced personnel. This chapter presents a summary description of these resources.

B. PHYSICAL GEOGRAPHY

1. LOCATION AND TOPOGRAPHY

The Union of Burma lies between 93° and 103° East longitude and 28° and 10° North latitude. Its boundaries encompass an area of 262,000 square miles. It has nearly double the land area of Japan, is somewhat larger than France, and approximately equal in size to the State of Texas.

Roughly, Burma's boundaries form a diamond 500 miles across from east to west and 800 miles long from north to south with the long, narrow coastal strip known as Tenasserim extending from the southeastern side of the diamond some 500 miles farther south into the Malayan Peninsula.

Pakistan and India lie along the northwest side of the diamond, China along the northeast side, and Indo-China and Thailand along the southeast; the Tenasserim extends far down along the western boundary of Thailand. The Bay of Bengal and the Andaman Sea form the southwestern and southern boundaries. The length of the coastline from Pakistan in the northwest to Thailand in the southeast is about 1,200 miles.

Burma's historical isolation from her neighbors is closely associated with geographical features. The Indian subcontinent on the west and the Malayan peninsula on the east both extend to the south of Burma, and the sea routes from the one to the other have by-passed Burma. On land, mountain barriers formed by the fingers of the Tibetan mountains cut Burma off from neighboring countries. On the northwestern side, the northern extension of the Arakan Yomas (hills) and the Naga, the Chin, and the Lushi Hills form the boundaries. The northeastern

boundary lies in the Kachin and Shan Hills, and on the southeast the Shan and Tenasserim Hills are barriers to communication and trade.

These and related hills are oriented in north-south ranges and overlie much of the larger part of the country's area. The Arakan Yomas in the southwest isolate the Arakan coast from the rest of the country. The highland plateau of the Shan Hills covers all of east central Burma. Even the central plain of southern Burma is divided into two parts by the semi-isolated Pegu Yomas. The rest of Burma consists of the valleys and deltas of the Irrawaddy, Sittang, and Salween rivers and of the Arakan and Tenasserim coastal strips. It is these lowland areas that contain and support the bulk of the population and that are economically the most significant.

The three main river systems, the Chindwin-Irrawaddy, the Sittang, and the Salween, flow in a general southerly direction. The Irrawaddy River has its source in extreme northeast Burma. Its southern and sometimes southwesterly course traverses the length of the country. Its valley forms the cultural, historical, and economic heartland of Burma. As it emerges from the main southern valley of Burma between the Arakan and Pegu Yomas and approaches the sea, the Irrawaddy branches into creeks and rivulets to form the Delta, one of the great rice granaries of the world, with an area of some 10,000 square miles.

The Chindwin River rises far to the northwest in the Naga Hills, and joins the Irrawaddy from the west in central Burma at the town of Myingyan. The watershed of the Irrawaddy-Chindwin system constitutes about 55% of the area of Burma.

The Sittang rises in central Burma and drains the area east of the Pegu Yomas. At the coastal plain it opens out into a wide estuary noted for its tidal bores, and empties its waters into the Gulf of Martaban between Rangoon and Moulmein. The fact that a large part of its 350-mile course is difficult to navigate limits its commercial significance.

Still farther east is the third main river of Burma, the Salween. It has its source in Tibet and enters the sea near Moulmein. It is a swift river that flows along a deep winding gorge. Rapids and cascades confine its use mostly to small craft operating within restricted areas and to the floating of teak logs.

Three minor river systems are important. The Rangoon River provides Rangoon's gateway to the sea, and its tributaries link Rangoon to the Irrawaddy system. The Kaladan-Lemro river system forms a network in the fertile western coastal plain of Burma, west of the Arakan Yomas, centering on the seaport of Akyab. The Great Tenasserim River, although it flows throughout a considerable length of the Tenasserim littoral, is navigable for only short distances above its mouth at Mergui.

2. CLIMATE

Two thirds of the country is in the tropical and one third in the temperate zone. The main determinants of the country's climate other than location are the monsoon and the configuration of the land. Variations in the land surface from the sea coast to the mountains bordering Tibet and the southern offshoots of these mountains cause different climatic conditions in various sections of the country.

The seasons in Burma are:

The monsoon (wet weather)	Mid-May to Mid-October
The post-monsoon (humid weather)	Mid-October to Mid-November
The cold weather	Mid-November to April
The pre-monsoon (hot weather)	April to Mid-May

The monsoon winds which blow toward Burma, across the Bay of Bengal from a southwesterly direction, carry a considerable amount of humidity, resulting in the wet weather from mid-May to mid-October. When they meet the Arakan and Tenasserim Yomas, these winds lose most of their moisture, and somewhat more than 200 inches of rain fall per year in the Arakan and Tenasserim coastal regions. This factor produces the Dry Zone in Central Burma, roughly indicated by areas 1 and 2 on the map, "Natural and Artificial Vegetation of Burma" (Plate 1). Here the rainfall averages 25 to 50 inches per year, and its extreme irregularity causes frequent crop failures. In the delta plains of the Irrawaddy and Sittang, annual rainfall is as regular as in the coastal strips along the Yomas, but is lower. It averages a little more than 100 inches per year in the main delta region, and somewhat less in the northern delta. The southwest monsoon current, unable to climb the Shan Hills, changes its direction to southeast, following the river valleys and giving up little moisture in Central Burma.

After leaving the central plain, the winds lose more moisture, causing somewhat greater rainfall on the Shan Plateau, and another heavy precipitation zone in the hills and narrow valleys of Northern Burma.

About the beginning of November the monsoon moves from southwest to northwest. This is the movement of the lower air currents of the southwest monsoon from central Burma to southern Burma followed by dry northwesterly land winds. The period continues until the southwest monsoon returns with its moisture from the ocean.

The temperatures in the Shan Plateau, the Arakan Yomas, and the northern hills are the lowest, remaining between 70 and 80° in the summer. Over most of these tracts, frosts are common in December and January. The Dry Zone, at the other extreme, has an annual average temperature of about 90°. Temperatures in the coastal plains and deltas fall between these extremes with less seasonal fluctuation than in the other two areas because of the influence of the sea. Table I-1 gives selected temperature data from official records.

TABLE I - 1

AVERAGE ANNUAL MAXIMUM AND MINIMUM TEMPERATURES FOR SELECTED TOWNS

	Average Annual	
	Maximum (°F.)	Minimum (°F.)
Myitkyina (Northern Burma)	92	50
Maymyo (Shan States)	84	39
Mandalay (Dry Zone)	102	59
Akyab (Arakan Coast)	92	59
Tavoy (Tenasserim Coast)	97	53
Rangoon (Delta)	98	64
Bassein (Delta)	86	73

3. SOILS AND VEGETATION

Most of the information available on soils comes from District Settlement Reports and is non-technical. The deltaic soils are principally heavy clays or clay loams overlying slaty blue clay. They have sufficient potash and are generally deficient in nitrogen and phosphates. Dry Zone soils are generally of a lighter texture. More detailed soil information is given in Chapter VIII, Agriculture.

Along the river banks soils are generally silt deposits which are covered in many places with a layer of sand. Exposed banks and islands are cropped during the dry season. Some of these lands whose fertility is replenished occasionally by silt deposition are usually rich and yield good crops.

The map, "Natural and Artificial Vegetation of Burma" (Plate 1), indicates the natural and artificial vegetation of Burma. The coastal areas having more than 80 or 90 inches of rainfall a year were originally forested with hardwood, but most of the accessible portions have been cleared for paddy. The hills remain forested.

In the delta, near the sea, mangroves thrive in swamps along the coast and tidal creeks. On the

92°

94°

96°

98°

100°

LEGEND

- 1 Rice.
- 2 Rice On Irrigated Land.
- 3 Dry Zone Crops.
- 4 Grassland.
- 5 Monsoon Forest.
- 6 Evergreen Forest.
- 7 Swamp Forest.
- 8 Mountain Grassland And Forest.
- 9 (Above 3000 Feet) Terraced Crops.

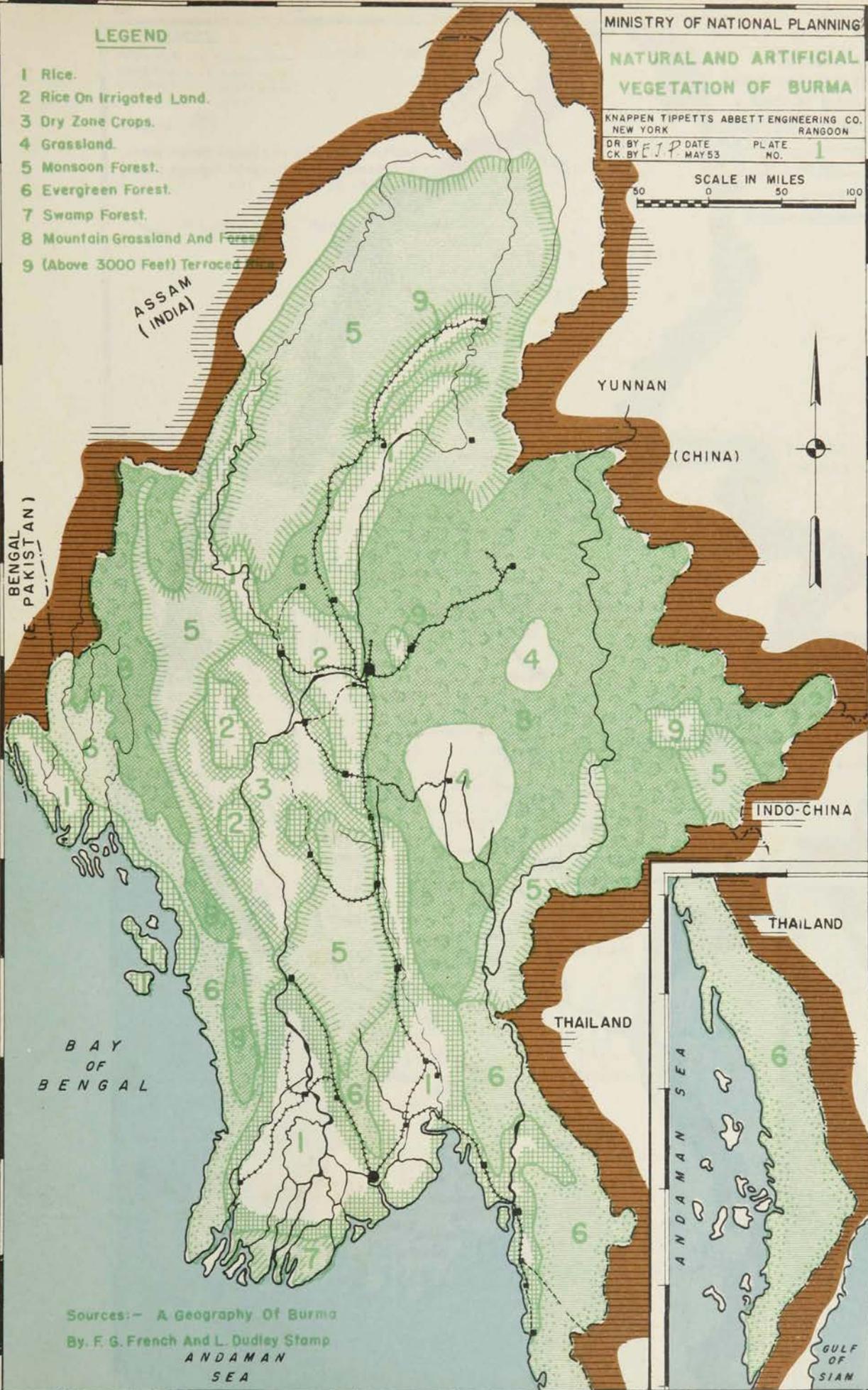
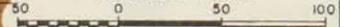
MINISTRY OF NATIONAL PLANNING

NATURAL AND ARTIFICIAL VEGETATION OF BURMA

KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK RANGOON

DR. BY E.T.P. DATE MAY 53 PLATE NO. 1

SCALE IN MILES



BENGAL (PAKISTAN)

ASSAM (INDIA)

YUNNAN

(CHINA)

INDO-CHINA

BAY OF BENGAL

THAILAND

THAILAND

ANDAMAN SEA

GULF OF SIAM

Sources:- A Geography Of Burma
 By F. G. French And L. Dudley Stamp
 ANDAMAN SEA

94°

96°

98°

98°

99°

28°

26°

24°

22°

20°

15°

14°

13°

12°

11°

10°

land behind the mangrove swamps are forests dominated by the kanazo tree. Large tracts of kanazo have been replaced by paddy-fields.

Nearly all of the area in which the annual rainfall is more than 40 inches but less than 80 inches is still covered with monsoon forests. The Pegu Yomas, the eastern slopes of the Arakan Yomas, and the Kachin State, except for the northern end, belong to this region. This belt is one of Burma's rich sources of forest wealth. Here are found teak, padauk, in, ingyin and other valuable woods.

The natural vegetation of the Dry Zone, with a rainfall of less than 40 inches a year and extremes of temperature, is largely small trees and scrub.

On the highlands of Burma, above 3,000 feet, grass and mountain forests thrive. The flat rolling plains of the Shan Plateau have broad grasslands, and the hilly regions of the northern and eastern hills have evergreen trees of the temperate region type.

C. AGRICULTURE

1. LAND RESOURCES

The land resources of Burma are highly suitable for richly productive agricultural activity. The economy revolves largely around agriculture. Its importance is reflected in the fact that roughly two thirds of the working population are engaged in the cultivation of land.

The most important crop, from the standpoints of both domestic consumption and export, is rice. For many years Burma was the largest single exporter of rice among all nations. If India was the jewel of the British Empire, Burma was its rice bowl.

The diversity of soil and of climate also favors the production of a relatively wide range of other agricultural products. At the present time, the most important farm products, next to rice, in approximate order of value of output, are groundnuts, tobacco, sesamum, sugar cane, pulses, rubber, onions, cotton, millet, chilli, maize, potatoes and wheat. The prospects for expanding the production of these commodities and others are favorable.

2. CLASSIFICATION INTO AGRICULTURAL REGIONS

In analyzing the agricultural resources of Burma, there is significance in the distinction between lower Burma and upper Burma, as indicated by the differences in soils and climate. The center of the transition zone between them lies approximately through the town of Thayetmyo, at 19° 20' North latitude. An important distinction is that, in paddy production, lower Burma is generally a surplus area, whereas upper Burma is generally a deficit area.

A more refined classification into four agricultural regions is useful; namely, Lower Burma, Central

Burma, Northern Burma, and the Shan and Kayah region. These divisions are indicated on Plate 2 and Table I-2, which present data on cultivated and cultivable land by districts. The large active and potential cultivation area in lower Burma testifies to the primary importance of this region in the agricultural economy.

TABLE I-2

LAND USE IN BURMA (1936 - 40)

	<i>Cultivated and Fallow</i>		<i>Cultivable but not Cultivated</i>	
	<i>1,000 acres</i>	<i>Per cent</i>	<i>1,000 acres</i>	<i>Per cent</i>
<i>Lower Burma</i>				
Akyab	882	26	1432	43
Kyaukpyu	236	8	91	3
Sandoway	121	4	44	2
Prome	450	24	158	8
Tharrawaddy	704	39	377	21
Pegu	1163	45	142	5
Insein	591	49	218	19
Rangoon		—	—	—
Maubin	672	64	233	22
Henzada	758	42	133	8
Bassein	995	38	412	15
Myaungmya	994	54	394	22
Pyapon	761	55	28	2
Hanthawaddy	931	76	64	6
Toungoo	591	14	160	4
Thaton	829	27	1620	52
Moulmein (Amherst)	717	15	1147	24
Tavoy	190	5	874	25
Mergui	194	3	1634	23
Salween (Papun)	28	2	14	1
<i>Central Burma</i>				
Minbu	482	21	120	5
Thayetmyo	325	11	304	10
Magwe	1127	48	208	8
Yamethin	637	24	769	30
Meiktila	705	50	226	16
Myingyan	1189	69	157	9
Pakokku	858	24	452	13
Kyaukse	275	34	65	8
Mandalay	280	21	123	9
Sagaing	851	1.41	72	11
Monywa (Lower Chindwin)	914	3.43	39	15
Shwebo	1119	3.50	31	9
<i>Northern Burma</i>				
Falam		—	—	—
Upper Chindwin	182	2	1916	22
Naga Hills	—	—	—	—
Katha		—	—	—
Myitkyina	142	2	1612	17
Bhamo	47	2	808	31
<i>Shan and Kayah States</i>				
Northern Shan States				
Southern Shan States				
Eastern Shan States				
Kayah State				

Source: Season and Crop Reports.

3. LOWER BURMA

a. Climate

Lower Burma, encompassing 30% of the country's total area, includes the Arakan, Irrawaddy, Pegu and Tenasserim Divisions, comprising nineteen administrative districts. It extends from the fertile coastal strip of Arakan on the west, across the broad valley and great delta of the Irrawaddy and the valleys and deltas of the Sittang and Salween, to the long, narrow Tenasserim littoral in the southeast.

This is a humid tropical region, with relatively high temperature and a regular monsoon which provides average annual rainfalls ranging approximately from 80 to 220 inches per year. Less than a century ago most of the non-hill area in this expanse was a swampy and sparsely inhabited jungle. The trade opportunities provided by the opening of the Suez Canal transformed it into a rich and populous agricultural region.

b. Land Classification

Of the total land area of 52.6 million acres in Lower Burma, 22% was cultivated before the war. Another 21% was officially classified as cultivable. This formal classification includes forests, swamps and other lands suitable for agriculture only after draining, clearing and other improvement. Reserved forests comprise another 18% of the total area. These are rich and accessible forest lands carefully maintained by the Forest Department for commercial exploitation. Table I-3 presents data from Season and Crop Reports on land use in the divisions of lower Burma for the five-year prewar period.

TABLE I - 3

LAND USE, LOWER BURMA, 1935-36 to 1939-40
(thousands of acres)

Division	Total Land Area	Re-served Forests	Other Land not Avail-able for Agri-culture	Culti-vable but not Culti-vated Land	Culti-vated Land	Per cent of Total Land Area Culti-vated
Pegu	12,832	3,652	3,631	1,119	4,430	34.5
Irrawaddy	8,701	1,745	1,575	1,200	4,181	48.1
Arakan	11,065	462	6,170	3,181	1,252	11.3
Tenasserim	19,976	3,635	9,094	5,289	1,958	9.8
Total	52,574	9,494	20,470	10,789	11,821	22.5

c. Rice

The lower Irrawaddy valley and delta lie wholly within the Pegu and Irrawaddy Divisions, a circumstance which accounts for the fact that these two

divisions contain almost three fourths of the cultivated land of lower Burma. This whole area is a vast patchwork of paddies—the great rice bowl of Burma. Also in the other fertile parts of lower Burma—along the Sittang and on the coastal strips of the Arakan and Tenasserim Divisions—rice is the dominant crop. About 90% of the total cultivated area of lower Burma is devoted to rice. Among the factors which make this whole region ideally suited for rice cultivation, the most important are the amount and regularity of rainfall. Most rice varieties are water plants that require several inches of standing water during most of the growing season. This can be accomplished in lower Burma by building up small mud embankments, or kazins, to retain the water during the long rainy season, from May to October, and to regulate its supply from field to field—a technique commonly known as “wet” cultivation.

d. Other Crops

As a whole, Lower Burma is a deficit area in other crops, which are imported from elsewhere in Burma or from abroad. However, some other types of cultivation are of considerable importance. The banks and islands of the rivers, which are annually flooded and silted but exposed during summer, are used to grow maize, millet and beans. Close to large consuming centers, the silt-covered lands are used for vegetable cultivation. Large portions of this alluvial or “kaing” land experience changes in surface, shape and size from year to year; sometimes large areas are washed away and reappear elsewhere. Such changing land is called “mye-nu” as distinguished from “mye-yin” which is permanent “kaing” land.

To a small extent in lower Burma, primitive “taungya” cultivation is practiced by the hill peoples. This type of cultivation consists of clearing patches of land by crude cutting, burning of vegetation, and sowing varieties of rice or other grains which will grow under these conditions. When the fertility is exhausted in two or three years, the process is repeated elsewhere. Such burned-over patches can be seen here and there on the hillsides of the Arakan Yomas and elsewhere in lower Burma. Fruit, palms, and chillies are also grown, and, in small quantities a variety of other crops.

It is worth noting that of the land brought under cultivation in lower Burma, the percentages of abandoned and fallow land are low. Especially in the case of rice, annual cropping is general. With proper rotation, if it were possible, the fertility of soil could be maintained. If the natural advantages of lower Burma are efficiently harnessed by an appropriate economic and social organization as

well as by technology, the area could become one of the most productive regions in the world.

e. Rubber

All of Burma's rubber comes from lower Burma. Before the war, over 100,000 acres were devoted to rubber cultivation. The largest plantations are located in the Mergui and Tavoy Districts of the Tenasserim Division, although a few sizable estates are found in the laterite soils of the Southern Pegu Yomas and around Rangoon. Before the war there were some 3,700 small estates of less than 100 acres each, most of which were owned and operated by Burmans.

f. Forestry and Fishing

Lower Burma is also important for forestry and fishing products. The forests in the Pegu Yomas rank highest commercially. The southern portions are evergreen forests, but the greater part of these hills is clothed with monsoon forests, including teak. The main wooded areas are in the Prome and Toungoo Districts of the Pegu Division, the percentages of total area forested being 32 and 57 respectively. The teak reserves are more valuable here than elsewhere in Burma because of their accessibility and their proximity to the Port of Rangoon. The Arakan Yomas are covered with jungle, which is pine or rhododendron on the ridges, tropical evergreen forests on the western flanks, teak on the eastern, and thick damp undergrowth in the valleys. The coastal strip, as in the Tenasserim, has thick tropical evergreen forests and jungle covering the uncultivated areas. The Tenasserim is too wet for teak, however, it contains vast reserves of other hardwoods, almost totally unexploited. Both in Arakan and in the Tenasserim, as well as in the central regions of lower Burma, there are huge stands of bamboo which are an inexhaustible source of housing materials and cellulose for paper making and other products. Section D contains data on the forested areas and timber production for the various regions of Burma.

Because of its large water surface and because it contains the entire coastline of Burma, the production of fish in lower Burma is far greater than elsewhere in Burma, though small-scale fishing occurs throughout the country in rivers and creeks and somewhat larger scale operations are carried out in a few places, such as Inle Lake near Taunggyi in the Southern Shan States. Fish are the second most important product of Arakan. A considerable fishing industry also exists in the southwest delta around Bassein. Fishing abounds along a large part of the Tenasserim coast, and Tavoy and Mergui are especially famous in Burma for their salt fish and for ngapi and other forms of fish paste.

4. CENTRAL BURMA

Central Burma, the Dry Zone, extends south from Shwebo to the Thayetmyo and Yamethin Districts. Between these, the other districts included are Lower Chindwin, Mandalay, Kyaukse, Pakokku, Myingyan, Meiktila, Minbu, and Magwe. This region receives less than 40 inches of rainfall per year. However, the irregularity of precipitation rather than the quantity shapes the nature of the cultivation. When the rains occur, they come in such downpours that most of the water is received in extremely brief intervals. If the rainfall was spread more evenly, this would not be a "dry zone," and agriculture would be much more productive.

Dry land cultivation is widely practiced in this area, but "kaing" cultivation and irrigation also exist. Although there are no extensive modern projects, irrigation systems have existed since early Burmese days.

Rice is an important crop even in the Dry Zone. Most of it is grown in irrigated tracts. Shwebo, Mandalay, Kyaukse and Yamethin districts are the centers of rice cultivation, but it is grown in some measure throughout the region. Groundnuts, pulses, sesamum, millet, and cotton are other major crops, and maize, gram, fruits, vegetables and sugar cane are grown. Because of the uncertainty of rainfall, farmers try to insure themselves against crop failures by diversity of crops.

5. NORTHERN BURMA

Northern Burma includes the administrative districts of Upper Chindwin, Katha, Bhamo, Myitkyina, the Naga Hills, and the Special Division of the Chins. The region is generally hilly and wooded and most of it is sparsely populated. The Special Division of the Chins, the northern part of Myitkyina, and the hilly portion of the Naga Hills district are clothed with dense hill forests. Bhamo, Katha, Upper Chindwin, and the remainder of Myitkyina, which also contain forested areas, belong to a wet zone that is similar in some respects to Lower Burma.

Over two thirds of the cultivated area is under rice. Most agricultural production is for local consumption, but in some parts of the broad northern valleys of the Irrawaddy and its tributaries surpluses of rice and sugar cane are produced. Most of the land cultivated or suitable for cultivation is in the Myitkyina-Bhamo-Katha triangle. Sizable tracts exist elsewhere. The area extending northwest from Homalin up to and including the Hukawng Valley, except for the highlands, though not now cultivated, is topographically suited to agriculture. In the unoccupied valleys of this region there are some 2,000,000 acres of well-watered land.

6. THE SHAN AND KAYAH REGION

The Shan and Kayah States represent a distinctive agricultural region. The grasslands are the most important part of the Shan Plateau. Wet cultivation and taungya cultivation are practiced, the former in the valleys and on the plains and the latter on the hillsides.

In the valleys and on the plains, rice and temperate crops such as wheat, potatoes, and other vegetables and fruits are grown. Tea is an important crop, mostly grown on the hills. Almost all of the garlic and ginger of Burma, much used by the Burmese to flavor their curries, are produced in the Shan States. This area is also the main source of supply of domestic animals—cattle, horses, sheep and goats—for other regions of Burma, especially draft animals for Lower Burma.

Most of the hilly parts of the Shan and Kayah Region have valuable forests, which as yet are largely untapped. In particular, the valleys in the southern portions of this region contain valuable teak forests.

D. FORESTS

1. PRODUCTS

The forests of Burma constitute an extremely valuable national asset. Timber, bamboo, and thatch are the basic materials used for housing and other construction. Firewood, charcoal, cane, bark for tanning and medicinal uses, cutch, lac, and thitsi (a gum used for lacquer work) are other major products of the forests. Teak, other hardwoods, cutch and lac are exported. Burma has been the world's foremost exporter of teak, which is her second most valuable postwar export; prewar it ranked fourth.

2. ACREAGE CLASSIFICATION

Table I-4 presents the forest acreage of Burma as currently classified by the Working Plans Circle of the Office of the Conservator of Forests. Burma is divided into six forest circles, which again are subdivided into forest divisions. Data with respect to the forests within each division are classified

TABLE I - 4*

FORESTS OF BURMA

(thousands of acres)

1 Circle and Division	2 Teak		3 Other Hardwoods		4 Reserved for Local Supply	5 Reserved for Fuel for B.R., I.W.T.B. Etc.	6 Reserved Unallotted	7 Total	
	Reserved	Unclassed	Reserved	Unclassed				Reserved	Unclassed
<i>Maritime Circle</i>									
Arakan	—	—	215	855	56	67	124	462	855
Henzada	193	—	—	—	7 (116)	—	365	565	—
Bassein	—	—	109	—	18	164	217	508	—
Delta	—	—	706	—	—	—	—	706	—
Thaton	282	2,646	— (91)	— (744)	— (60)	—	—	282	2,646
Ataran	622	1,510	— (352)	— (1,540)	— (2)	—	19	641	1,510
Thaungyin	329	64	116	—	—	—	82	526	64
Tavoy	—	—	2,098	—	43	55	—	2,197	—
Total	1,426	4,220	3,244 (443)	855 (2,254)	124 (178)	286	807	5,887	5,075
<i>Hlaing Circle</i>									
Thayetmyo	636	1,580	— (133)	—	—	—	—	636	1,580
Allanmyo	138	290	3 (94)	—	19	—	—	160	290
Prome	259	322	5 (149)	—	66 (6)	—	—	330	322
Zigon	270	—	7 (104)	—	14	—	—	291	—
Tharrawaddy	170	—	— (34)	—	51	—	—	221	—
Insein	237	—	— (237)	—	48 (6)	7	10	302	—
Total	1,710	2,192	15 (751)	—	198 (12)	7	10	1,940	2,192

RESOURCES FOR BURMA'S DEVELOPMENT

9

TABLE I - 4* (contd.)

1 Circle and Division	2 Teak		3 Other Hardwoods		4 Reserved for Local Supply	5 Reserved for Fuel for B.R., I.W.T.B. Etc.	6 Reserved Unallotted	7 Total	
	Reserved	Unclassed	Reserved	Unclassed				Reserved	Unclassed
<i>Sittang Circle</i>									
Yamethin	426	70	— (149)	—	61 (8)	—	—	487	70
Pyinmana	456	250	— (275)	—	— (21)	—	13	469	250
North Toungoo	314	321	— (176)	—	1 (18)	— (2)	11	326	321
South Toungoo	621	1,486	3 (64)	—	55 (26)	—	6	685	1,486
North Pegu	512	39	3 (74)	—	30 (21)	—	4	549	39
South Pegu	528	—	— (302)	—	43	15	—	586	—
Total	2,857	2,166	6 (1,040)	—	190 (94)	15 (2)	34	3,102	2,166
<i>Northern Circle</i>									
Myitkyina	436	2,285	—	—	1 (46)	179	—	616	2,285
Bhamo	497	1,271	31 (202)	719	2 (46)	—	—	530	1,990
West Katha	1,182	3,482	— (275)	—	—	—	—	1,182	3,482
East Katha	519	431	— (291)	151 (431)	19 (13)	—	27	565	582
Shwebo	815	1,926	143 (386)	—	44 (28)	—	—	1,002	1,926
Maymyo	499	659	40 (88)	—	69 (26)	—	50	658	659
Total	3,948	10,054	214 (1,242)	870 (431)	135 (159)	179	77	4,553	10,924
<i>Chindwin Circle</i>									
Upper Chindwin	877	996	17 (3)	—	—	—	21	915	996
Myittha	543	1,050	33	—	12	—	92	680	1,050
Lower Chindwin	457	72	128	893	—	—	—	585	965
Meiktila	255	—	58 (160)	—	230 (83)	—	114	657	—
Yaw	647	1,058	38 (553)	—	78 (11)	—	—	763	1,058
Minbu	671	442	87 (625)	—	35	—	318	1,111	442
Total	3,450	3,618	361 (1,341)	893	355 (94)	—	545	4,711	4,511
<i>Shan States</i>									
Mongmit	631	998	47 (148)	—	—	—	29	707	998
N. Shan States	237	1,730	58 (126)	—	5 (5)	—	—	300	1,730
S. Shan States	512	4,805	— (23)	—	15	—	473	1,000	4,805
Total	1,380	7,533	105 (297)	—	20 (5)	—	502	2,007	7,533
<i>Unclassed Forests not Assigned to Working Circles</i>									41,896
<i>Grand Total</i>	14,771	29,783	3,945 (5,114)	2,618 (2,685)	1,022 (542)	487(2)	1,975	22,200	74,297†

* Figures in parentheses columns 3, 4, and 5 represent areas that overlap with those given in column 2; they are not, therefore, included in the total in column 7.

† The Unclassed Grand Total equals Total Unclassed for Teak and other Hardwoods, and Unclassed Forests not Assigned to Working Circles.

into one or more of the following groupings, according to the main uses for which the forests are intended:

Teak Selection Working Circle—primarily teak forests.

Commercial Supply Working Circle—primarily other hardwood forests.

Local Supply Working Circle—forests reserved for use of villages in the vicinity, and controlled to prevent destructive exploitation by villagers.

Other Working Circle—forests reserved for fuel for the railways and the Inland Water Transport Board for rafting poles and for other special purposes.

Unallotted—forests reserved for climatic reasons; commercially valuable but inaccessible forests reserved for future exploitation; remote forests about which little is known; miscellaneous forests.

The second and third and to a small extent the fourth working circles listed above overlap with the first, i.e., some of the forest areas are assigned more than one use. This is shown by the figures in parentheses in columns three, four, and five of Table I-4 which represent areas that overlap with those given in the second column; they are not, therefore, included in the total in column seven.

Forests falling under the Teak Selection and Commercial Supply Working Circles are further divided into reserved and unclassified forests as indicated in the table. The reserved forest areas are more valuable in terms of such characteristics as number of trees, quality of timber, and accessibility, and are generally intended as a perpetual commercial source of supply. Like the forests falling under the other working circles, these are closely administered by the Forest Department, and exploitation is carefully regulated. The unclassified forests are loosely administered, if at all. Some unclassified forests are not assigned to any of the working circles.

A map showing the location of all reserved forests in Burma is included in Chapter XXII.

3. WOOD PRODUCTION

Production of teak and collectively of all woods other than teak (which are almost entirely hardwoods) each averaged roughly half a million cubic tons per year immediately before World War II. It is generally thought that with respect to teak this amount represents the maximum sustainable rate. In the case of other hardwoods, the supply is potentially much greater than half a million cubic tons annually. The limitations are markets and accessibility of the forest areas. One of the problems of accessibility is that most other hardwoods, unlike teak, do not float, and must be transported overland or by bamboo rafting on the larger waterways.

Burma has a long history of careful protection and administration of its forests. A large forest service is manned by experienced personnel. The war and subsequent insurrections have seriously inhibited the work of the Forestry Department. The production of timber, likewise, has been drastically reduced. Because of the remoteness of forests and the need for long supply lines in backwoods areas, timber extraction is one of the industries most affected by the prevalent sporadic fighting.

TABLE I - 5
PRODUCTION OF MAJOR MINERAL PRODUCTS
IN 1939*

(All figures are in thousands)

Location	Mineral	Quantity
<i>Tenasserim Division</i>		
Thaon	Tin and Tungsten Concentrates	0.2 tons
Amherst	"	0.1 tons
Tavoy	"	6.7 tons
Mergui	"	2.4 tons
<i>Mandalay Division</i>		
Yamethin	"	0.4 tons
<i>Kayah State</i>	"	5.6 tons
<i>Arakan Division</i>		
Kyaukpyu	Petroleum	11.1 gals.
<i>Magwe Division</i>		
Magwe	"	246,706.5 gals.
Pakokku	"	22,127.1 gals.
Minbu	"	2,818.2 gals.
Thayetmyo	"	1,996.4 gals.
<i>Sagaing Division</i>		
Upper Chindwin	"	2,014.1 gals.
	Total Petroleum	275,673.4 gals.
<i>Northern Shan States</i>		
(Bawdwin Products)	Ore†	486.9 tons†
"	Zinc Concentrates	59.3 tons
"	Refined Lead	76.0 tons
"	Copper Matte	7.9 tons
"	Nickel Speiss	2.9 tons
"	Antimonial Lead	1.2 tons
"	Refined Silver	6,175.0 troy ozs.
"	Tin and Tungsten Concentrates	15.4 tons
	Total Concentrates and Refined Metals	1,431.1 tons
	(Exclusive of ore)	

* Source: "Report on Mining and Mineral Production in Burma," 1939. The following approximate quantities of other minerals (except salt) were reported by the same source as produced in 1939:

Building stone and road metal	2,564,441 tons	Quartz	100 tons
Salt	57,000 tons	Bismuth	8 cwts.
Petrol from natural gas	36,005 tons	Jadeite	767 cwts.
Iron ore (Flux for Bwdn. smelter)	26,259 tons	Amber	6 cwts.
Clay for pottery	16,343 tons	Gold	1,206 ozs.
Soap-sand	1,878 tons	Rubies	211,570 carats
Antimony	325 tons	Sapphires	10,532 carats

† The ore is the source of all other Bawdwin products and is omitted from the total.

In calculating the totals, silver is converted to tons at the rate of 32 667 troy ounces per ton.

92°

94°

96°

98°

100°

REFERENCES

PROVINCE
DIVISION
DISTRICT

TOWNS.....●

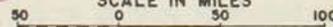
MINISTRY OF NATIONAL PLANNING

AVERAGE ANNUAL RAINFALL

KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK RANGOON

DR BY: G.P. DATE: MAY 1953. PLATE NO. 4

SCALE IN MILES



28°

26°

24°

22°

20°

15°

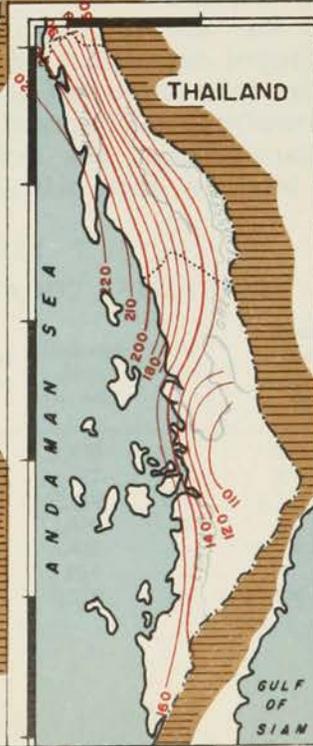
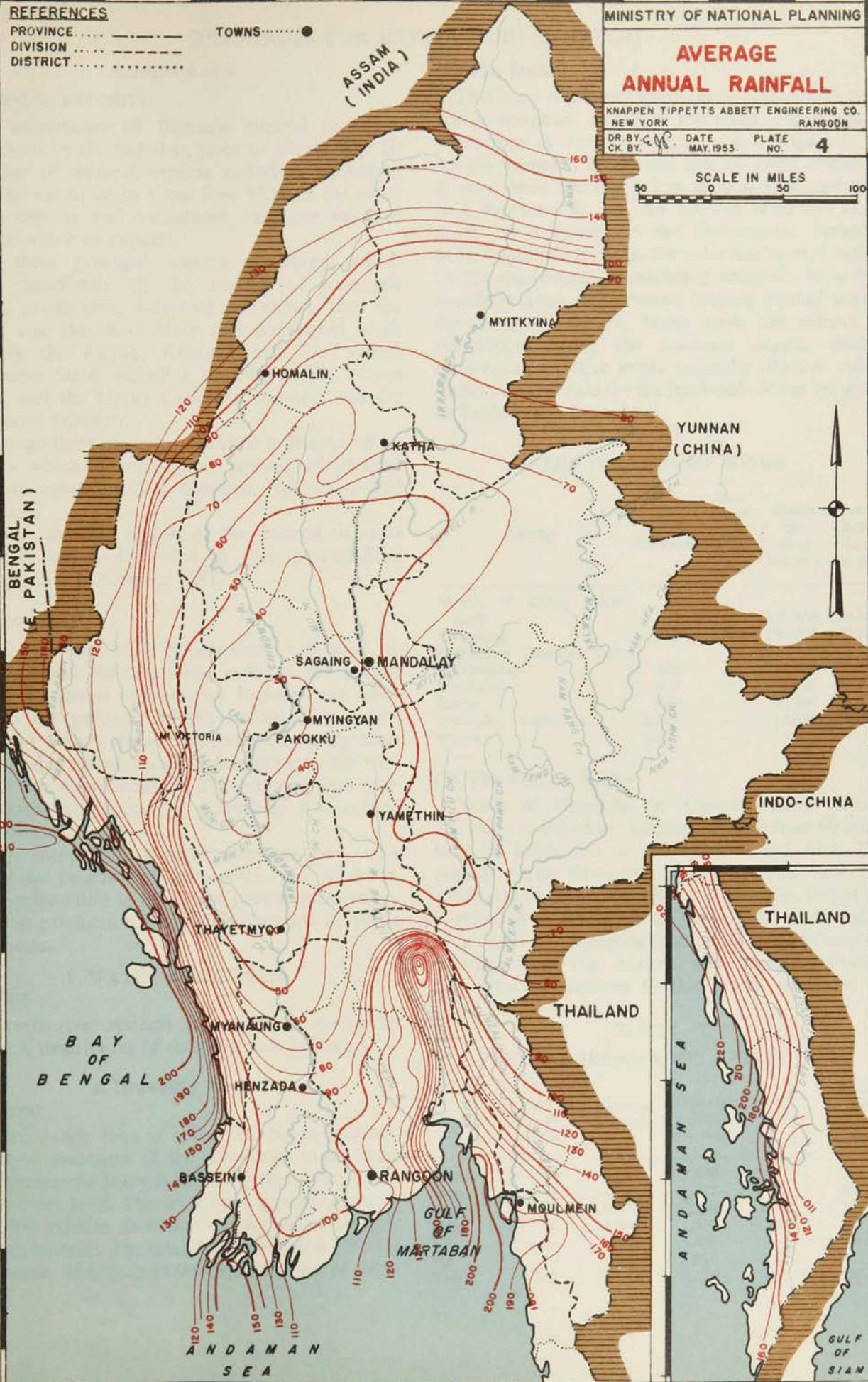
14°

13°

12°

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10°



94°

96°

98°

98°

99°

E. MINERALS

1. MINERAL DEPOSITS

The importance of Burma's mineral resources is indicated by the fact that, prior to World War II, the value of mineral exports including petroleum products was equal to about four fifths of the value of rice exports and constituted over one third of the total value of exports.

The three principal regions of Burma which include practically all the sources of economic mineral production, excepting petroleum, thus far known are: the Shan State and contingent areas including the Kayah, Kentung and Wa States; the Kachin State, including the Naga Hills, North Burma, and the Upper Chindwin country; and the Tenasserim Division.

Although there are many minerals in Burma, those deposits which hitherto have proved of greatest economic value are tin, tungsten, lead-silver and petroleum.

A more detailed review of the mineral deposits of Burma and a discussion of their potentialities may be found in Chapter XXI.

2. PRODUCTION

The data on 1939 production, presented in Table I-5 and its footnotes, indicate the prewar pattern of mineral exploitation. Included are references to the products of the Burma Corporation smelter at Namtu (near Bawdwin), the only large metal refining operation in Burma prior to the war. All of the approximately 275-million-gallon prewar annual production of petroleum was refined within Burma.

Many important mineral deposits are now inaccessible because of insurgency. As a result, present production is far below prewar production. Petroleum production has been below the domestic requirement.

F. WATER RESOURCES

1. RIVERS

The main river systems of Burma are shown on Plate 4. A description of these systems follows:

a. Irrawaddy River

(1) General

The Irrawaddy rises at about 28° North latitude, in a major extension of the Himalaya Mountains, having permanent snow fields and peaks over 19,000 feet above sea level. The river flows generally southward 1,300 miles to its mouth on the Bay of Bengal, 16° North latitude. The total drainage area is 155,000 square miles, including 15,000 square miles of delta area.

(2) The Delta

This has a maximum width (east-west) of 200 miles and a maximum length of 150 miles. The principal water use is for agriculture and navigation. In certain Rangoon areas clear potable water originates in sand beds 280 feet below ground level and rises to a depth of 30 feet. An artesian condition exists north of Rangoon, at the Government Spinning Mill. South of Henzada, the delta has several outlets to the sea through meandering channels. It is flat, poorly drained, and receives intense rainfall during the monsoon season. Many areas are subject to inundation during the monsoon season, despite numerous protective levees, normally effective. Additional physical data for the Irrawaddy River are given in Table I-6.

TABLE I - 6

THE IRRAWADDY RIVER

Locality	Miles Upstream	Max. Flood Flow (thous. c.f.s.)	Drain- age Area (sq. mi.)	Annual Output (thous. ac. ft.)
Mouth of China River	0	—	155,000	310,000
Myanaung	218	2,000	140,000	280,000
Confluence of Irrawaddy and Chindwin	559	—	117,870	260,000
Mandalay	670	—	48,160	140,000
Katha	890	—	32,400	119,000
Irrawaddy Confluence	1,160	—	17,900	90,000
Source	1,290	—	—	—

(3) The Central Valley

North of Henzada the Central Valley extends 250 miles to Pakokku, varying in width from 60 miles near its south end to 160 miles at Pakokku. The rainfall varies from 90 inches per year near the south end to about 30 inches at Myingyan. Irrigation is required as far south as Thayetmyo, water being obtained from numerous perennial flowing tributaries entering from the Arakan and Pegu mountains. The principal streams in this group are listed in Table I-7.

TABLE I 7

CENTRAL IRRAWADDY TRIBUTARIES

River	Length in Miles	Elevation at Source	Drainage Area (sq. mi.)	Low Flow (c.f.s.)	Annual Output (thous. ac. ft.)
Matun	116	3,750	1,670	—	1,690
Man	78	4,250	717	20	725
Mon	196	10,000	2,314	160	2,340
Salin	94	8,500	1,350	20	—
Yin	—	2,000	2,410	—	1,540
Pin	—	5,000	1,014	—	—
Yaw	148	8,750	2,575	—	11,900

(4) The Northern Basin

The northern Irrawaddy basin, including the Chindwin, Mu, Shweli and Myitnge Rivers, contains vast power and irrigation resources (see Chapters IX and XIX). Commercial navigation exists on the main Irrawaddy River to Myitkyina and to Homalin on the Chindwin. Irrigation is desirable over the lower part of the northern basin and minor projects have been developed in the Mandalay, Shwebo, Kyaukse and Sagaing Divisions (see Chapter IX).

b. Arakan Rivers

West of the Irrawaddy Valley lie the coastal mountains extending from low foothills near Bassein (lat. 16°) to the Indian Border (lat. 24°). The foothills, termed the Arakan Yomas, increase steadily toward the north culminating in 10,000-foot Mount Victoria (lat. 21°). North of this peak there is a continuous range of mountains, 8,000 to 9,000 feet in height, terminating in the rugged Chin Hills. The coastal mountains are heavily watered. Proceeding from the southern extremity, the principal rivers on the west slope discharging directly into the Bay of Bengal are indicated in Table I 8.

TABLE I 8
ARAKAN RIVERS

<i>River</i>	<i>Length in Miles</i>	<i>Elevation at Source</i>	<i>Drainage Area (sq. mi.)</i>	<i>Annual Output (thous. ac. ft.)</i>
Lemro	168	5,500	3,910	20,300
Kaladan	404	8,000	8,730	43,600
Mayu	96	2,000	1,975	9,200

c. Pegu River

East of the Irrawaddy Central Valley, separating it from the Sittang River, lie the Pegu Yomas, a range of low mountains about 150 miles in length. Out of the southern portion and discharging into the Rangoon River, flows the Pegu River. The total length of the river is 166 miles and its elevation at the source is about 2,700 feet. The drainage area is 2,065 square miles and average annual output 6,500,000 acre feet. In view of its proximity to the Rangoon market, high annual runoff, and adequate storage possibilities the Pegu has promise as a source of hydroelectric power which can be scheduled for early development (see Chapter XIX).

d. Sittang River

The Sittang River originates near Yamethin (lat. 20° 15'), at elev. 1,500 feet, and discharges into the Gulf of Martaban (lat. 17° 15') about 60 miles east of Rangoon. The river parallels the Irrawaddy

in its southward flow. It has a valley length of about 200 miles and a width of 40 to 50 miles. The drainage area is 13,280 square miles and annual output 34,000,000 acre feet. Numerous large tributaries having good sustained flow enter the river from both east and west. Several have sufficient output and head to be considered for irrigation and power. Among these are the Shwegyin and Kyaukkyi, discussed in existing reports as potential power streams in conjunction with diversion of water from the Yunzalin drainage. Installations up to 150,000 horsepower have been contemplated, to supply power to Rangoon and other "central valley" towns (see Chapter XIX).

e. Bilin River

East of the Sittang and flowing parallel thereto is the Bilin River, 935 square miles drainage area and 5,000,000 acre feet annual runoff. Its source is at elev. 4,500 feet, and its outlet is the Gulf of Martaban. The valley length is about 100 miles and maximum width 20 miles. Flow is well sustained in the rainy season with over 150 inches of annual rainfall. The river is a possible source of power, although somewhat remote from load centers.

f. Salween River

Farther east is the Salween River, which crosses the China-Burma boundary at River Mile 760 and stream bed elev. 2,000+ft. Thence it flows in a southerly direction discharging into the Gulf of Martaban at Moulmein. The river has an average gradient of 2.6 feet per mile without notable falls. Throughout most of its length in Burma the river flows in a major canyon, and numerous large tributaries enter by steep channels or sizable cascades. Consequently, the power potentialities on the tributaries are very large, but located far from

TABLE I - 9
MAJOR TRIBUTARIES OF SALWEEN RIVER

<i>River</i>	<i>Drainage Area (sq. mi.)</i>	<i>Annual Output (thous. ac. ft.)</i>
Western Tributaries		
Donthami	1,090	5,200
Yunzalin	1,130	6,000
Nam Pawn	7,290	16,300
Nam Teng	5,880	14,100
Nam Pang	4,890	12,500
Eastern Tributaries		
Ataran	2,200	11,700
Gyaing	3,680	19,400
Nam Hsim	1,980	4,400
Nam Hka	3,980	8,900
Nam Ting	3,460	8,900

existing markets. The downstream 70 miles of the Salween is located in an alluvial plain where meanderings and alternate channels exist. The river is navigable in this lower reach, and is said to be passable part of the year for small boats proceeding downstream from the China border to the sea (see Table I 9).

g. Tenasserim Rivers

In the panhandle south of Moulmein are the Great Tenasserim and a number of small rivers where navigation will be the principal use. However, there are power sites suitable for local supply, where 200- to 250-inch rainfall occurs annually (see Table I 10).

TABLE I - 10
TENASSERIM RIVERS

<i>River</i>	<i>Drainage Area (sq. mi.)</i>	<i>Annual Output (thous. ac. ft.)</i>
Lenya	1,230	6,900
Great Tenasserim	6,840	41,600
Tavoy	1,110	6,900

2. PRECIPITATION

The average annual precipitation for all parts of Burma, obtained from long-term records of the Ministry of Agriculture and Forests, is shown on Plate 4. The rainfall varies from 200 inches or more on the Arakan and Tenasserim coasts to a low of 30 inches on the area near Chauk and Myingyan. At the sources of the Yunzalin River (elev. 8,500 ft.) the average rainfall is 224 inches, and in North Burma it averages 160 inches near the Irrawaddy and Chindwin sources.

The monthly distribution of rainfall throughout the average year is shown for selected stations in Table I-11.

3. RUNOFF

Estimated runoff factors vary from 20% in the dry belt to 75% in the Kachin States. The estimated factors are based on recorded discharge and rainfall for the Rangoon Water Supply Reservoir at Gyobbyu, and for the Bawgata hydroelectric project where stream-flow measurements were made in 1947-48. Based upon available rainfall and discharge records, the runoff factor for the Pegu watershed above Pegu Town varied from 49.5% to 70.6% for the period 1946-52, with an average of 60.7%. The runoff factor for the Saingdin Drainage Area has been computed to be 55.7% for 1952. More detailed runoff data are given in Chapter IX.

4. IRRIGATION

A detailed description of the over-all irrigation program and specific projects may be found in Chapter IX.

5. NAVIGATION

Seasonal navigation is developed on the Irrawaddy as far north as Myitkyina and on the Chindwin to Homalin. Navigation extends 70 miles up the Salween. A complete system of channels connects all tidal rivers of the Irrawaddy Delta so that barge movement of rice to the deep water ports is customary. Numerous tidal estuaries and rivers on the Arakan and Tenasserim coasts are suitable for navigation. The Sittang River entrance is made troublesome by a bore; however, this area is by-passed by the

TABLE I - 11
MONTHLY AND ANNUAL MEAN RAINFALL AT SELECTED STATIONS

<i>District</i>	<i>Jan.</i>	<i>Feb.</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year</i>
Rangoon	0.2	0.2	0.3	1.6	12.0	18.0	21.4	19.9	15.3	6.9	2.8	0.4	99.0
Mergui	0.9	2.0	3.1	5.3	16.9	29.4	31.6	29.2	26.4	12.1	3.7	0.7	161.3
Akyab	0.1	0.2	0.5	2.1	14.0	46.9	54.8	45.2	22.6	10.9	5.5	0.8	203.6
Myitkyina	0.4	0.9	0.9	2.0	6.0	15.1	19.2	15.5	9.7	6.8	1.2	0.4	78.1
Toungoo	0.1	0.3	0.2	1.9	7.7	14.1	17.6	19.1	12.1	7.4	1.8	0.5	82.9
Tharrawaddy	0.1	0.3	0.2	0.8	8.8	16.5	21.1	19.9	12.8	5.6	2.0	0.4	88.5
Prome	0.0	0.1	0.1	0.8	5.5	8.8	9.0	9.0	7.2	4.5	1.7	0.2	46.9
Meiktila	0.1	0.1	0.2	0.8	5.2	4.9	3.4	4.7	6.3	5.5	1.9	0.4	33.5
Maymyo	0.1	0.2	0.5	2.1	9.7	8.9	6.3	9.3	10.2	7.6	3.3	0.6	58.8
Lashio	0.3	0.3	0.6	2.2	6.9	9.8	12.0	12.7	7.8	5.7	2.8	0.9	62.0
Thayetmyo	0.0	0.0	0.1	0.7	5.3	7.9	8.0	8.5	7.8	4.9	2.3	0.0	45.5
Mandalay	0.1	0.1	0.2	1.1	5.9	5.5	3.3	4.6	5.7	4.7	1.6	0.4	33.2

Pegu-Sittang Canal bringing small boats from the Sittang into the Rangoon River. A detailed description of the navigability of the river systems of Burma is contained in Chapter XIII.

G. TRANSPORTATION

1. WATERWAYS

The Irrawaddy system constitutes the country's chief means of inland waterways transport. The main river is navigable for 900 miles throughout the year, and for 105 additional miles during seven months of each year. Its great tributary in the northwest, the Chindwin, is navigable for 400 miles. In the south, the delta formed by the mouths of the Irrawaddy is a vast maze of minor rivers and streams. These form 1,500 miles of commercially navigable waterways throughout the year. Another 300 miles are added by the connected Rangoon River and its tributaries. These, plus innumerable other little streams used by small craft, form a network which provides the primary and in many places the only channel for travel and trade—short and long distance—throughout the region.

The Kaladan-Lemro rivers and their tributaries in northwestern Arakan constitute a separate and important system of inland waterways—commercially navigable for 350 miles, and more on tide. Including smaller streams usable by country boats, this is virtually the only method of transport in the area.

The Sittang is not navigable at its mouth, and the Salween for only 55 miles from its mouth. The Great Tenasserim and Tavoy rivers likewise have limited navigation possibilities. These waterways and various minor coastal streams in the Tenasserim are significant only for local traffic.

Both large and small waterways in Burma are affected by tides for considerable distances inland. Even commercial transportation can be significantly extended when it is timed with high tides. Also, a marked seasonal expansion of navigable waterways occurs during the five to seven months of high water during and after the rains.

There are only a few scheduled carriers in the coastal waters. The Government is developing a scheduled coastal service. One ship now operates between Rangoon and Arakan ports. When other ships which are on order are received, the service will be extended to the Tenasserim.

2 RAILWAYS

Prior to World War II, there were 2,060 route miles of government-owned railway of excellent standards. Owing to destruction by the Japanese and insurgent operations, only some 1,500 miles are

presently in operation. Rehabilitation is planned to a total of about 1,900 route miles by 1954. Existing lines and those to be rehabilitated are shown on the map, Plate 2 of Chapter XI.

The main lines extend 161 miles up the Irrawaddy Valley from Rangoon to Prome and 385 miles up the Sittang and Samon valleys from Rangoon to Mandalay. From Mandalay, one branch continues northward to Myitkyina and another extends 176 miles northeast to Lashio in the Northern Shan States.

There are three junction points for branch lines on the main Rangoon-Mandalay line. At Thazi, below Mandalay, branch lines run northwest to Myingyan on the Irrawaddy River and east to Shwenyaung in the Southern Shan States, 20 miles short of Taunggyi. Farther south at Pinyinmana, a branch line originally extended northwest to Kyauk-padaung, but it will not be rehabilitated for traffic until 1954.

Pegu is the initial point for a branch line running southeast to Martaban on the Salween River across from Moulmein. From Moulmein an isolated branch carries little traffic a hundred miles south down the Tenasserim coast to Ye.

From Letpadan, about midway on the Rangoon-Prome line, a branch extends westward to Henzada on the Irrawaddy. Traffic is ferried across the river whence forks go north to Kyangin on the Irrawaddy and south to the seaport town of Bassein. Other short branches complete the system.

3. HIGHWAYS

There are about 6,000 miles of highways and main roads. These are indicated on the map, Plate A of Chapter XVI. Nearly two thirds of these roads are tarred or metaled, and are motorable in all seasons; the rest only in good weather. Among the main national highways motorable in all seasons are the Rangoon-Mandalay-Lashio-Bhamo (a fair-weather road extends to Myitkyina), Rangoon-Prome-Mandalay, the Moulmein-Mergui (between Amherst and Ye the road is fair weather only), the Sagaing-Shwebo-Monywa-Sagaing (a fair-weather extension exists from Shwebo to Kalewa-Tamu), and the Meitktila-Taunggyi-Kentung (an all-weather road continues to the Thailand border).

4. AIRWAYS

There are at present 32 airfields in addition to the new Mingaladon airport. These are of varying lengths and surfaces. Some of them are serviceable only in the rainless months. All scheduled domestic service is by the government-owned Union of Burma Airways. All services radiate from Rangoon,

departing from and returning to Rangoon on the same day. UBA maintains daily services from Rangoon to Bassein, Myaungmya, Moulmein, Thaton and Mandalay. It provides weekly or semi-weekly services between Rangoon and Lashio, Magwe, Lanywa, Meiktila, Pakokku, Heho, Kentung, Shwebo, Loikaw, Myitkyina, Tavoy and Mergui.

5. INTERNATIONAL TRANSPORT

Because Burma is hemmed in on the east, north, and west by mountain barriers, land traffic to or from bordering countries is negligible. Three mountain roads represent the only land communications of any consequence: the road to Thailand through Kentung; the Burma Road through the Northern Shan States leading to Yunnan; and the war-built Ledo Road winding through the northern hills into Assam. Most international traffic is carried by sea and by air, and mainly under foreign flags. The Union of Burma Airways has flights to Calcutta, Penang and Singapore. Many international airlines operate from Rangoon. Several sea-going ships are on order for inaugurating a governmental shipping service to India.

H. CAPITAL RESOURCES

Centuries of productive effort in Burma have added large amounts of man-made capital to her natural resources; yet she is still markedly deficient in modern productive equipment.

1. PREWAR CAPITAL

Comprehensive data on prewar capital do not exist. However, its general nature and the role it played are well known. The clearing of forests and jungle and construction of embankments, canals, and irrigation ditches constituted capital improvements in the land which accounted for much of its value. Together with agricultural equipment and livestock and with the buildings on agricultural lands, these improvements formed a greater stock of capital than existed in any other single group of economic activities. Considerable capital value resulted also from the work which had been done in opening up forests for timber extraction and developing mines and wells. The development and improvement of roads, ports and waterways, and railroads represented a sizable investment, and served the needs of the prewar economy. Rice and timber mills, three oil refineries, a cement plant, and a large smelter were the only large-scale processing facilities, but small-scale and cottage industries, together with wholesale and retail trade and a variety of service establishments had built up a large stock of capital, though much of it was crude and outmoded. In other sectors

as well, much of the equipment and facilities was obsolete. Transport, crude material extraction, large industry, and the impoverished agricultural sector stood in need of technological improvement in varying degrees.

2. WAR DAMAGE

This modest capital structure was largely demolished by the war. Industrial facilities were razed, oil wells plugged and mines flooded. Irrigation systems, forests, and agricultural lands deteriorated for lack of upkeep. The transport system, which bound the country together effectively before the war, suffered extensive damage. Telecommunications facilities were almost completely destroyed.

3. RECONSTRUCTION

Since the war reconstruction has just begun to out-pace the ravages of postwar civil insurrection. Most of the rehabilitation, however, has taken the form of makeshift reconditioning of old installations along old lines. A few of the more modern prewar enterprises are now being rejuvenated on an up-to-date basis—a Burmah Oil Company refinery, the Bawdwin mines and smelter, and the cement plant at Thayetmyo. In addition, several new investment projects have been undertaken by the Government. The Mingaladon Airport is a first-class aerodrome, and a modern State Cotton Spinning and Weaving Factory has been constructed and placed in operation.

For the most part, however, the capital resources of Burma are inferior to those of prewar both in quantity and quality; meanwhile, technological advance elsewhere in the world has widened the gap between Burma and the more highly industrialized countries. The value in 1952 of all capital improvements and equipment in Burma may be estimated at between K10,000 and K15,000 millions. The rate at which this store of productive equipment is increased, and the quality of the new capital, will in large part determine the success of the development program.

I. HUMAN RESOURCES

Of all the economic resources of any country, by far the most important are the skill, energy, organization, and morale of the people. Where the inhabitants have been able and willing to apply themselves skillfully, much has been achieved even with meager resources. Where the people have been untrained or without initiative, great physical resources have not prevented national poverty. Any summary of the economic potentialities of Burma must therefore appraise the country's human resources.

1. SIZE

The latest over-all data on the Burmese labor force are those of the 1931 census; the 1941 census results, except for some summary information, were lost during the war. The first stage of a new census, whose three stages will require at least three years, has just been completed and some preliminary results are available. However, it is only a partial tabulation limited primarily to the accessible large towns, and its results should not be taken as representative for the country as a whole.

The results of earlier censuses indicate that in the past about 45% of the total population were in the working group. In 1941, the total population of Burma was 16.8 million, the increase over 1931 due to births and deaths being estimated at about 14%, or 1.3% per year. At this rate of increase the 1953 population would be 19.7 million. However, net emigration, probably fewer births due to disturbed conditions, and higher death rates due to war and insurrection, suggest a figure of about 19 million. At this level of population, the earlier 45% worker-population ratio, which probably has not changed radically, indicates a present labor force of about 8.5 million workers.

The population will probably increase more rapidly in the future than before the war because of a lowering of the death rate, especially the infant mortality rate, which will accompany improvements in preventive and remedial health services. A decline in the birth rate may also occur, but not until a later period. The percentage of the population which is in the labor force will be influenced downwards because a rapidly increasing population implies a greater proportion of younger non-workers, periods of education and training for children will be longer, and perhaps a decreasing death rate will have a greater immediate effect on the very young and the very old than upon persons of working age. The size of the labor force may be expected to increase at about the same rate as in the past, to about 9.3 million workers in 1960.

Burma is sparsely populated relative to its natural endowments and in comparison with neighboring countries. The average density of population per square mile in 1941 was 72, one of the lowest densities in Southeast Asia. As the economy emerges from its present under-developed status, larger and larger proportions of labor will be drawn from the relatively unproductive bearer-type occupations into more remunerative industrial and mechanized work. By this process an expanding consumer market based on expanding consumer income rather than on expanding population is created. In such an expanding economy, new methods of production and new

capital equipment initially replace rather than augment existing methods and productive capacity, and consequently their introduction is far easier to realize than in an economy where introduction of the new involves painful displacement of the old. Too rapid an increase in population will, however, counteract the expansion of production and prevent the rise of the standard of living which is the basic purpose of the development program.

2. LOCATION

Plate 3 shows the population of Burma by districts and the density of population in each district in 1941. The horse-shoe of hills and mountains separating Burma from her neighbors is very sparsely inhabited, the densities ranging from around 50 down to 9 persons per square mile. The bulk of the population is located between the Arakan Yomas and Chin Hills on the west and the Shan Hills on the east, from Rangoon north to Shwebo. There is a high concentration of population in the agricultural heartland—in the delta and north along the Irrawaddy to the latitude of Mandalay and small concentrations around Akyab and Moulmein. Densities in the main delta districts varied in 1941 from about 40 to 260 persons per square mile. They were similarly high in a few districts around Mandalay and in Akyab District. They are no doubt higher now.

Within this region and even more so in the rest of Burma, the population is overwhelmingly rural, scattered in small villages interspersed with towns of a few thousand inhabitants each. In 1931, 87% of all towns and village tracts in Burma had populations of less than 1,000 and accounted for over two fifths of the total population; 97% had populations of less than 2,000 and accounted for about three fourths of the total population. Since then, there has been a migration into the larger towns due largely to the quest for security from insurgency and dacoity.

Results of the 1953 census operations can be compared to those of 1941 only for 28 larger district headquarters towns of which about the 14 largest are the most populous towns in Burma. These data as well as the 1931 figures are shown in Table I-12. The total increase in population of these 28 towns between 1931 and 1953 was 61%; between 1941 and 1953, they showed an increase of 37%; from 1931 to 1941 their increase was 18%. Immigration into towns for security purposes has been of some significance. Since these 28 towns are district headquarters, as well as being among the largest in Burma, they are the most secure. For this reason they have no doubt experienced the largest increases.

92° 94° 96° 98° 100°

REFERENCES

PROVINCE TOWNS
DIVISION
DISTRICT

LEGEND

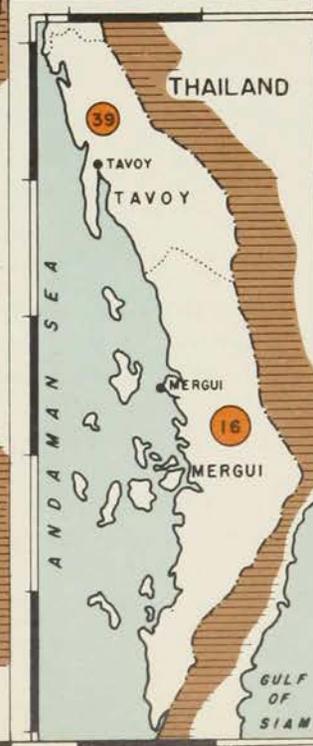
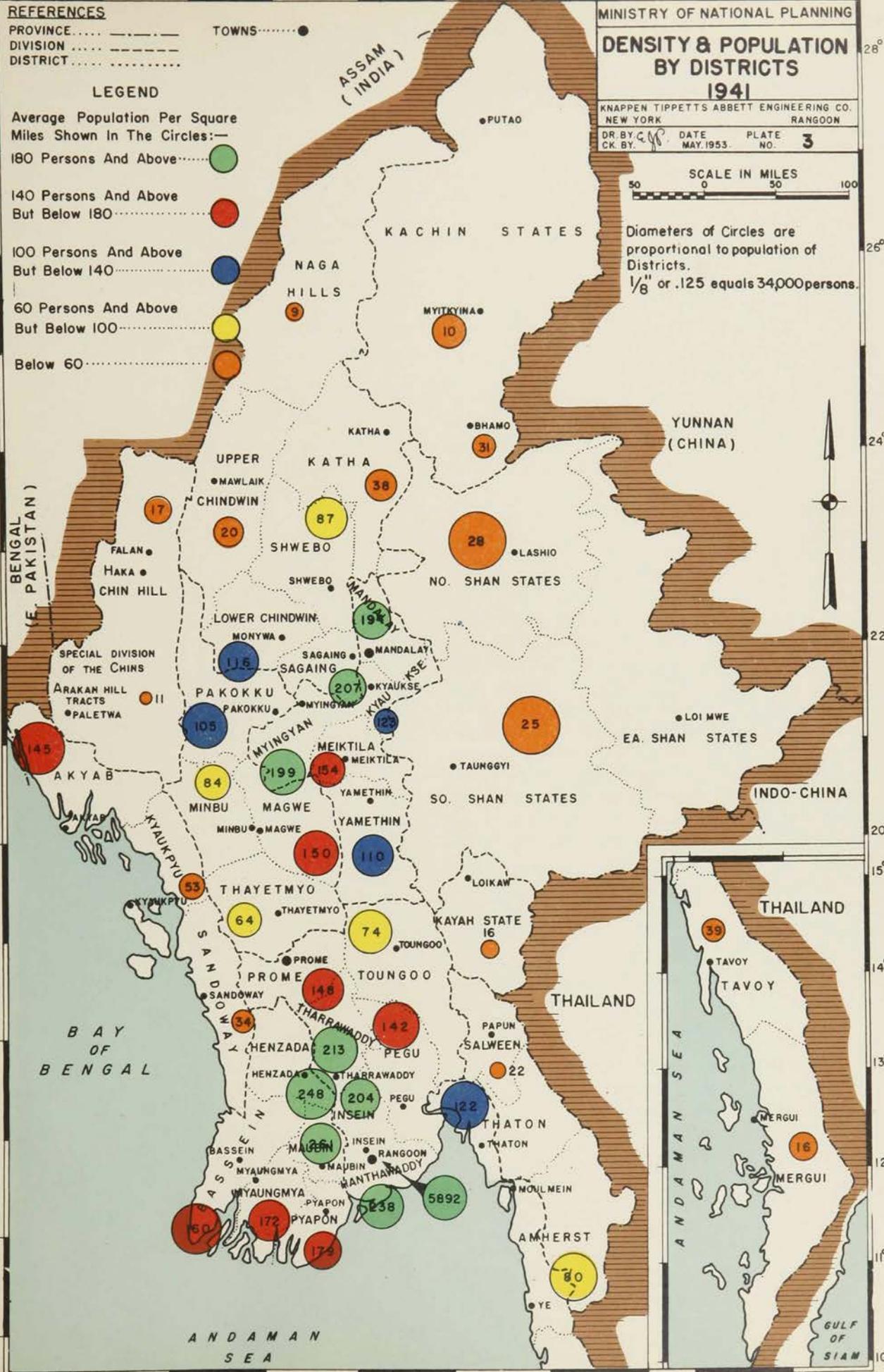
Average Population Per Square Miles Shown In The Circles:—
180 Persons And Above
140 Persons And Above But Below 180
100 Persons And Above But Below 140
60 Persons And Above But Below 100
Below 60

MINISTRY OF NATIONAL PLANNING
DENSITY & POPULATION BY DISTRICTS 1941

KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK RANGOON
DR. BY: G.P. DATE: MAY 1953. PLATE NO. 3

SCALE IN MILES
0 50 100

Diameters of Circles are proportional to population of Districts.
1/8" or .125 equals 34,000 persons.



94° 96° 98° 98° 99°

The total increase from 1931 to 1953 for 49 other towns for which a comparison could be made, and which were smaller on the average, was 53%; the increase for the rest of the country was probably between 25% and 30%. Except for Rangoon, the large percentage changes in town populations indicated apply to small numerical bases, and the movement of rural population to those towns is not as large as the percentage differences might lead one to believe. Thus, the total increase in population from 1941 to 1953 in the 28 towns is only some 450,000, of which almost one half is attributable to Rangoon; the increase in the population of the rest of Burma was probably in excess of 1,500,000.

3. RACE

There are probably considerably less than a million Indians and Pakistanis in Burma now—perhaps as few as three quarters of a million. In view of immigration policies and of the large number

of unmarried persons in this group, their numbers will not increase as rapidly as the national average but may tend to remain constant. About a quarter of a million Chinese represent the only other large non-indigenous race. There are some indications that immigration of Chinese has accelerated in the postwar period. There is a very high concentration of non-Burman races in towns. This increases their proportion to Burmans in the towns and decreases the proportion in the countryside. Many of the non-indigenous population have become or are becoming citizens; the number of non-nationals is much lower than of non-Burman races.

For various reasons, the percentage of foreigners who are in the labor force is greater than the percentage of native people. However, it is highly unlikely that the total number of workers of all non-indigenous races is more than 750,000. Occupationally, indigenous races have retained dominance in the traditional types of work. They virtually monopolize agriculture and constitute over two thirds of the craftsmen. Under colonial rule they lagged in the tasks of modern industry and modern government. Nevertheless, before the war they constituted at least one half of each of the major groups of workers other than agriculturists and craftsmen: unskilled and semi-skilled laborers, traders and shop assistants, clerical workers, and the military and police establishments. However, individual occupations such as that of sweepers were dominated by foreigners. While Burmans did not participate proportionately to their numbers in some of the more stimulating and rewarding occupations of a modern economy, the same is true for some of the least pleasant and least remunerative occupations. The most serious experience handicap is that top managerial-administrative posts in industry and trade before the war were reserved almost completely for foreigners; few Burmans gained the opportunity to exercise those talents which are so indispensable to economic progress, and whose cultivation is an important challenge facing Burma in her development program.

4. SKILLS

It is difficult to describe the skills of Burma's inhabitants in quantitative terms. A rather indirect clue is provided by an analysis of the labor force according to the types of industries in which work is performed. This information is obtained by the census on a countryside basis, and the Labor Directorate is developing a monthly tabulation of the number of workers in selected industries.

Since because of depression, war, and insurrection there has been relatively little "upgrading" of

TABLE I - 12

POPULATIONS OF 28 LARGER DISTRICT HEAD-QUARTERS TOWNS, 1931, 1941, 1953*

Towns	1931	1941	1953	Per cent Increase 1931 to 1941	Per cent Increase 1941 to 1953
1. Rangoon	398,967	500,800	711,520	25.5	42.1
2. Mandalay	147,932	163,243	182,367	10.4	11.7
3. Moulmein	65,506	71,181	101,720	8.7	39.6
4. Bassein	45,662	50,277	77,382	10.1	53.9
5. Akyab	38,094	48,492	41,589	27.3	-14.2
6. Tavoy	29,018	32,964	40,066	13.6	21.5
7. Henzada	28,542	31,114	60,666	9.0	95.0
8. Prome	28,295	31,144	36,762	10.1	18.0
9. Insein	20,487	27,491	28,672	34.2	4.3
10. Myingyan	25,457	26,895	36,439	5.6	35.5
11. Pegu	21,712	26,234	45,941	20.8	75.1
12. Toungoo	23,223	25,960	31,180	11.8	20.1
13. Pakokku	23,115	23,558	29,824	1.9	26.6
14. Mergui	20,405	23,074	33,587	13.1	45.6
15. Thaton	16,851	18,820	37,981	11.7	101.8
16. Pyapon	12,338	15,501	19,180	25.6	23.7
17. Sagaing	14,127	13,631	15,382	-3.5	12.8
18. Shwebo	11,286	13,590	17,827	20.4	31.2
19. Monywa	10,800	13,414	26,279	24.2	95.9
20. Meiktila	9,195	12,321	19,474	34.0	58.5
21. Thayetmyo	9,279	11,847	11,679	27.7	-1.4
22. Yamethin	9,291	10,126	11,167	9.0	10.3
23. Myaungmya	7,773	10,066	24,252	29.5	140.9
24. Maubin	8,897	9,637	23,442	8.3	143.2
25. Magwe	8,209	9,353	12,229	13.9	30.7
26. Tharawaddy	7,131	8,326	7,637	16.8	-8.3
27. Kyaukse	7,353	8,117	8,668	10.4	6.8
28. Minbu	6,005	6,404	9,093	6.6	42.0
Total	1,054,950	1,243,580	1,702,005	17.9	36.7

*According to the complete data of the 1931 census, the first 14 towns were the largest towns in Burma at that time. The others ranked from 16th to 68th in size.

Burmese industry, the over-all results of the 1931 census are informative. These show that 70% of the labor force was employed in agriculture and related work, 10% each in the classifications of "industry" and "trade," and the remainder scattered in the minerals, petroleum, transport, professional, public administration, and domestic service sectors of the economy. In "industry," most workers were occupied in home and small-scale production of textiles, mats and various handicraft products which do not constitute industrial production in the usual sense of the word. Trade in foodstuffs dominated the trade sector, a large part of which was of the road-side stall and hawking variety.

The latest tabulations of the Directorate of Labor, January to June 1951, which are incomplete, apply to about 700 larger establishments in industry, mining, petroleum, transport, finance and motion pictures. About 55,000 permanent workers are accounted for and these are highly concentrated in transport and allied work (50%) and in the rice-milling, petroleum and saw-milling industries (30%). Temporary workers were even more concentrated in these few industries.

These data are evidence of the well-known fact that Burma has been primarily a land of farmers, small traders and craftsmen. Only a moderately developed transportation system and a few organized industries for processing raw materials exist. These sectors employ relatively old and non-complex techniques and equipment. The same is true for the traditional sectors of the economy such as agriculture, where present techniques, although

sometimes requiring a high order of skill, are not highly productive.

5. WOMEN

The industrial potential of women workers as a group constitutes a particularly under-developed national resource. In 1931, about one half of the population was female, and about one third of the women were in the labor force. Since these proportions have probably not changed radically, the present number of female workers may be estimated at about three million. According to the 1931 census, which is probably still representative, about two thirds of the female workers were in agriculture where they constituted a fourth of the total workers. Most of the rest were in trade and industry. Because of the large number of women engaged in all sorts of petty trading, especially foodstuffs, they constituted half of the total workers in trade. In industry also, they formed half of the total by virtue of their near monopoly of spinning and weaving. This latter is by far the main "industrial" occupation of women, followed by work in the food and tobacco industries and in the making of lacquer, baskets and other light hand products.

Because they work in industries of relatively low productivity, because within these industries they occupy the more poorly paid jobs, and because much of their work is seasonal, contribution of women to the national output and their share of total income is considerably less than in proportion to the number participating. There is a large potential for increasing national output by utilizing woman-power more effectively.

CHAPTER II

THE TASK AHEAD

A. ECONOMIC PROBLEM AND OPPORTUNITY

Burma has won her crown of independence; she is striving to adorn it with the jewels of expanded output and improved levels of living and welfare. Her determined effort is part of a tremendous upsurge in the Far East which has been rising for several generations and reached a crest in World War II. Asian peoples without political independence are striving to achieve it; all are seeking economic independence and security as well. In some cases, the obstacles to political independence and sovereignty are well-nigh insuperable. In others, the difficulties encountered in the attempt to achieve economic well-being and security are equally difficult to surmount. In both respects, Burma is exceedingly fortunate. Her political sovereignty is well-established and unquestioned. Her magnificent resources offer her a unique opportunity to achieve, along with economic independence, levels of living and welfare hitherto unknown in Southeast Asia.

The problems which confront Burma in exploiting her potentialities cannot be overlooked. The heritage of the past weighs heavily.

1. THE PROBLEM

Throughout her history, Burma's geographic position isolated her from the changing modes and advancing techniques elsewhere. Like her neighbors, she was half-way round the world from the ferment of technological advance brewing in western lands. In addition, her mountain-locked land frontier and her withdrawn ocean boundary cut her off from the main streams of commerce among her neighbors and between them and the rest of the world. In these circumstances, semi-feudal organization persisted late in her history; the full territorial organization which is a requisite of government and society for advance in productive technology developed only recently. Nature was kind and bountiful, so that the wherewithal of living could be lifted rather than wrested from the soil. Needs for shelter and clothing were few and easily satisfied with but a modicum of work. These factors tended to lessen rather than stimulate the urge for technological advance.

The British colonial administration brought law and order; developed transport and communications; and encouraged investment and increased output in the extractive industries, notably in rice, oil, metallic

minerals and timber. These were important contributions. However, the British administration was ill-suited to full economic development. Profits were in large part paid out in dividends or invested abroad, not ploughed back into the Burmese economy, except in the industries producing directly for export. Capital formation under western auspices has in any case existed for only four generations, a far shorter period than that during which capital formation has been proceeding in western Europe.

Most top managers for foreign productive enterprises in Burma were brought in from Europe. In second-level management and technical functions, Indians and Chinese from seacoast trading centers were given experience; Burmans almost none. Indian coolies willing and eager to work for wages too low to support the Burmese standard of living rushed into Burma. Their availability lessened the incentive to introduce technically advanced methods. In agriculture, recognizing a great need, the Government encouraged cooperative societies, and when, mis-managed through inexperience, they failed, the Government assumed the liabilities of the central cooperative banks. But political principles of *laissez faire* prevented the Government from going further to establish an adequate credit system, or from setting up the organization necessary to inculcate improved methods of cultivation in Burma's basic industry.

Thus Burmans entered independence with age-old technologies in most industries, and with truly modern technology in very few; without technical or managerial "know-how" or attitudes; and above all lacking the concept and practice of continuous technological advance. This concept, rather than merely mechanization or the accumulation of physical capital, is the basis of the high and advancing living standards in the industrialized countries of the world.

World War II brought large-scale destruction and ruin to much of Burma's productive plant, and prevented necessary maintenance of that capital which was not damaged or destroyed. With independence came the wholesale evacuation of virtually the entire managerial, technical, and administrative population. And when, despite this serious loss, Burma made a substantial economic recovery in the early postwar years, civil insurrection liquidated these gains and laid the economy prostrate.

The destruction of capital in war and insurrection has been discussed in Chapter I. Output experienced comparable disruption. The output of the entire economy in 1949-50 was 41% below that before the war. In the basic rice industry, acreage was down by one fourth, production by one third, and exports by almost two thirds. Timber exports were only 8% of prewar; metals and ores 5%; and exports of oil, which before the war were one fourth of total exports in value, had ceased. Further to add to the problem, known reserves of metallic minerals and oil have been depleted to such an extent that extraction at the prewar rate will no longer be economic unless new deposits are discovered (see Chapter XXI). The fact that Burma, in spite of these repeated blows, has been able to rally as she has, increasing the total output of goods and services by one third in three short years from 1949-50 to 1952-53, is the strongest possible indication of her ability to meet the challenge of the future.

In spite of this remarkable gain, production, income and levels of living in Burma today are far below the prewar level. The total output of goods and services in Burma in 1952-53 will be approximately K4,297 million or 20% less than the K5,338 million of 1938-39 (both measured in 1950-51 prices). Moreover, because of population growth during the period, output per capita today compares far less favorably with prewar than does total output. In 1952-53, output per capita will be approximately one third below that of 1938-39. These figures are reflected in the current levels of living of the Burmese people—in the food they eat, in the clothes they wear, in their housing in their educational and medical services, in every aspect of everyday life. This is the situation which Burma's plan for economic development must overcome.

2. THE OPPORTUNITY

If the problems which face Burma are great, her opportunities for overcoming them are even greater. Her natural resources (described in Chapter I) are enviably abundant. Fertile lands, rich mines and forests, excellent ports and waterways, water resources ample for irrigation and electric power—all these in abundance in relation to the population they must support—can contribute richly to Burma's future. Burma's workers have demonstrated that they have the intelligence and the aptitude to learn the skills and the techniques necessary to efficient production. Burma's financial situation is sound. While her capital equipment is seriously deficient, she has and will continue to have the means to buy the improved equipment she needs. In this respect she is uniquely favored, and will continue to be for some

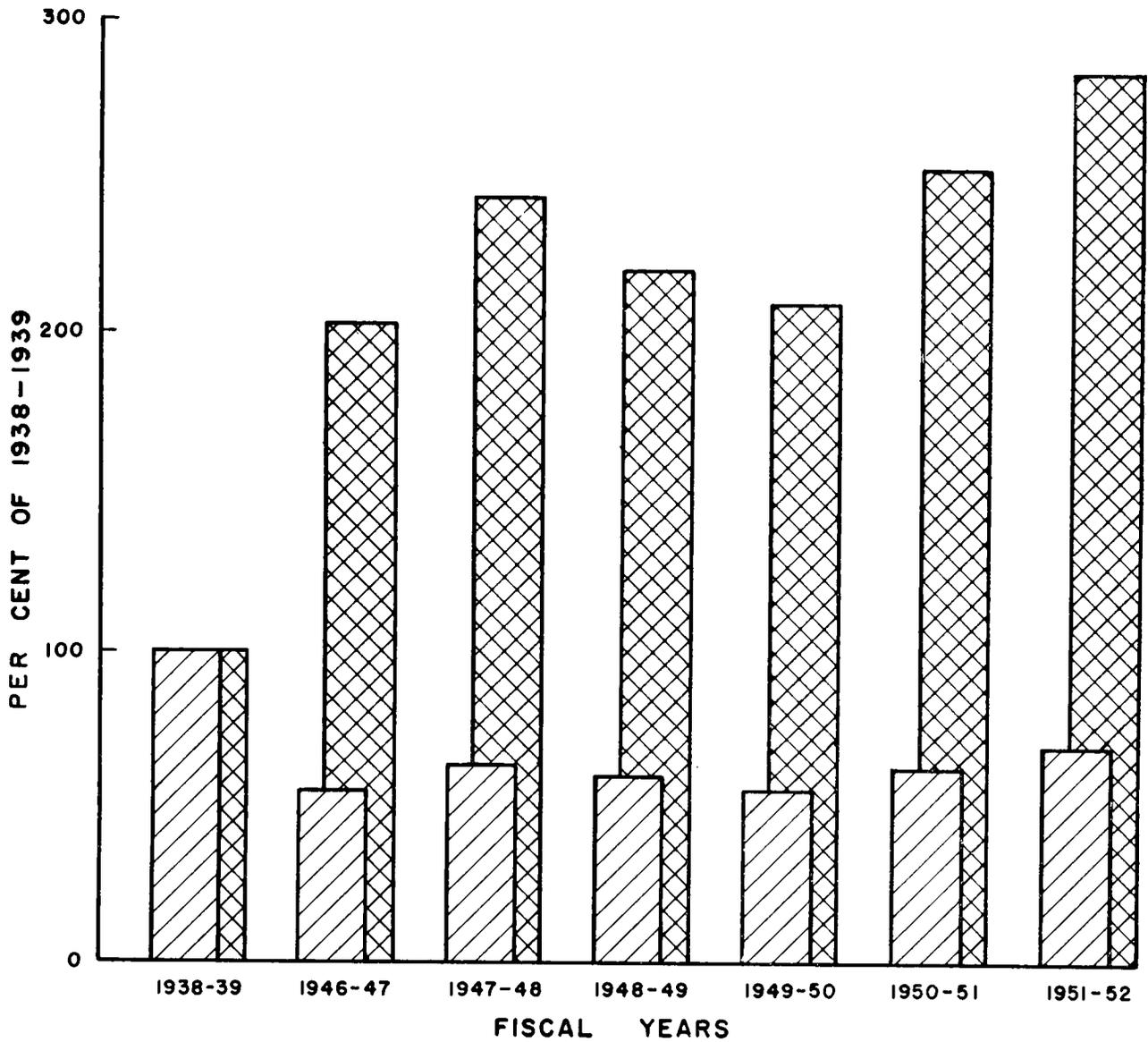
years at least, in the existence of a highly advantageous world market price for her chief export crop, rice. In combination, these factors provide Burma with an opportunity given perhaps to no other sizable undeveloped country in our time. Will Burma, this golden land, take full advantage of this golden opportunity? The chief objective of the plan for economic development presented in this Report is to assist Burma to make the very most of it.

Wherein exactly lies this opportunity? Certainly it does not lie in the opportunity to produce more and more "things" merely for the sake of producing them. The objective of the economic development plan must be to enable the Burmese people to live longer, healthier, happier lives; to provide more of the good things of life—cultural and spiritual, as well as material—for themselves and their children; and to insure that these benefits will be lasting, and available in increasing measure, for their children's children. How can this be achieved? How can the cultivator be assured of a more certain tenure on his land; easier credit; cheap fertilizer and improved seeds; healthier and more productive livestock; greater output and income; better school and health facilities for his children; sanitary water and electric power in his home; better roads and transport facilities to take him to the village or the market place; sufficient income to buy the many things he needs? How can the worker in the town be assured of a better and more productive job; better pay; more sanitary and safer work surroundings; better housing; improved opportunities for health, recreation and leisure? How can there be assured to every individual the economic freedom that makes reality of his equal right and opportunity to contribute his creative talents to the advancement of mankind in full and equal competition with his fellow man?

The development plan must provide answers to these questions. It must make possible these improved levels of living, and welfare, and human aspiration for all the people of Burma. In order that the improvements it seeks to effect shall be of a lasting character, it must seek also to effect a balanced development—in which every productive sector (agriculture, forestry, mining, industry and trade) and every geographic region will participate and share.

B. DEVELOPMENT GOALS

The Government of the Union of Burma has accepted specific goals for the development of Burma's productive resources during the remainder of the present decade. Such goals are necessary if the largest possible contributions are to be made to the well-being of the Burmese people in the years immediately ahead. With such goals set, the means for their



LEGEND



VALUE

PHYSICAL OUTPUT

MINISTRY OF NATIONAL PLANNING			
GROSS DOMESTIC PRODUCT			
VALUE AND PHYSICAL OUTPUT			
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DR. BY <i>EJP</i>	DATE	PLATE	1
CK. BY <i>DL</i>	JUNE 53	NO.	

fulfillment can be elaborated, the appropriate policies formulated, and the activities necessary to assure their fulfillment instituted.

In 1951 a comprehensive evaluation was made of the resources and productive potentials of Burma. The outgrowth of that early examination and review was the Preliminary Report submitted early in 1952, in which it was recommended that Burma should strive for a level of total production of some K7,000 million (in 1950-51 prices) by 1959. This was an ambitious goal, almost 90% above the 1950-51 level, but it was also believed to be feasible. It was based in part on a judgement that K7,500 million of development expenditures necessary to achieve the goal could be financed and disbursed by 1959. During the eighteen months intervening since submission of the Preliminary Report, the feasibility of this goal has been given further and thorough study. Three developments during that period have altered the economic basis underlying the original estimates of feasibility.

(1) The original estimate was based on the assumption that insurgency and internal disorder would be substantially eliminated by the end of 1953. While the restoration of internal security and order have progressed greatly during 1952 and 1953, they are not at the stage assumed in the original estimates.

(2) To accelerate pacification and to meet the KMT menace, defense expenditures have been more than doubled (from 1951-52 to 1952-53), and constitute not far from half of total budget expenditures for both current and capital purposes. These defense expenditures may remain at a high level for a number of years. In the presence of civil disorder, they are among the most productive expenditures which the country could make; but the necessity of devoting large numbers of men and large amounts of material resources to defense diminishes the size of the developmental program which the country can support.

(3) On the other hand, a study of the prospective world supply of and demand for rice gives promise of higher prices and larger earnings from rice exports—available to finance the development program—than had originally been estimated. Prices have already fallen somewhat from their record level of late 1952 and early 1953 and some further fall may occur during coming years, but a continuation of prices much higher in relation to import prices than was true before the war and considerably higher than was assumed in making the original estimate, seems assured.

This favorable development will considerably increase the annual rate of capital plus defense expenditures which the economy can support, and

will permit the development program to continue at a high rate in spite of the necessity for a large defense program. Because of it, the considerable increase in defense expenditures does not require any major change in the goal for the development program. However, balancing these several factors, and especially because of the delay in attaining internal security, it seems prudent to defer slightly the target date for reaching the prewar level of output. The fiscal year 1959-60, rather than the calendar year 1959, is therefore used as the target date in this Report.

While the goal is expressed in material terms, there is full appreciation of the cultural, spiritual and moral objectives associated with the basic wants and needs of the people. The first expression of the development goal is in terms of physical production, measured for simplicity's sake in money terms, but the basic objective relates to the education and health, the security of shelter and clothing, and the fulfillment of other wants generally comprehended in the expression "standard of living." As physical wants are satisfied, opportunities for creative self expression will multiply, Burmese culture, letters and science will add their contribution to the progress of civilization, the people of Burma will enjoy a more satisfying and more abundant life.

1. THE GOAL IN TERMS OF OUTPUT AND CONSUMPTION

The major goal for the increase in the total output of goods and services in Burma is accompanied by other goals relating to per capita output and to total and per capita consumption. These are shown by Table II-1, in relation to comparable figures for 1938-39 and recent years.

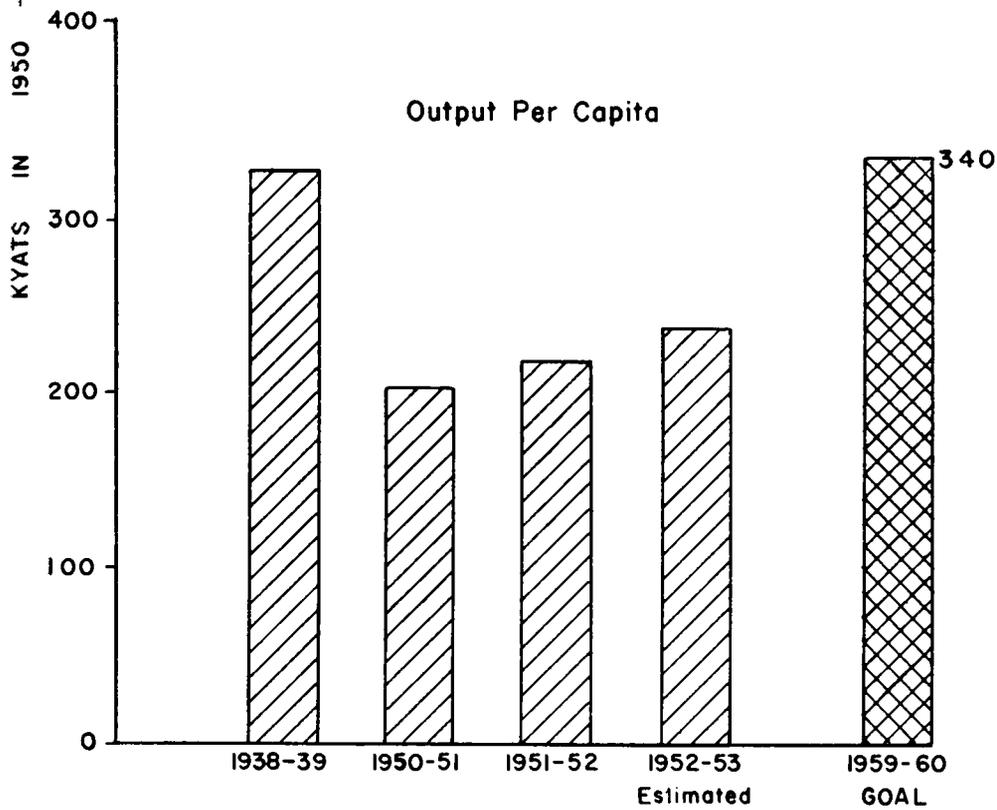
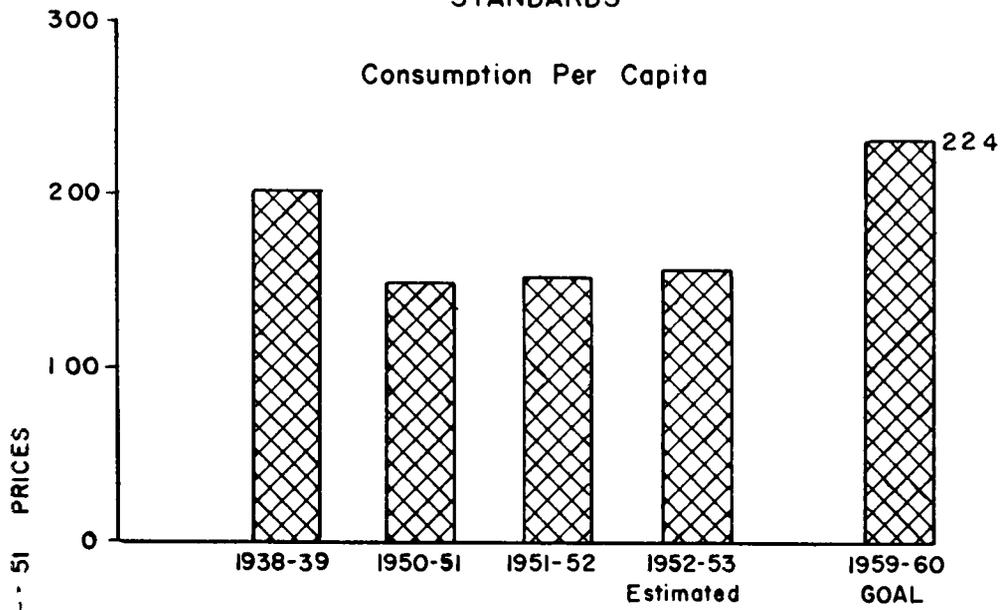
TABLE II - 1
SELECTED GOALS AND COMPARISONS
(1950-51 prices)

	1938-39	1950-51	1951-52	1952-53	1959-60
Gross Domestic Product					
Total (million K)	5,337	3,710	3,927	4,295	7,000
Per Capita	326	201	210	226	340
Consumer Purchases					
Total (million K)	3,382	2,693	2,745	2,964	4,663
Per Capita	206	146	147	156	224

Achievement of the total production goal of K7,000 million by 1959-60 will require an increase of 88% over the level of 1950-51 and of 63% over the estimated 1952-53 level. It will represent an increase of 31% over prewar.

Achievement of the per capita output goal of K340 in 1959-60 will require an increase of 69% over

FALL AND RECOVERY IN LIVING STANDARDS



MINISTRY OF NATIONAL PLANNING	
FALL AND RECOVERY IN LIVING STANDARDS	
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1950-51 and of 50% over estimated per capita output this year. It will represent, however, only a 4% increase over prewar per capita output.

Achievement of the total consumption goal of K4,663 million by 1959-60 will require an increase of 74% over 1950-51 and of 58% over that estimated for 1952-53. It will represent an increase of almost 38% over prewar.

Achievement of the per capita consumption goal of K224 by 1959-60 will require an increase of 54% over 1950-51 and of 44% over that estimated for 1952-53. It will represent an increase of about 8.5% over prewar.

A few observations will make clearer the significance of these goals:

(a) It will be noted that the planned increase in total output and in total consumption above the prewar level are considerably greater than are the planned increases in per capita output and consumption. This is because Burma's population has grown considerably since before the War, and will continue to grow. Hence Burma must increase output and consumption commensurately with population growth just to maintain per capita output and consumption. Per capita output and consumption can increase only to the degree that increase in total output and in consumption exceed population growth.

(b) Though the goals set seem extremely ambitious in relation to the levels of recent years, they are more modest when compared with Burma's achievement prewar.

(c) The remarkable increase in output achieved since 1950-51 testifies to the resiliency of the economy, and is strong evidence that the goals can be achieved.

(d) In 1959-60, with output per capita only 4% above prewar, consumption per capita will be above prewar by 8.5%. This is because a larger share of income will go to consumers in Burma and a larger share of output will therefore be purchased by consumers. Before the war, a considerable percentage of income flowed to foreign firms as profits, as is evidenced by the fact that in addition to the large sums invested abroad annually, primarily by foreign firms operating in Burma, a significant share of the gross national income (in 1938-39, 6%) was paid as dividends or interest to foreign owners of companies operating in Burma. With the nationalization of many large enterprises, it is estimated that a smaller share of the nation's income will be retained as profits and a larger share will flow to consumers.

It may be that the social welfare program will have proceeded far enough in 1959-60 so that a heavier share of income than now estimated is taken by the Government in taxes and used to provide social

services such as education and health instead of being left to the individual. If so, private expenditures for consumption may be less than shown in Table II-1, social services to consumers having replaced them.

(e) In interpreting the 1959-60 consumption goal, less than 10% above the prewar figure, it must be remembered that this is an average increase, and that averages conceal a number of internal differences. Because of new progressive tax measures and because of new social services provided without charge to the mass of the people by the Government, the distribution of income and of economic benefits will be more equal than before the war. If these policies are effectively carried out, classes and individuals who had far larger than average incomes before the war will not enjoy the increases shown; lower income classes will enjoy a somewhat larger percentage increase.

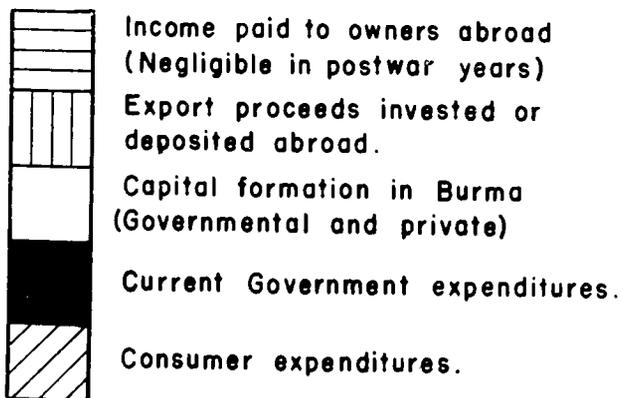
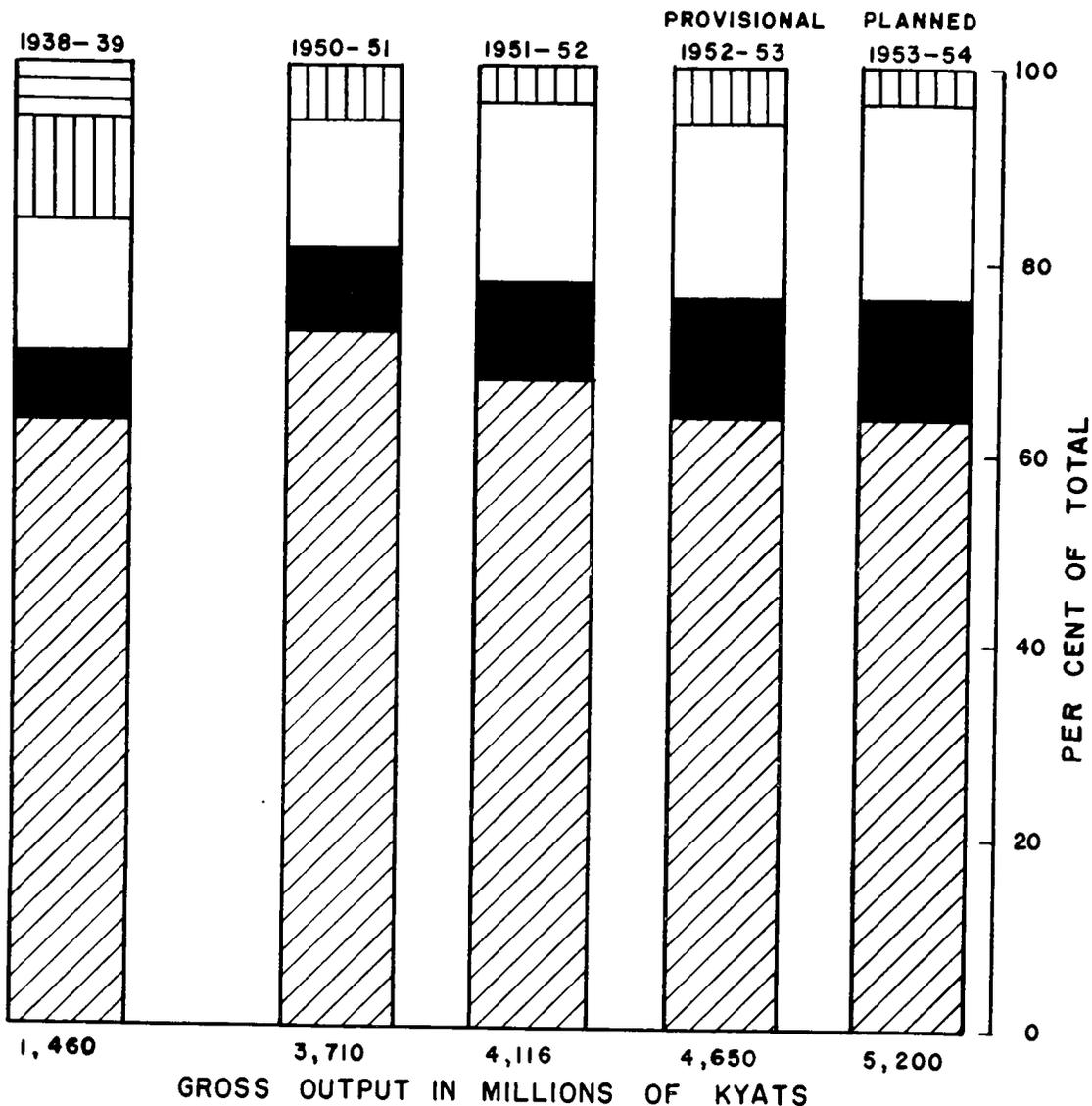
There are limits, however, to the benefits which can be achieved through such redistribution of income. The degree to which redistribution of income can advantageously be effected is limited. The prospect of increasing one's income is a powerful incentive to investment and to efficient production, and if progressive taxation is so heavy that it makes it difficult for the owner of an enterprise to increase his income after taxes, or if other measures reduce too greatly his incentives, private investment will dwindle, production will be less efficient, prices will be higher, and the mass of the people will suffer.

However, the most absolute limitation on the redistribution of income as a method of raising the standard of living is that it cannot bring about an increase sufficient to make a significant contribution to living levels in general. If the entire income of the wealthy in Burma were taken in taxes and distributed in government services or in cash among the nineteen million people of Burma, the increase in income per person would be very small. The wealthy are few and the poor are many. Burma simply does not produce enough goods to yield a high income. Maximum production of which Burma is capable with present methods of production cannot yield a high level of living, no matter how equitably the income from it is distributed. The benefits from optimum distribution of income will be small compared to those from a comprehensive development program.

2. THE PROGRAM FOR ATTAINING THE GOALS

Why were these goals selected? Why is per capita output just above the prewar level deemed feasible by 1959-60, rather than 1964-65? Or why not achieve it by 1956-57? The answer is that attaining the necessary productive capacity will involve large developmental projects. These projects will involve

MARKED SHIFT FROM PREWAR TO POSTWAR.



MINISTRY OF NATIONAL PLANNING		
HOW BURMA USED ITS GROSS INCOME		
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CK. BY <i>J.L.</i>	JULY '53.	NO. 3

heavy purchases of materials and equipment abroad, employment of large amounts of labor and natural resources at home, and great managerial and technical ability. It is believed feasible to carry out the necessary expenditures by the end of this decade, but impossible to do so in a shorter period. The program set forth is not an easy one, but it is believed to be a possible one. The availability of the necessary foreign exchange and the necessary quantity of domestic resources is discussed in Chapter III. The availability of managerial and technical skills is discussed in Chapter VII.

These developmental expenditures will include primarily expenditures for addition to the nation's stock of physical capital; its buildings, equipment, tools, and man-made improvements in natural resources. They will also include expenditures for research and for education and training in skills and techniques—especially for expanded professional, technical and vocational education and for a greatly enlarged agricultural extension program. Other chapters of this Report stress the importance of these activities. It would be a serious error to plan a development program primarily in terms of added capital, without adequate provision for these corollary actions which provide the technical, scientific, and educational climate without which an industrial society cannot successfully flourish. To economize on expenditures such as those for agricultural extension or for vocational and technical education in order to free more funds for capital development projects would be pya-wise and kyat-foolish.

The development program recommended in this Report includes both specific projects and a broad program in all sectors of the economic system. During the period of its development program Burma must improve and augment its capital equipment and its methods in many fields. Key projects in the fields of transport, communications, power, irrigation, mining, industry, fishing and forestry are discussed in this report. Those recommended will cost a total of about K3,000 million (see Chapter XXV).

No one should suppose, however, that these planned productive projects can or should constitute the whole of Burma's development program. Partly as a result of the key projects, partly as a result of the steady improvement in security and order, and partly as a result of the stimulus provided by a general rise in national income and in the market for products of all kinds, individuals and firms will also carry out on their own initiative from month to month and year to year many, many projects of repair, rehabilitation and expansion of both old and new productive ventures in almost every field of production, trade and services. The rise in income will create increased purchases and demands for new types of goods which

will stimulate investment in a great variety of fields and projects. As national income rises and security improves, individuals will also increase their expenditures for housing and for related improved living facilities. Improvement in transport and communication facilities, included among the key projects, will permit and stimulate many new productive ventures. Development of hydroelectric and other power sources will foster the development of new cottage industries and manufacturing industries. In these and many similar ways, the key programs recommended here will evoke and be complemented by a great variety of capital expenditures by individuals, firms and the Government.

The projects and efforts involved in the entire development program may be classed for convenience into four groups: productive projects planned by the central Government (but not necessarily executed in every case by the Government); other productive projects; and social projects—houses, schools, health and medical facilities, water supply systems and other community facilities—which may likewise be subdivided into those centrally planned and others. The individual projects discussed in this Report belong with the first group. Most of the expenditures for these planned productive projects will be governmental; some will no doubt be private. The variety of other projects referred to will be planned by the person or persons concerned, but will be unplanned in the sense that they will not be individually identified in a central master plan. They will be typically smaller than the planned projects, but in the aggregate they will provide a large share of the increase in the country's productive capacity and output. A development program which ignored them, or failed to establish conditions favorable to their execution, would be incomplete and unbalanced.

Social capital projects will also be both planned and unplanned. The Government's housing program will provide only a small fraction of the needs of Burma's growing population for replacements of and additions to present housing. Unplanned private construction (controlled in the main however by the community planning of individual communities) will provide much the greater share of the nation's new housing. In the other fields of social capital, planned governmental ventures will predominate.

The Government's plans for the economic development of Burma must take into account not only its own planned expenditures for productive and social capital, but also the prospective expenditures of individuals and firms which Government policies will do much to stimulate or retard. The amount of capital formation by Government which will be necessary to reach a given goal for the nation can be

estimated only if the private capital formation which will aid that goal is taken into account. The total amount of resources which the people and Government of the country in combination will be willing and able to divert from current use for developmental purposes is limited, and the capacity of the country to support any one of the four groups of developmental expenditures must be gauged in the light of its total developmental program. No one class of projects can be taken as an absolute requirement, before which the other categories must give way. Each class of projects must be considered in relation to the others, and total developmental expenditures must be considered in relation to total national income, to uses of income for current purposes, and to the nation's foreign exchange resources.

Burma's capital needs are reduced by the fact that her rich agricultural, mining, and timber resources will yield returns with relatively small capital investment; a country with poorer resources would have to employ a greater quantity of capital to gain a given return. Her capital needs are also lessened by the absence of population pressure; an over-populated country requires far more social capital relative to its total production and income. On the other hand, Burma requires large expenditures for transport and communication facilities to bind together the long country cut by ranges of hills. One aspect is of especial importance: in agriculture and some other fields it is possible to rehabilitate the productive equipment and restore prewar productive capacity with far less investment than would be necessary if the land were being opened up or the productive capacity being created for the first time.

In view of these various considerations, it is estimated that total development expenditures required to carry the economic system forward from its position at the beginning of 1952 to an output of K7,000 million by 1959-60 will be K7,500 million. Of this amount, expenditures totaling about K900 million have been carried out in 1952 and thus far in 1953. Expenditures of about K6,600 million remain to be carried out during the seven fiscal years 1953-54 through 1959-60, K940 million per year, or about one sixth of the prospective gross national income during the period, a feasible level, as indicated in Chapter III.

This program includes only the net increase required in the nation's physical capital. Total capital formation will have to be greater to offset the depreciation of existing capital through wear and tear and to obsolescence which goes on year by year. For example, since bamboo and thatch houses have a life of only three to five years, new housing construction equal to one third to one fifth of the total number of such houses is needed simply to keep the nation's supply of

housing from decreasing, and is not included in the estimate of the required increase in the nation's capital. The program also does not include expenditures for buildings and capital equipment for the nation's defense forces, except to the extent that they will later be useful for civilian purposes.

The estimate of K7,500 million assumes that the program recommended will be completed by 1959-60. This assumption is one determinant of the size of the program. If Burma were to decide to spread the program recommended here over a longer period of years—completing it by say 1961-62—the same investment would not yield the same standard of living. By 1961-62 a larger amount of developmental expenditure will be needed—for in the intervening two years the population will have increased by more than 500,000 persons, and added capital and added productive opportunities will be required.

A corollary of this fact is that, having attained the goal by 1959-60, Burma will not remain there by standing still. She must add capital and new productive jobs year by year at a rate equal to the population increase, merely to keep the standard of living from falling. To continue to raise the standard of living she must provide capital and improve methods to continue to increase the productivity of workers in existing jobs at the same time that she provides the capital and opportunity for added jobs. Burma's development program, like that of every progressive country, must be a perpetual one. Only the first and most difficult step will be completed by 1960.

The total program for 1953-54 to 1959-60 is presented in Table II-2, broken down into three major fields of investment.

TABLE II - 2
DEVELOPMENT PROGRAM EXPENDITURES
1953-54 to 1959-60
(millions of kyats)

Planned productive projects	3,000
Unplanned productive projects	2,950
Social capital	650
Total	6,600

Planned projects should not be regarded as necessarily governmental projects. In the field of transportation, communication, power, irrigation and mining, the Government itself will no doubt carry out, either alone or possibly in joint ventures, all of the larger and therefore planned projects. In other fields, however, and especially in manufacturing, the Government may choose in a number of cases to encourage and aid private ventures rather than to enter them itself. The tabulation therefore does not give an

indication of the precise division between governmental and private expenditures.

This, and the precise allocation of governmental expenditures between productive and social capital will be decided by the Government on grounds which are in part neither engineering nor economic in nature. However, the indicated division of the total program between broad fields suggests the general nature of the aggregate program which will be found advantageous.

The plan for economic development must include not only a plan for the total amount of developmental expenditures but an effective allocation of those expenditures between governmental and private, between planned and unplanned, between productive and social, between industries, within the planned area between individual projects, and between successive time periods. The principles on which such an allocation should be made are clear, though their application is complex. They are discussed in the succeeding paragraphs.

C. ACHIEVING MAXIMUM OUTPUT: GENERAL CONSIDERATION

No nation, except as it receives grants from other nations, can regularly consume more than it produces, for the goods will not be made available. On the other hand, if production increases, with economic policies so managed that all goods find a market, income will increase commensurately and living standards can rise. Because of these facts, Burma's standard of living will depend on Burma's total production. The development program is aimed at increasing Burma's productive capacity in the maximum possible degree.

1. RESTORATION OF NORMAL EMPLOYMENT

The first of the two ways in which this can be done, and the most important immediate task of the development program, is to restore to normal employment those persons now unemployed and the much larger number now underemployed. When a man who has been involuntarily idle or partially idle is again able to resume productive work in agriculture, mining, industry or trade, he earns additional income at the same time that he increases the nation's production. As a result of his added expenditures, the market for goods is expanded. Production, demand, and living standards rise hand in hand.

Two conditions in Burma other than destruction of productive equipment have been obstacles to restoration of the normal level of employment. One is civil disorder. The Government has been acting vigorously and effectively to restore order. Since 1949, as the Government has freed for productive uses areas of the country which were in the hands of insurgents,

expanding employment and production have brought an increase of one third in the nation's output and income. But the country is not yet fully secure; in many areas production is still hampered. For the immediate future, completing the full restoration of security and providing the capital needed for immediate renewed employment will continue to be the most important single step in raising the level of welfare in Burma.

A second source of unemployment and underemployment has been the fact that in the crippled economy, aggregate income was too low to stimulate enough purchasing by consumers to keep available workers busy. Throughout Burma, cottage industries have been partially idle because people did not have enough income to buy their products. The remedy for this situation is the development expenditures themselves and the continued reclamation of agricultural lands. As development expenditures and exports rise, the resulting injection of added income into the economy will stimulate activity.

2. INCREASING PRODUCTIVITY

The second way in which income and living standards in Burma can be increased is by increasing the productivity of production. If, through the introduction of better methods into a factory, one hundred workers can turn out more goods than before, they can be paid higher wages, or the products can be sold at a lower price, thus benefiting others. If, through the introduction of improved seeds or improved farming methods, cultivators can obtain increased yields, they will obtain higher incomes and live better. If a new industry is more productive than existing ones, it will produce products at lower cost or yield higher incomes. These are merely simple examples of a general truth. In each case, better methods are the key to greater productivity and higher living standards. In Burma, except in the exploitation of mineral resources, methods have improved little during the past century. The key effort of Burma's development program must be to increase productivity.

Productivity may be increased in three ways. One, the most obvious, is to take up the slack in existing idle productive capacity by raising farm prices. (For example, a rise of 5% in the incomes of two thirds of the people should, in itself, support an increase of production of 10% by the remaining one third of the population.) Another method is to introduce new industries which can produce goods in Burma more cheaply than they can be imported, or in the case of export products, at low enough cost to compete in the world market. The third is improvement in methods of production in existing industries.

It is a common misconception, held in Burma as elsewhere, that the introduction of almost any new industry to manufacture within the country a commodity previously imported makes the commodity available to the people more cheaply and benefits the country. This is erroneous. If a commodity is imported, labor and natural resources must be devoted to producing exports in order to pay for it. If it is produced within Burma, labor and natural resources are still required; they must be devoted to the production of the commodity itself. If the cost of production at home is greater than the overseas cost plus the cost of transportation to Burma, production at home burdens the economy and lowers the standard of living. Only if the cost of production at home is lower is there a benefit.

The contrary impression is inherited, in Burma as elsewhere, from a period when ill-informed rulers tried to insulate their countries from the world. In Burma, as in western Europe, several centuries ago, kings were mercantilists. The germ of truth in the idea that production of as many things as possible within the country is an advantage, lies in the idea that it will save foreign exchange. This is an advantage only to the extent that the product can be made more cheaply locally, but saving foreign exchange is commonly done at the expense of living standards.

The experience of other countries indicates the wisdom of exporting one's specialties and depending on other countries for other products. The eight countries in the world with the highest living standards are the United States, Australia, Canada, Denmark, New Zealand, Sweden, Switzerland and the United Kingdom. Every one of the eight except the United States is notable for its dependence on imports for a large share of its needs. The United States, because of the enormous variety of climate and resources within its borders, produces all but a small percentage of the commodities it needs. But if the United States were divided into eight countries, each with a population slightly greater than that of Burma, the foreign trade of each with the others would be exceedingly great. Like the other countries mentioned, each area of the United States has achieved a high standard of living by depending on other areas for the commodities for whose production it is not best suited.

For Burma, introduction of new industries, especially some manufacturing industries, will contribute to a rise in living standards. Industries introduced should be those for which Burma offers not merely the necessary raw materials but over-all productive advantages, and also a large enough domestic market to make the industry economic; plus the very few industries which can compete in the world market. The rate of their introduction should be limited by the

rate at which Burmans can gain technical and managerial training and experience. As income in Burma rises, the domestic market will increase and more industries will become economic; but this is a gradual process. Except gradually and in the long run, new industries can employ only a very small fraction of Burma's workers, can produce only a very small share of the goods Burma needs, and therefore can contribute only a small amount to raising living standards. Introduction of new industries must proceed, but it is not the major road to raising living standards. The major emphasis must be on the improvement of methods in the types of production which now employ the great majority of Burma's workers. Of these the major one is agriculture.

The introduction of new methods must not be thought of as a process of taking care of the matter once-and-for-all-time by the introduction of "modern" methods. "Modern" methods cannot be introduced at one sweep; in many industries they will not be efficient until the literacy of the population and the level of its technical training have been raised and the country has gained experience in a new set of auxiliary or service industries. Further, "modern" methods do not remain modern. The best industrial machines will be outmoded in twenty years; the best present strains of seed and the best agricultural methods will gradually be replaced by better ones. Burma must not adopt methods that are now the most efficient, and then stagnate. She must adopt practices and attitudes and methods of training which will induce her producers to be forever dissatisfied with "the best" and to seek continuing improvements in materials, methods and products.

There is no known limit to possible improvement in materials, methods and products. Improvements in methods go on year by year. The improvements in methods are not all spectacular; many of them are small. The important fact is that they continue. The standard of living increases as a result, year by year and decade by decade. Each generation is better off than the one before. Every man can look forward to the prospect that his children will live better than he did, and his grandchildren better than his children. This must come about in Burma also. Burma must become a progressive nation, so that her people not only live better in 1960, but look forward to continued improvement, without limit.

Initial improvements during the remainder of this decade should be many and varied, pervading almost every industry. In agriculture, they must include some large projects and large changes. Of these the main ones are large irrigation projects and steps toward mechanization. But the program must not be confined to these. The revolution in agricultural methods

which is needed in Burma must stress such steps as the introduction of improved varieties of plants, the adoption of seed selection practices, the use of commercial fertilizers, better preparation of seed beds, green manuring and the use of available compost materials where appropriate, the liming of highly acid soils, the use of improved implements, better crop rotation, better soil conservation, more efficient storage practices, a many-sided program of disease, insect and rodent control, and countless other fairly simple steps. Creating the human organization necessary to bring about such changes by practical guidance and demonstration in every village in Burma must be an integral part of Burma's development program.

In other industries also, both large and small changes in methods must take place. To cite a few pertinent examples: in fishing, it may be possible to achieve considerable increase in productivity through the development of a deep-sea fishing industry; in salt making, increases in productivity may require the construction of salterns to replace the primitive methods of evaporation now used. Advances in weaving may involve not merely the introduction of modern factories, but also a large number of small improvements in small-scale production methods. Improvements in construction may involve standardizing millwork such as window frames and doors into a few standard shapes and sizes, and investing in the necessary machinery to produce these standard items on an assembly-line basis.

The installation of improved telecommunications equipment will increase not only the productivity of persons employed in telecommunications, but of those in every industry in Burma who need to communicate locally or between cities by telephone or telegraph. Improvement in the organization of postal service can similarly increase the productivity of everyone in Burma who uses the mails. Improvement in the road system and in railways and river transport will have a similar effect. The time lost by delay in a telephone call or delivery of a letter, or by delay in the transport of goods, reduces productivity and reduces the income which an industry can pay to its workers just as surely as does an inefficient method in a factory or on a farm.

In trade and in the services, productivity may increase not only through improvements in transport and communication but also through simple devices such as the adoption of more systematic stock records so that less labor is involved in handling stocks and more efficient service to the consumer is assured. Among these and all other improvements in productivity, some require much additional capital, some little, and a few none. Increase in productivity

in one field may involve expenditure for capital equipment; in another, expenditure for training in new methods. In most, it will require both. There must be no more hesitation to spend money to create human abilities than to invest it in tractors or dams.

Though increasing productivity is the only road to continuing increase in living standards, it will not invariably be welcomed. An age-old fear has haunted the worker who has seen improvements in methods increase output; namely, that less labor will be needed, and that he will become unemployed. If this were truly the typical result of improvements in methods, unemployment should be widespread in all economically progressive countries. In western Europe, workers in some industries turn out five or ten times as much product as did their predecessors a century earlier. The result has been not that four fifths or nine tenths of the labor force is unemployed, but that living standards have risen by five or ten times. Workers not only can produce five to ten times as much; they also have enough income to buy five to ten times as much.

Yet for individual workers technological unemployment may exist. And in a partially stagnant economy, when new investment does not keep pace with the savings available for investment, technological unemployment may develop for many workers and worker groups.

The significant point for Burma is that the development program, if carried forward at an appropriate pace, will eliminate any real possibility of a lack of demand for the services of workers because of technical progress. It is unlikely, in Burma, that the demand for goods will increase less rapidly than will productive capacity. But if at times this should be the case in certain industries, so that unemployment develops, then more workers can be used on development projects. None need ever be idle for long periods for lack of demand for their services.

There may nevertheless be problems of adjustment for individual workers who must shift from one occupation to a new one. The Government should in such cases take steps to aid the transfer of workers to a new occupation, and may properly grant them financial aid during the process. Other forms of aid or unemployment compensation may be devised to insure the individual worker against the hazards of temporary dislocations until he can adjust himself to a new situation. There need be no threat of hardship to the individual worker if adequate social planning accompanies the technological changes. An advance which will raise the standard of living of workers in general should not be barred by temporary inconvenience to the few.

D. CRITERIA FOR THE SELECTION OF PROJECTS

Certain well-defined criteria are tests of whether a project will be advantageous to Burma. They have been applied in formulating the development program. In this section, they are listed and discussed briefly, and the technical and economic interrelations between them are then discussed at greater length.

1. THE CRITERIA

Within the limits of Burmese labor supply, natural resources, and present productive facilities, the following factors have been considered in selecting projects:

- (a) Suitability of climate, soil, and natural resources.
- (b) Adequacy of market.
- (c) Adequacy or potential adequacy of transport.
- (d) Obtainability of power.
- (e) Obtainability of skilled labor, technicians and managers.
- (f) Obtainability of complementary facilities to service complex and technical processes.
- (g) Economic feasibility of foreign material or equipment purchases.

A few examples of the effects of these criteria may be presented. The more favorable the country's natural resources for any given industry, the better its prospects. Because Burma's climate is so varied, most types of agricultural production can yield high income in some locality in Burma, if the proper methods of production are used. Manufacturing or processing industries for which good raw materials are available at low cost, for example pulp and paper manufacture, will yield greater income per person engaged than ones for which materials cost is high. Other things being equal, low transport and power costs, made possible by favorable transport routes or power sources, have much the same effect as low raw materials costs. The existence of a market in Burma or nearby may be of crucial importance even if some factors relating to production in a given industry are less favorable in Burma than elsewhere.

An otherwise advantageous new industry, or use of new methods in an old industry, may suffer a temporary disadvantage in Burma because skilled and technical labor of the types required are not available. In general, this factor should not be given great weight, since labor can be trained, and indeed must be trained, in new skills if new types of industry are ever to be introduced. If an industry, once established, will be advantageous, temporary inefficiency while the necessary skills are being acquired, or rather while skill is steadily increasing, is a price well worth paying. It would be proper to charge

short-run expenses involved in training such workers, technicians, and managers to original investment, rather than to current operating costs. However, the more technical and complex the production process in a given industry, so that a large number of experts with a high degree of professional and scientific education and experience is necessary for efficient production, the more difficult the problem becomes. Burma's own supply of technicians trained in industrial sciences is extremely small; with even the most intense efforts, which should be and are being exerted, it cannot be increased rapidly. The need for such technicians during the next generation will be much greater than Burma can meet; this must be one factor determining the order of priority of the steps in her continuing development. Similar considerations apply to management. The management of a modern productive enterprise is a complex and exacting job, demanding years of experience and a combination of talents possessed by only a few men. Without top quality management, the best designed venture may fail. The availability of management is as necessary as the availability of raw materials or transport or power.

Many modern manufacturing industries depend not only on technical skills within themselves, but upon service or auxiliary functions by other complex industries which have grown up to serve an industrial network over generations. For any technologically complex industry, an important question therefore is the availability or possibility of introducing the necessary auxiliary industries.

The peculiarly fortunate world situation in which Burma finds herself at the time of her great developmental effort makes unnecessary any Spartan abstention from foreign purchases. Burma's present and prospective foreign exchange position is strong, as Chapter III makes clear. There will be no need during the coming decade for her to avoid any project because of the foreign materials required, nor to introduce any new industry solely because it will reduce imports. No industry need be introduced unless it will be sufficiently efficient to help raise the standard of living. It will be desirable when purchasing materials or equipment abroad to give preference to purchases from non-dollar areas, but even this need not be a rigid requirement, as Chapter III indicates.

The selection of projects must of course be based on an engineering and economic study of all of the other criteria. No one factor or its absence is determining; the degree to which every factor is present and the effect of all in combination must be considered. While the criteria are simple, their quantitative evaluation and joint application is often complex.

2. TECHNICAL COMPLEMENTARITY

Moreover, no one project can be properly evaluated in isolation. The development program is greater than the sum of its parts. The contribution which a given project can make to the standard of living in Burma depends not solely upon that project considered by itself, but upon its relationship to the program as a whole. Many advantageous projects must be complemented by other projects. Many projects which would be wasteful if constructed alone are essential and advantageous if other projects which will provide materials, market, power or transport are also developed. For example, the Myingyan refinery project would not be efficient without both the zinc mines and the Kalewa coal development.

Such technical complementarity is especially relevant with respect to transport, communication and power. The country's means of transport are its veins and arteries, through which its life blood flows. The desirability of expenditures on river, rail, road, and air transport is not to be tested merely by the net income, if any, earned by each system, nor by the income which each will pay out to workers and to the State, but by the contribution of the integrated transport system to moving the country's commodities efficiently, expeditiously and economically to their destinations, and thus reducing the costs of production and the costs of goods to consumers. The port of Rangoon, for example, and the country's other ports must be equipped with added facilities by certain dates if the country's foreign trade is to be carried on. It happens that the port of Rangoon is a highly profitable venture (though of inadequate capacity), but investment in new facilities would be needed and desirable if it were not. It may be possible by the end of the decade to establish the operations of the Burma Railways on a profitable basis; but even if not, the railways are indispensable to the economic life of the country, and their equipment must be rehabilitated, modernized and augmented. The investment recommended in each transport mode during the next seven years is the amount thought necessary to provide efficient and economical transport for the amount and types of production which are anticipated, with due regard for the distances and directions over which they must be moved.

The same is true of communications; postal communication and telecommunications must be and have been planned in a similar integrated way, for similar reasons. In a comparable fashion, power development is justified, not alone by the income created in the power industry, which yields a fairly small return on a large capital investment,

but because cheap power is peculiarly important in furnishing opportunity and stimulus for the creation of new efficient industries and for reduction in costs and increase in income in many of the country's existing basic industries. Conversely, power developments are feasible because new power-using industries will provide enough demand for power to make power projects economic. Power projects and the industries using them interlock; each is advantageous because of the other. The planned amount and nature of expenditures on power development, like those on transport and communication, are those needed to create facilities of the right nature and amount to serve the expanding economy.

3. BALANCED ECONOMIC DEVELOPMENT

The need for economic complementarity, which is as essential as technical complementarity, may be stated summarily as follows. Burma's growing labor force will require increasing employment opportunities. Some of these will be provided in agricultural expansion; some must be provided in new industries, which in any event are desirable in themselves. Some will also be provided in the construction activity of the development program itself. To furnish a growing market for new industries, per capita income must increase throughout the economy. This increase can be brought about only by increasing productivity in existing industries. Doing so will release some workers from existing industries. New industries and construction must absorb them. Thus the introduction of new industries and the improvement of productivity in existing industries must proceed hand in hand.

The Burmese economy is an expanding one. The population is increasing at a rate between 1.2% and 1.5% per year, probably at about 1.3%. The labor force is growing at roughly the same rate. Hence the basic need for expanding employment opportunities. Agriculture, the dominant industry, will itself provide some of these opportunities, for unused agricultural land of good quality is available for exploitation. But some of the best opportunities will be outside of agriculture; if the standard of living in the expanding economy is to rise, and to rise at the fastest possible rate, some of the new employment opportunities must be in manufacturing industries which are economic for Burma, but which have not yet been developed in Burma.

In Burma, as in any country, most manufacturing or processing will be for the domestic market, since natural resource advantages which will enable new industries to compete advantageously in the world market are limited. But there are only a limited

number of manufactured products which Burma can produce efficiently and for which sufficient demand exists in Burma at present. People with low per capita income, as in Burma, spend almost all of it on basic food, clothing, shelter and the simple necessities of life. A few of these necessities are industrial products, and out of the remaining fraction of their income they also buy a few minor luxuries. The consumers' market for industrial products will be limited for some time to these few expenditures by the masses, plus expenditures by the well-to-do. Since the light consumers' goods industries will be small in scope and volume, they, in turn, will comprise a small market for heavy or basic industries manufacturing producers' goods—machinery parts and equipment, basic raw materials, and others.

Hence only a fairly small number of new industries will be efficient in Burma at present. Unless an increasing domestic market is created, both for consumers' and producers' goods, the process of industrialization must grind to a halt.

The introduction of this limited number of industries will itself raise the average level of income, and so increase the domestic market. But the extent to which industry can feed on itself in this way is limited. The development in Burma of an increasing market for industrial products therefore depends on an increase in per capita income throughout the entire economy. For this increase, agriculture offers the dominant opportunity. Income in agriculture is now low, but the potential exists to increase it substantially. A fundamentally important step in the industrialization of Burma must therefore be a comprehensive, well organized and determined program to achieve a continuing increase in productivity and in the standard of living of Burma's agriculturists.

Such a program is discussed in detail in Chapter VIII, Agriculture. Its results will be to create a steadily increasing margin of income above the subsistence level and a gradual expansion of expenditures not only for a greater quantity and improved variety of food, shelter and clothing, but also for a greater variety and quantity of other products and services. Thus it will make possible and indeed require the expansion of manufacturing industry and of trades and services.

Improvement in productivity in other occupations throughout the economy—cottage industries, mineral and timber extraction, trade and transport, government, and all other—can make a contribution similar in nature but more limited in quantitative importance, in correspondence with the lesser importance of these other occupations in the economy.

Increase in productivity in existing industries, for

example agriculture, creates problems and opportunities of its own. As the efficiency of agricultural production increases, each person engaged in agriculture will be able to cultivate a larger area of land and there will be a continuing surplus of workers on the agricultural land now cultivated. Even while there is good agricultural land not yet cultivated, not all of these surplus workers should remain in agriculture, and when the good quality land has been occupied, all of them must find productive employment elsewhere. There must be a constant new demand for workers elsewhere. This increasing demand for workers can be created by a steady expansion of industrial production and of the trades and services which are a part of urban life.

Hence, for maximum prosperity and social stability, the expansion of new industries and services and the increase of productivity in agriculture and other existing occupations must proceed hand in hand. This is the law of balanced economic development. And this is one reason why the present Report recommends both the introduction of new industrial ventures and a program of improvement in methods of production in agriculture and other existing industries.

However, it should not be supposed that if increase in productivity in existing industries and the introduction of new industries are not perfectly synchronized from year to year, there is no escape from increasing underemployment, and some degree of stagnation. Synchronization may often be imperfect. This is merely the problem of technological unemployment, whose remedy has been discussed. The construction activity of the development program itself is a balancing factor. If increase in the labor force or in its productivity makes workers available at a more rapid rate than that at which they are being absorbed in new industries, they will be available for work in the development program, and the pace of that program can be stepped up. Only if the problems of administration and management are not solved will the development program be unable to employ productively all available labor and prevent underemployment. On the other hand if the demands of new industries for workers exceed the number of workers available, the shortage must cause re-trenchment either of the development program or elsewhere.

4. THE SOCIAL SERVICES

The discussion of balanced economic development thus far has dealt only with the question of economic complementarity between introduction of new industries and increase in productivity in old. Proper balance in economic development requires allowance

for an additional factor, namely the place of expenditures for social welfare services. The activities which have been discussed so far in this chapter are those whose value is measured in the market place. Social welfare activities, even though their benefits cannot be evaluated in financial terms, are an equally important part of a balanced development program. Burma has great need for more and better schools, specifically for vocational and technical training, and more generally for the broader education of her people. She has need for an expanding program of public health activities and of medical care, to care for the bodies of her people even while she cares for their minds and spirits. She has need for better housing. Better health, education and housing increase the productivity of the labor force. Purely from an economic viewpoint, a development program without these components would be warped and incomplete. Their value is of course humanitarian, not merely economic, but this does not really distinguish them from other phases of the development program, for the ultimate purpose of the entire program is to enhance human welfare by raising living standards. The essential difference is that the humanitarian effect of the social welfare services is direct, of other phases of the program, indirect.

Social welfare expenditures must be large enough to permit education, medical and health care, and housing to make their proper contribution to human welfare, but not so large that they choke off other phases of development. In evaluating their proper magnitude, it should be recognized that when the development program has gathered real momentum, shortages of labor and materials will appear. Labor shortages should be balanced as far as possible by progressive mechanization. Thereafter the social welfare programs will compete for materials, men and money with other programs. At this point, the faster the construction of schools and hospitals, and the larger the program to staff them, the slower must be the pace of programs to improve agriculture, to introduce new industries, to develop mines, to build roads and ports and power plants.

The slower the rate of improvement in these productive fields, the lower the rate of increase in per capita income. On the other hand, the faster the improvement in productive methods, the higher the level of income later, and the greater the expenditures which can later be afforded for health, education and housing, among other programs. The balance between social welfare programs and other programs is therefore a balance between immediate social welfare and future social welfare. Neither the claims of the future nor of the present should be neglected. A reasonable balance must be struck.

E. REACHING THE GOAL: PLANNING AND EXECUTION

This chapter has presented a goal for Burma's development, and has indicated the basis on which a plan to reach that goal has been evolved. The plan is presented in this Report. Its presentation is only a small step in Burma's development program. The Government, which has already accepted the basic principles of the plan, must now evaluate it in its full form, prepare its own program for action, and adapt its economic policies where necessary to the program. The job of execution will then lie ahead.

The plan presented here embraces the entire economy, even though it does not present specific projects in all sectors. The Government's planning must be similarly comprehensive. Good planning will provide for the balanced use of resources, through unplanned as well as planned activity, and will seek to enlist the full participation of the entire nation—government agencies, cultivators, workers, traders and industrialists alike, both at the center and throughout the country. There must be a real educational effort to acquaint all concerned with the basic aims, objectives and features of the plan, and to enlist the cooperation of all concerned in both the development and execution of the plan. Good planning must also provide for programming and re-programming from year to year as the past progress in various sectors requires.

Effective execution of the plan will depend in large measure on the kind of widespread cooperation indicated above. It will also depend on effective organization and administration within Government, in the ministries and departments, within the Development Corporation, within public corporations, and throughout the private sectors of the economy as well. It will depend in large measure on how successfully Burma solves the problems of technical skills and management, especially in the early phases of the plan. It will depend in serious measure on the determination, the vigor, and even the daring displayed by those entrusted with responsibility for carrying out the plan.

Carefulness in planning is not inconsistent with daring in execution. Every important consideration should be taken into account in arriving at a decision to incorporate a given feature in a plan of action. Once the plan is formed, the time for action has arrived. Decisions need to be made. Responsibility for making decisions must be accepted and discharged. Action must not be unduly deferred by those responsible because they are fearful of making mistakes. Mistakes will undoubtedly be made in executing the program. However, they will not bulk

large in the total picture. By far the most serious mistake of all would be the mistake of doing nothing to avoid all possibility of mistake.

On the basis of the discussion above, it will be plain that at least three and perhaps four problems exist which comprise key bottlenecks to the development program. These must be overcome if the program is to succeed. The first of these is the question of internal security. While a great deal of progress has been made since the preliminary report was submitted toward improving security conditions, a good deal yet remains to be done. Continued rapid progress in security throughout the country and achievement of a reasonably complete state of internal security within another year will be necessary if the economic development program is to proceed at the pace required. The second key bottleneck is that which arises from the acute shortage of skilled technicians and experienced managers and administrators. Indeed, it would not be overstating the case to say that the success of the development program hinges more on this than on any other single factor. The third bottleneck is that which arises in the organization and administration within Government itself, where established modes and procedures are in tune with the more leisurely pace of another day, having developed in response to a relatively static rather than a dynamic way of life in Burma. Organization, administration, and personnel in the government ministries, agencies, departments and boards must be brought into step with the dynamic requirements of the development program. Finally, determination, vigor, and daring must be displayed by those charged with responsibility for the execution of the development program. There has been no opportunity to evaluate as yet the degree to which these qualities will be forthcoming. It is to be hoped that they will be present, for it is clear that the program will falter without them.

Given the abundant resources which nature has bestowed on Burma, the exceptionally strong financial position of the Government both in relation to internal cash balances and external assets in the form of foreign exchange, and the will of the people guided by intelligent and strong leadership, it is not

too much to expect that the people of Burma will be able to produce within a few years, on the average, slightly more per capita than they did a generation ago and to go on thereafter to an ever-increasing standard of living. The basic potentialities are here. The great advances which have been made elsewhere in modern technology and in putting machinery to work for the benefit of mankind are available. Burma has the opportunity to telescope within a limited number of years the process of increasing productivity which took generations for other nations to achieve.

Too much emphasis cannot be placed on the fact that material and financial resources alone do not guarantee economic progress. Some countries which have been endowed richly with natural resources suffer low productivity and low standards of living. Fertile land, favorable climate, ample rainfall, rich mineral resources and abundant forests do not necessarily mean high productivity. On the other hand, there are nations whose people have learned how to organize their economic activity and how to exploit their limited resources for their economic well-being. There is no reason why Burma, with its limited population in relation to its geographic area and its natural resources, should not in time enjoy one of the highest standards of living among the nations.

The task is now one of organizing and mobilizing the resources of the country so that its fullest potentialities can be realized. The task can be done provided the will exists—the will to understand as well as to do. Among the leaders of Burma, both inside and outside the Government, there is manifestation of such a will.

The chapters which follow discuss various aspects of the tasks referred to in this chapter. Chapter III discusses the financial feasibility of the plan recommended. Chapter IV considers the central economic policies necessary to carry it out. Chapter V then discusses the necessary organization of the Burmese Government for planning and programming; Chapter VI, organization of execution, and Chapter VII the key problem of manpower and management. Parts III to VII then present sectors of the plan, and Chapter XXV summarizes in time schedule the full program for the planned sector of the economy.

PART II

ECONOMICS AND ADMINISTRATION

CHAPTER III

FINANCING THE PROGRAM

A. THE NATURE OF THE PROBLEM

Table II-2 of Chapter II indicated the capital expenditures recommended for Burma's development, and their distribution among broad fields. The present chapter discusses the problem of financing them or, what is equivalent, the problem of allocating a large enough share of Burma's productive resources to the program to carry it through to completion.

The analysis is based on two assumptions concerning world conditions and conditions in Burma during the remainder of the decade:

- (1) That there will be no general war.
- (2) That there will be continued rapid improvement in security within Burma.

No rigid assumption is made concerning world economic conditions. Continued world prosperity is not a necessary condition for the successful prosecution of Burma's development program. The depression of the 1930s reduced the prices of Burma's imports as well as of her exports, and improved her balance of trade. It is difficult to say what the net effect of a world depression during the 1950s might be. Certainly it is not necessary to conclude that it would prevent the successful execution of the program. The other two assumed conditions are, however, necessary bases for the successful execution of the program, and its financing is therefore analyzed on the supposition that these conditions will prevail.

1. FINANCING EXPENDITURES AT HOME AND ABROAD

About one third of the development program expenditures will be made abroad, for the purchase of capital equipment and materials, and about two thirds in Burma, for the purchase of indigenous materials and products and the employment of labor.

The problem of financing the purchases abroad differs in nature from that of financing the domestic expenditures. The purely financial aspect of the domestic problem is simple. The necessary kyats can always be obtained by the Government without difficulty. If, however, labor and indigenous materials are scarce, purchasing the materials and employing labor on new projects will cause inflation. The question, therefore, is one of whether enough productive resources, especially labor, will be available. The question is expressed in monetary terms only because

money is the convenient common denominator for totaling the needs of all the different projects, the value of resources needed, and other factors.

The question of obtaining foreign currencies for purchase abroad, on the other hand, is essentially a financial one. Burma need not concern herself with the underlying economic question whether her purchases (small in the total world picture) will contribute to scarcities and inflation in the supplying countries. The only questions which need concern her are whether she has or can command enough foreign currency to purchase what she needs, and whether she can find suppliers who will deliver the goods.

The magnitude of each of these two problems will depend on the share of the expenditures which consist of purchases abroad, the time distribution of the expenditures over the seven-year period remaining, and the share of the program which the Government undertakes as compared with the share which is left to private investors.

2. WHY ONE THIRD EXPENDITURES ABROAD ?

The share of a country's expenditures for economic development which must consist of purchases abroad depends on the resources and industries of the country. In the United States or in the Soviet Union most of the materials and equipment for developmental projects could be produced within the country. In developing oil fields in desert areas of the Middle East, on the other hand, a very large portion of the expenditures were in other countries; only a small amount of local labor, and food and simple equipment for the construction crews could be furnished within the country.

Burma has ample resources of timber and un-specialized labor, can now produce building materials such as lumber products, cement, lime and low quality brick, and will be able fairly quickly to improve the quality of her brick, and to create added productive capacity for brick, lumber products, lime and tile. It would be much more costly to import these commodities than to make them domestically. She will find it necessary to continue to import many other materials and almost all industrial equipment and heavy metal products.

Experience in other countries suggests that in Burma's circumstances, taking the developmental

program as a whole, at least one third of the developmental expenditures will be for materials and equipment purchased abroad, and not more than two thirds for labor in Burma and for materials and equipment which can be produced in Burma. If defense expenditures for "capital" items, including munitions, are included in the calculation, the proportion abroad will be greater, for munitions are necessarily purchased almost entirely abroad. The percentage of purchases abroad shown by the final estimates is 34.6% excluding defense purchases and 36.9% including them.

The ratio of expenditures abroad to those at home will vary from industry to industry, and even more from project to project. For some construction projects which consist largely of earthwork construction or of timber structures, and for other projects which use a relatively large amount of construction labor on the site in comparison with the value of equipment, much more than two thirds of the expenditures will be made at home. At the other extreme, expenditures for expansion of the river and harbor flotillas will be met almost wholly abroad, and those for other projects involving the installation of heavy metal equipment will be met largely abroad. The proportion of about one third abroad to two thirds at home is an average of expenditures for the entire program.

This proportion is neither precise nor inflexible. It will vary to some extent depending on the projects selected and on the materials selected for a given project. While in the main the selection of projects and materials must be determined by other criteria, there will be some freedom to choose between projects or different materials requiring or permitting different proportions of foreign to domestic capital purchases. For example, either teak beams fabricated in Burma or steel spans prefabricated abroad can be used for small bridges. Such choices will, however, be fairly limited. They are one way of conserving labor in Burma, if it is scarce, by spending more money abroad, or of conserving foreign exchange, if it is scarce, by using more labor in Burma.

3. THE TIME SCHEDULE OF DEVELOPMENT EXPENDITURES

The financing problem will also be affected by the timing of development expenditures. If the program gets under way slowly, a correspondingly larger effort must be crowded into the last years of the decade to complete the program within the time planned; if a fairly high level of expenditures is attained soon, the program can be spread more evenly over the remaining years.

Except in one respect, noted below, the time

distribution of the program will not materially alter the problem of financing foreign exchange expenditures (expenditures in foreign currencies). Because of increase in her exports, Burma will earn more foreign exchange annually during the later years of the decade than during the years immediately ahead. However, Burma should have sufficient foreign exchange during the next several years to finance purchases abroad for the development program, even if expenditures for the program should rise at the maximum rate which seems possible. If their rise is slower, the foreign exchange earnings will of course accumulate and be available at a later date.

In one way, however, the rate at which the program gets under way will affect the foreign exchange problem to an important degree. The more rapidly complete civil order is restored, and rice, mineral and timber production and exports increase, the larger will be Burma's foreign exchange earnings. The progress of restoration of civil order is therefore of first importance as a determinant of Burma's foreign exchange position.

Rapid progress is even more important to make possible completion of the necessary expenditures within Burma. If a disproportionately large share of the program remains for the last years of the decade, the share of the nation's labor and resources required to carry it out during those years may be too great to be achieved. The more quickly expenditures on the program reach a high rate, the lower will be the amount which must be completed in any one year and the easier the problem.

There is sufficient slack in the economy now to permit a rapid rise in development expenditures. To some extent, the rate of rise in total expenditures will depend upon the degree to which the Government creates an environment favorable to private investment, a problem discussed in the last section of Chapter VI. To an even greater extent, it will depend upon the effectiveness with which the problems of administering the Government's share of the program are met. The major administrative problems will be setting up the necessary organization for effective management, obtaining the necessary managerial talent, technical skills, and specialized labor, and breaking some materials bottlenecks. While in theory the program might rise so rapidly that a peak rate might tax the economy's resources in the near future, the problems of administration are such that there is no likelihood of this occurrence.

Table III-1 indicates a plausible schedule for the entire program—public and private, planned and unplanned, productive and social—during the years 1953-54 to 1959-60. This schedule of expenditures is used as the basis for the discussion of financial

requirements which follows. The schedule of planned projects presented in Part VIII fits appropriately into this more comprehensive program. The comprehensive schedule should be regarded as a minimum target, not an ideal pattern. If development expenditures lag significantly behind it, there is danger that the program will not be completed. If they exceed it in the years immediately ahead, the prospects for successful completion of the program are correspondingly enhanced.

TABLE III - 1

DEVELOPMENT PROGRAM EXPENDITURES

<i>Year</i>	<i>Expenditures (millions of kyats)</i>
Jan.-Sept., 1952	415
1952-53 (est.)	485
Programmed :	
1953-54	655
1954-55	830
1955-56	950
1956-57	1,015
1957-58	1,030
1958-59	1,050
1959-60	1,070
Total, 1952 to 1959-60	7,500
Total, 1953-54 to 1959-60	6,600

The development program includes all capital expenditures for net additions to the country's productive and social capital. It does not include either capital projects for defense purposes or capital formation to make good the depreciation of existing capital which goes on year after year. Table III-2 adds estimates of these elements, and divides the expenditures between those at home and those abroad. There is of course no sure basis for forecasting defense capital expenditures. They are assumed to reach a level of K120 million in 1953-54 and to

TABLE III - 2

GROSS CAPITAL EXPENDITURES, 1953-54 TO 1959-60, INCLUDING DEFENSE, DIVIDED BETWEEN AT HOME AND ABROAD

<i>Year</i>	<i>Total</i>	<i>Abroad</i>	<i>At Home</i>	<i>Per cent Abroad</i>
		<i>(millions of kyats)</i>		
Jan.-Sept., 1952	625	120	505	20
1952-53 (est.)	835	200	635	24
Programmed:				
1953-54	1,035	442	593	43
1954-55	1,190	503	687	42
1955-56	1,315	531	784	40
1956-57	1,385	527	858	38
1957-58	1,405	500	905	36
1958-59	1,430	454	976	32
1959-60	1,455	445	1,010	31

decline gradually thereafter. Estimates of the amount of capital formation needed to offset depreciation are based on estimates of depreciation during past years on all capital plant and equipment of the economy.*

4. GOVERNMENT VERSUS PRIVATE DEVELOPMENT EXPENDITURES

The third factor which affects the problem of financing the program is the division of the program between government expenditures and private expenditures. All investment in the economy must be matched by saving. The greater the share of the investment which the Government undertakes, the greater the share of current saving which it must in one way or another siphon off to its use. This division of investment between government and private will be important so far as financing within the country is concerned. It will not however affect Burma's ability to meet her foreign exchange needs; as is shown below, Burma will be able to meet them regardless of the degree to which private investors from abroad invest in Burma. Discussion of the division of investment between government and private is therefore deferred to Section C, dealing with financing expenditures within Burma.

B. FINANCING FOREIGN EXCHANGE PAYMENTS

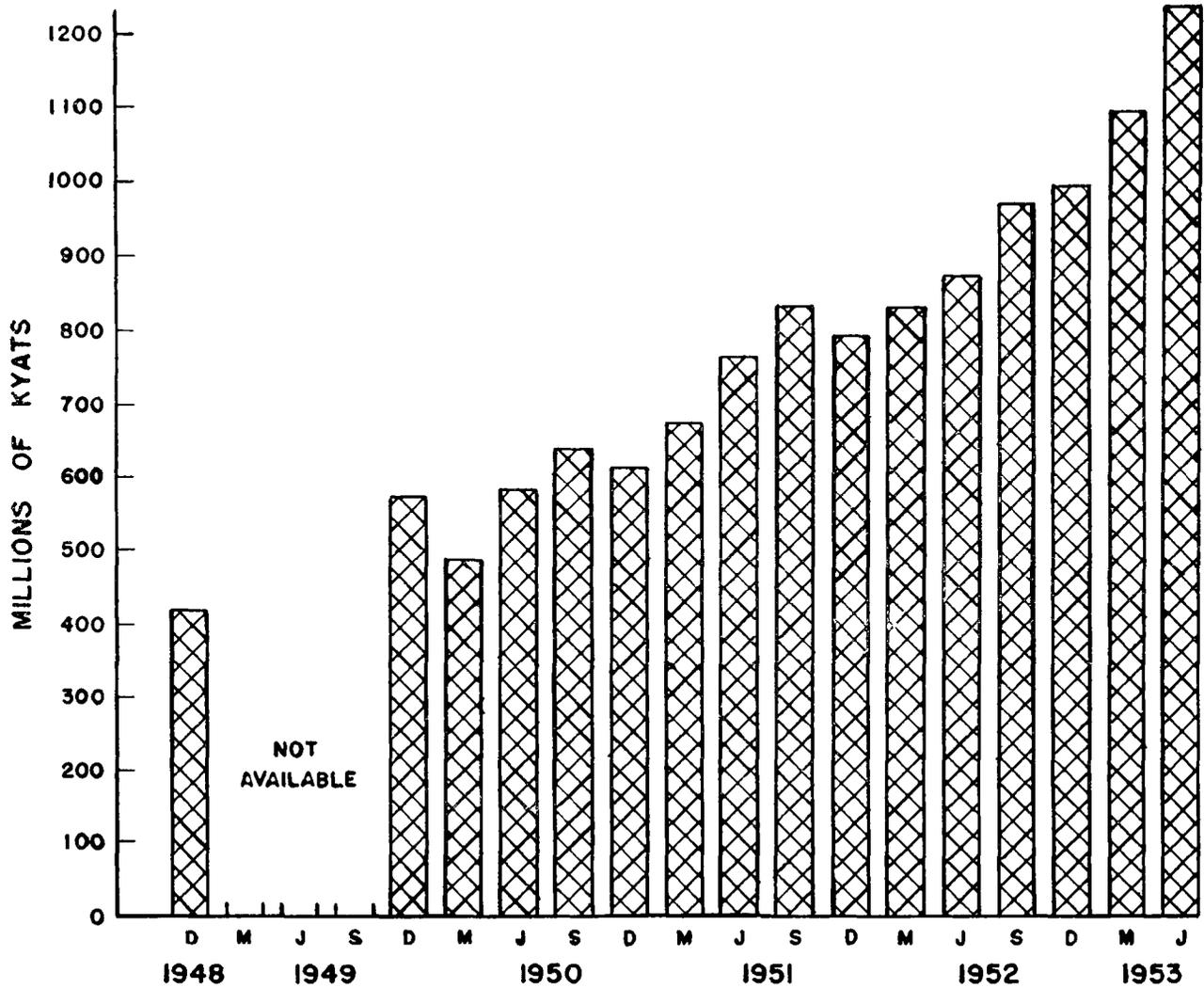
The financing of purchases of capital equipment and materials abroad during 1953-60 can be accomplished from earnings from exports during the period, from use of foreign exchange previously accumulated in excess of the minimum needed as reserves, and from the flow of foreign capital to Burma. All three are available to Burma. She has accumulated foreign exchange reserves in excess of her requirements and international lending agencies very probably would consider favorably loan applications for certain types of projects. Financing from the proceeds of her exports must, however, be her main reliance.

1. FOREIGN EXCHANGE NEEDS

The purchase of capital equipment and materials will of course be only one of the purposes for which foreign exchange will be needed. By far the largest requirement will be for imports for current consumption or fabrication. Foreign currencies will also be needed to pay ocean freight and marine insurance and for the expenses of Burma's diplomatic establishments abroad, travel abroad by residents of Burma, remittances by individuals in Burma to relatives abroad, dividend payments to stockholders abroad,

*It is estimated that in 1953-54 K25 million and in each subsequent year of the decade K50 million of normal depreciation will be made good by the development program expenditures themselves, since to some extent in creating new capacity they will replace existing obsolete equipment.

DEPOSITS ABROAD ARE ACCUMULATING RAPIDLY



MINISTRY OF NATIONAL PLANNING			
FOREIGN EXCHANGE RESERVES, 1948-1953			
KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK		RANGOON	
DR. BY <i>F.J.P.</i>	DATE	PLATE	1
CK. BY <i>S.L.</i>	JUNE 53	NO.	

and for various other uses. If imports are left unrestricted, the magnitude of imports for consumer goods, of raw materials for fabrication, and of freight and insurance on both, will depend primarily on the level of output and income in Burma. So also will other minor foreign exchange expenditures. Past relationships between output and imports provide a basis for estimates of future trends. Table III-3 presents estimates of total foreign exchange payments during the remainder of the decade, together with data for recent years. Column 2 indicates the value of output in each year which is assumed in making estimates. The data present what is thought to be the most probable course of output and of foreign exchange expenditures if the development program proceeds as planned.

TABLE III - 3
ACTUAL AND ANTICIPATED FOREIGN
EXCHANGE EXPENDITURES
(millions of kyats)

1	2	3	4	5	
Year	Gross Domestic Product ^a	Imports of Productive and Social Capital ^b	Other Imports (including Military) and Net Non-trade Payments ^b	Total Foreign Exchange Payments ^c	
Actuals	1938-39	14	29	299 ^d	328
	1946-47	2,928	81	640 ^e	721
	1947-48	3,506	122	875 ^e	997
	1948-49	3,224	51	507 ^e	558
	1949-50	3,033	72	523 ^e	595
Estimate	1950-51	3,710	74	750 ^e	824
	1951-52	4,116	135	731 ^e	866
	1952-53	4,650	135	830	965
Forecast	1953-54	5,200	362	980	1,342
	1954-55	5,550	430	1,075	1,505
	1955-56	5,950	464	1,160	1,624
	1956-57	6,300	467	1,230	1,697
	1957-58	6,600	447	1,300	1,747
	1958-59	6,800	407	1,355	1,762
	1959-60	7,000	405	1,430	1,835

^a "Gross domestic product" is the value of the nation's production. The figures for 1951-52 and subsequent years reflect not only increase in output but also increase in the value of rice exported because of the rise in world rice prices. A gradual fall in rice prices from 1953 to 1960 is assumed. If rice prices had remained at the 1951 level throughout the decade, the approximate value of the nation's output for each year in millions of kyats would be: 1951-52, 4,070; 52-53, 4,500; 53-54, 5,000; 54-55, 5,400; 55-56, 5,800; 56-57, 6,200; 57-58, 6,500; 58-59, 6,750; 59-60, 7,000.

^b Division of payments between components in past years is estimated.

^c Net of non-trade receipts.

^d Of this total, K85 million consisted of income payments abroad. Postwar income payments abroad have varied between K6 and K13 million per year.

Payments for imports included in these figures differ considerably from the value of imports received during the year.

One type of payment which has decreased greatly since before the war is that to foreign owners of

enterprises in Burma. In 1938-39 these payments were estimated at K85 million. If they had increased in the same ratio as prices they would now be K400 million or more per year. In fact in no postwar year have they exceeded K13 million. As noted in Chapter II, the decline results in part from transfer of ownership, in part from partial paralysis of export industries. It greatly influences present and prospective foreign exchange payments.

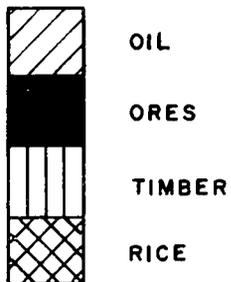
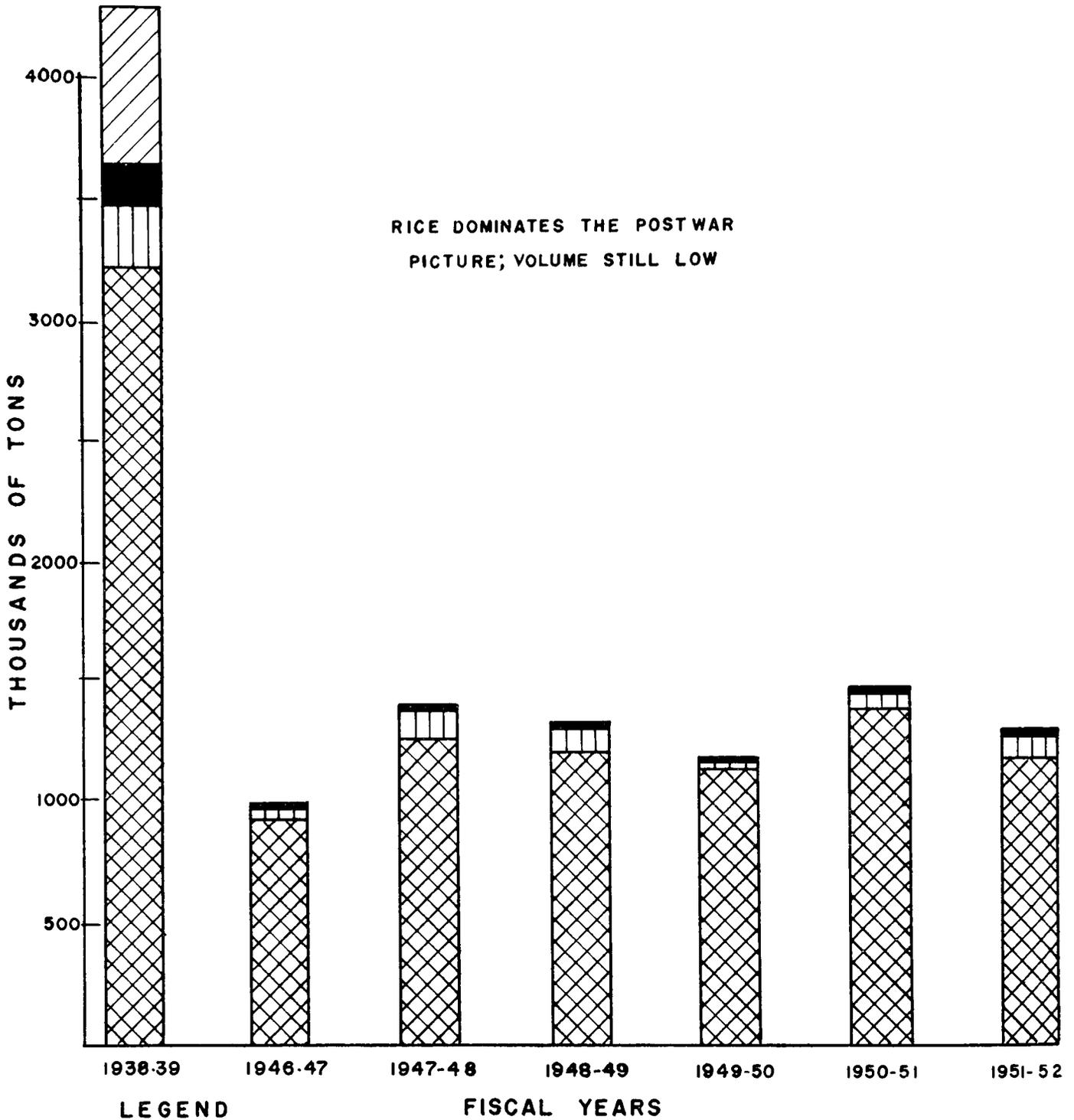
It should be emphasized that the general trend of foreign exchange expenditures shown in Table III-3 is more indicative of probable developments than are the figures for any one year. Large orders for capital equipment placed in any one year cause actual expenditures to swell in that year, and variation in the granting of import licenses may cause large swings in the year-to-year totals for imports. Even the figure for 1952-53 may differ greatly from the estimate, depending on the degree to which large capital purchases abroad being arranged as this is written are consummated and paid for by September 30. The table shows the trend which may be anticipated, but obviously does not allow for such variation. The table assumes unrestricted imports of consumer goods from non-dollar areas.

The table indicates that by 1959-60 the foreign exchange needs of Burma may increase to more than double the 1951-52 level and to about 90% above the present (1952-53) level. How will Burma be able to meet these needs?

2. FOREIGN EXCHANGE EARNINGS

Many small countries and some large countries during the past generation have been chronically short of foreign exchange with which to purchase required goods from abroad. This problem has been especially acute in recent years, because of needs for foreign goods arising out of wartime destruction and large-scale rehabilitation efforts. Foreign exchange shortage is normally made more acute by a development or rehabilitation program. Such a program directly creates a need for capital equipment and materials from abroad, and at the same time, by raising the level of economic activity and income, it increases the demand for imports for current use. Burma has shared the fear of other small countries of such a foreign exchange shortage. This fear was no doubt accentuated by the drain on her foreign exchange reserves in 1946-47 and 1947-48 and by the financial crisis of 1948-49.

But in Burma's case this fear is unnecessary. One of the most important economic facts concerning Burma is that the prospects for Burma to meet all of her foreign exchange needs out of the proceeds from her exports are favorable. A sizable excess of



SOURCE: QUARTERLY BULLETIN OF STATISTICS

MINISTRY OF NATIONAL PLANNING	
MAJOR EXPORTS BY VOLUME	
KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK RANGOON	
DR. BY. <i>E.J.P.</i> DATE	PLATE
CK. BY. <i>J.L.</i> MAY 53	NO. 2

foreign exchange receipts over foreign exchange payments has occurred in 1951, 1952 and 1953, in spite of relaxed restrictions on imports in the latter two years, and has resulted in a continuing increase in foreign exchange reserves (see Plate 1). Imports have been low because of the low level of national income. Expenditures for imports and other foreign exchange payments will increase steadily as income and output rise, and as annual development program expenditures rise, but a careful analysis of Burma's prospective foreign exchange earnings indicates that earnings are very likely to increase at least commensurately with payments. The excess of receipts is likely to continue even when consumer imports have risen further and when developmental expenditures are at their peak.

In the light of Burma's prewar record, this conclusion is not surprising. Though many Burmans do not realize it, even during the depression years of the 1930s Burma's exports earned foreign exchange far in excess of the amount required to pay for imports, plus shipping and insurance costs, plus substantial dividends to foreign owners of Burmese enterprises, plus all her other foreign financing needs. Large amounts of excess foreign exchange earnings were invested abroad annually. These amounts would have been more than sufficient to finance every year the annual foreign exchange requirements for a development program as large as that now recommended for Burma. Put another way, if Burma's prewar volume of exports and imports were re-established, the financing would be available for bringing in the productive equipment required for the proposed development program, even if price relationships were no more favorable than those which prevailed prewar. While data for "invisible" payments—freight, insurance, remittances to relatives—are not available for prewar years, data for exports and imports are available. Table III 4 shows the excess of exports over imports for five-year periods from 1901-02 to 1940-41. Hardly another small country in the world has a similar record:

TABLE III 4
BURMA'S FOREIGN TRADE BALANCE 1901-1941
(millions of kyats, and percentages)

Year	Exports	Imports	Excess of Exports	Per cent Excess of Exports
1901-1906	210.6	145.1	65.5	45
1906-1911	304.8	184.0	120.8	66
1911-1916	356.8	211.8	145.0	68
1916-1921	457.6	282.3	175.3	62
1921-1926	660.2	365.7	294.5	81
1926-1931	661.2	362.6	298.6	82
1931-1936	485.6	201.3	284.3	141
1936-1941	519.2	250.8	268.4	107

Two offsetting influences distinguish export prospects of the 1950s from the 1930s. On the one hand, destruction and insecurity caused by the war and insurrection have brought a very sharp drop in the production of rice, minerals and timber, which made up most of Burma's exports (see Plate 2). Rice exports during the remainder of the 1950s will be smaller than before the war not only because production will be smaller, at least until the end of the decade, but also because the increased population will consume more. Because of the depletion of reserves of minerals at Bawdwin and Mawchi and the time required to explore or develop other prospective mineral sites, production and exports of minerals will also be below the prewar level. Exports of petroleum and products will be small or nil. Increased security could permit exploitation and export of timber and timber products considerably above the present level, but hardly above the prewar level.

But the reduction in the physical volume of exports has been compensated by favorable price trends. The relationship between the prospective world price level of rice and the price of import goods is the most important single determinant of Burma's foreign exchange situation. While the prices of goods imported by Burma have risen on the average to between four and five times their level in 1938-39, export prices for rice, the major export, now average about ten times the prewar level. The probability is strong that the terms of trade will continue to be favorable throughout the decade, though not in the same degree.

Factors influencing the price of rice have been reviewed and the opinions of world food experts have been checked. It is generally agreed that the prospects for the price of rice over the next few years are highly favorable. It is most unlikely that a full decline to the prewar relationship to industrial prices or non-food raw materials prices will occur during the next five to eight years.

3. PROSPECTIVE RICE EXPORTS

Table III 5A and III 5B (*see next page*) present alternative forecasts of Burma's earnings from the present to 1960 from rice exports, together with factors entering into the estimates. These are "intermediate" and "low" estimates; higher estimates which were also prepared are not presented. In order to estimate foreign exchange earnings with due conservatism, the intermediate estimate assumes paddy acreage by 1959-60 no higher and yield per acre a little lower than the targets set for 1956-57 in the Agricultural Five-year Plan. The low estimate assumes lower acreages and yields. Both also assume a decline in the average price received for rice exports below the present

ECONOMIC AND ENGINEERING DEVELOPMENT OF BURMA

government-to-government prices of £60 per long ton (which in turn is below the present private market price). The intermediate estimate assumes a fall to

about 8% below the present government-to-government price, or to £55; the low estimate a fall of about 16% to £50.

TABLE III - 5A

RICE OUTPUT, HOME USE, EXPORTS AND PROCEEDS

(Intermediate estimates)

Year	Sown Acreage Paddy 1,000 Acres	Paddy Output 1,000 Tons	Paddy Home Use* 1,000 Tons	Available for Export, 1,000 Tons of Paddy	Available for Export, 1,000 Tons of Rice	Fiscal Year Exports 1,000 Tons of Rice	Export Price per Ton in Kyats	Value of Exports in Fiscal Year K Millions	Income to Private Sector K Millions
1950-51	9,467	4,979	3,347	1,632	1,142	1,320†	563	745	415
1951-52	9,698	5,250	3,395	1,855	1,299	1,110†	720	787	436
1952-53	10,331	5,740	3,451	2,289	1,602	1,350‡	840	1,134	609
1953-54	10,781	5,950	3,502	2,448	1,714	1,886§	785	1,482	600
1954-55	11,198	6,180	3,556	2,624	1,837	1,806	800	1,445	643
1955-56	11,615	6,470	3,607	2,863	2,004	1,962	787	1,544	701
1956-57	11,979	6,730	3,659	3,071	2,150	2,114	773	1,634	752
1957-58	12,292	6,960	3,711	3,249	2,274	2,243	760	1,705	796
1958-59	12,604	7,200	3,764	3,436	2,405	2,372	747	1,772	841
1959-60	12,917	7,440	3,816	3,624	2,537	2,504	733	1,835	888

* Seed at 46 pounds per acre, annual per capita disappearance 125 kg. rice.

† Based on actuals.

‡ Estimate on basis of first three quarters.

§ Includes excess carryover of 198,000 tons.

TABLE III - 5B

RICE OUTPUT, HOME USE, EXPORTS AND PROCEEDS

(Low estimates)

Year	Sown Acreage Paddy 1,000 Acres	Paddy Output 1,000 Tons	Paddy Home Use* 1,000 Tons	Available for Export, 1,000 Tons of Paddy	Available for Export, 1,000 Tons of Rice	Fiscal Year Exports 1,000 Tons of Rice	Export Price per Ton in Kyats	Value of Exports in Fiscal Year K Millions
1950-51	9,467	4,979	3,347	1,632	1,142	1,320†	563	745
1951-52	9,698	5,250	3,395	1,855	1,299	1,110†	720	787
1952-53	10,331	5,740	3,451	2,189	1,602	1,300‡	827	1,075
1953-54	10,300	5,870	3,493	2,377	1,664	1,898§	800	1,511
1954-55	10,600	6,040	3,544	2,496	1,747	1,726	773	1,334
1955-56	10,900	6,270	3,592	2,678	1,873	1,870	747	1,397
1956-57	11,200	6,500	3,643	2,857	2,000	1,969	720	1,418
1957-58	11,500	6,670	3,695	2,975	2,083	2,062	693	1,429
1958-59	11,800	6,900	3,747	3,153	2,207	2,176	667	1,451
1959-60	12,000	7,080	3,797	3,283	2,298	2,276	667	1,518

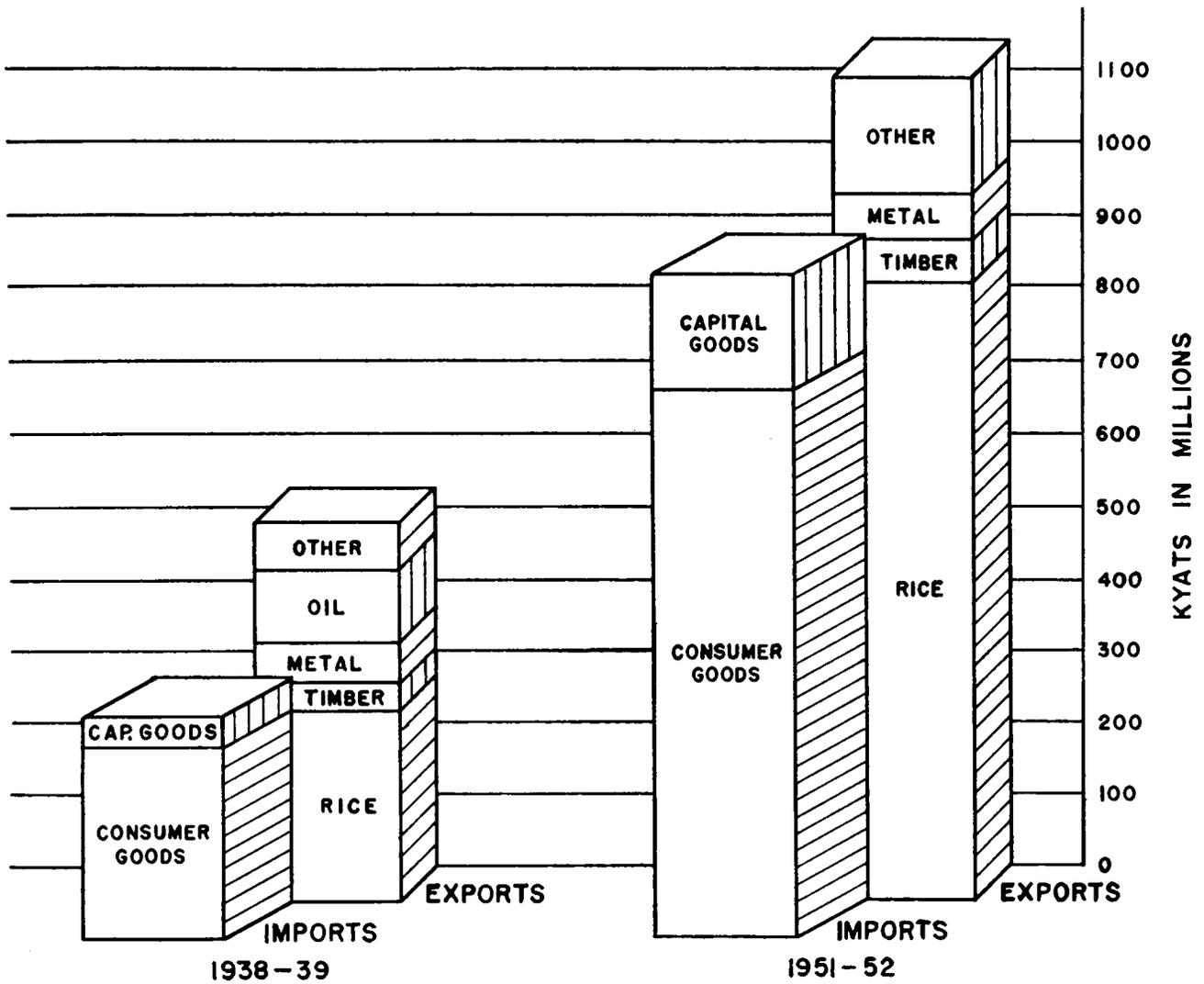
* Seed at 46 pounds per acre, annual per capita disappearance 125 kg. rice.

† Based on actuals.

‡ Estimate on basis of first three quarters.

§ Includes excess carryover of 248,000 tons.

VALUE OF EXPORTS AND IMPORTS
BY COMMODITY



MINISTRY OF NATIONAL PLANNING			
VALUE OF EXPORTS AND IMPORTS BY COMMODITY			
KNAPPEN TIPPETTS ABBETT ENGINEERING CO.		RANGOON	
DR. BY <i>E.F.P.</i>	DATE	PLATE	3
CK. BY <i>J.L.</i>	JULY 53	NO.	

4. THE FAVORABLE BALANCE BETWEEN EARNINGS AND EXPENDITURES

Table III-6 combines the data of Tables III-4 and III 5A with estimates of receipts from exports other than rice. These estimates too are conservative; they assume that even by 1959-60 the physical volume of other exports will still be much below that before the war. These exports will include metallic minerals, teak and other timber, a variety of agricultural products, rubber and miscellaneous other commodities. Total receipts in 1959-60 only 75% above prewar are assumed. Plate 3, Value of Exports and Imports by Commodity, compares the prewar and postwar exports and imports of major commodity groups.

TABLE III - 6
PROSPECTIVE FOREIGN EXCHANGE EARNINGS
AND EXPENDITURES
(millions of kyats)

Fiscal Year	Receipts : Intermediate Estimates		Total Receipts from Exports	Payments* (Table III 3)	Excess of Receipts
	From Rice Exports	From Other Exports			
Actual	(Table III 5A)				
1938 39	218	267	485	328	157
1950 51	745†	242†	991	824	167
1951 52	787†	280†	1,025	866	159
Estimated					
1952 53	1,134	260	1,394	965	429
Forecasts					
1953 54	1,482	300	1,782	1,342	440
1954-55	1,445	320	1,765	1,505	260
1955 56	1,544	340	1,884	1,624	260
1956 57	1,634	370	2,004	1,697	307
1957 58	1,705	400	2,105	1,747	358
1958 59	1,772	435	2,207	1,762	445
1959 60	1,835	470	2,305	1,835	470

* Net of non-trade receipts.

† These data are customs data for value of exports. Unreconciled discrepancies exist between them and total receipts from exports shown in the adjacent column.

The table shows receipts during 1953 54 to 1959 60 K2,540 million in excess of expenditures. That is, it shows proceeds from exports during the seven years sufficient to finance unrestricted imports for current purposes, plus all purchases abroad for the development program, with a surplus in addition to the present large foreign exchange reserves of K2,540 million.

As in the case of Table III 3, the general trend of the figures is much more significant than those for any given year, which are subject to fluctuation.

If the low receipts estimates of Table III-5B are substituted for the intermediate estimates, the forecast still shows a balance of foreign exchange earnings over receipts of more than K1,100 million over the seven-year period. The price of rice would have to fall to £45 by 1959 60, or to fall abruptly below £55 in the near future and continue down thereafter, to create a deficit of foreign exchange for unrestricted imports. What is the probability that such a fall or a greater fall will occur?

Should generally depressed conditions emerge in the world economy, or should peace and conditions favorable to maximum rice production occur in all major rice producing countries, rice prices might fall more than other prices but hardly to prewar relations. If rice were to sell at £50 per ton by the end of the decade and other prices remain stable, then almost one third of the present advantageous level of rice prices relative to other prices will have been eliminated. If the price of rice drops to £45 per ton and other prices remain stable, then almost half of the relative price advantage which rice enjoys over other products today in relation to prewar levels will have been eliminated. In face of all the influences which can be evaluated, this would appear to be very unlikely. Far more likely is the probability that future declines in the price of rice will be partially offset by lesser declines in other prices.

The analysis thus far has treated the forward period to 1959-60 as a whole, and has contemplated continuous trends throughout it. This does not exclude the possibility of a drop in price within any year of this period more substantial than those indicated. However, it is believed that any such sharper drop, relative to other prices, would probably result from a temporary combination of circumstances which would not invalidate the analysis for the longer period.*

5. PRESENT FOREIGN EXCHANGE RESERVES

The future, however, cannot be foreseen clearly, and a greater fall in foreign exchange receipts relative to payment is possible. If it should occur, Burma would have to rely on one of three other procedures to finance imports for economic development.

* Subsequent to the completion of the mimeographed edition of this report, Burma has concluded long-term agreements with Ceylon and Japan at price schedules below those indicated above. The new price schedules, if applied to all rice sales and extended throughout the period 1953 54 to 1959-60, would reduce substantially the sizable addition to foreign exchange predicated. However, the basic conclusion, namely, that Burma will probably be able to finance her development program entirely from present foreign exchange availabilities, plus earnings during the period, would remain unaffected. This would also be true even if average prices for the entire period were some 10% below those of the Ceylon agreement. This would not preclude prices more than 10% below the Ceylon schedule in any given year of the period.

One of these is use of some of her present foreign exchange "reserves," i.e., present deposits and investments abroad.

At the end of June, 1953, these totaled over K1,200 million. Of this amount, less than one third is needed as statutory reserves of the Union Bank of Burma (which could of course be reduced by statute). Because an adequate reserve should be held to meet seasonal swings in foreign exchange payments, the minimum reserves held should perhaps be larger, or half of the present total. Even so, K600 million of present deposits and investments abroad could safely be used to finance imports if desired.

6. CURTAILMENT OF IMPORTS

The second additional available procedure is restriction of imports. The estimates presented above assumed completely unrestricted imports from non-dollar areas. It would not require severe restrictions to divert, say, K100 million per year, during the last years of this decade from other imports to imports for the development program.

7. INTERNATIONAL LOANS

Finally, Burma could request loans from abroad. It seems very probable that such loans could be obtained for resource development which directly or indirectly would increase the country's capacity to export and thus to repay loans.

In view of the very favorable earnings prospects and the availability of these supplementary procedures, it is hardly conceivable that Burma will not have adequate foreign exchange to finance the full development program which has been recommended. She should proceed with her development program with no hesitation whatsoever on this score.

8. DOLLAR IMPORTS

The discussion above has applied only to imports from non-dollar sources. Though Burma will probably earn ample sterling and other non-dollar foreign exchange in relation to her maximum requirements, the same will not be true of United States dollars. The United States is herself a rice exporter, and for the present she has advantageous alternative sources of supply for most other materials which Burma exports. Burma's earnings of dollars will be derived mainly from fairly small sales of some minerals, and perhaps from the sale of rice to United States forces in the Pacific or to countries in the Pacific area which have dollars available for payment. On the other hand, Burma's imports of United States products for consumption are not large. Indeed for most items other sources of supply can be substituted without hardship, even though there may be

consumer preferences for the United States product. There will remain some consumer items and some items of capital equipment with respect to which an advantage in price, performance, or speed of delivery justifies procurement from dollar areas.

Burma's direct dollar earnings will probably not be great enough to meet her requirements for consumer goods and capital equipment from the United States and other dollar areas. Wherever and whenever opportunities present themselves for exports for dollars, advantage should be taken of such opportunities. As a contributor of important quantities of commodities to other sterling area countries, Burma will very probably be able to obtain from the sterling area dollar pool the moderate amount of dollars needed to supplement these sources. While the amount required will be of considerable importance to Burma, it will not bulk large in relation to the sterling area dollar pool as a whole. Burma can therefore expect to finance without difficulty her reasonable needs for dollars as well as non-dollar imports.

The prospective availability of ample amounts of foreign exchange, of course, has important implications with respect to foreign exchange and foreign trade policy. These are discussed in Chapter IV.

C. FINANCING DEVELOPMENT EXPENDITURES WITHIN BURMA

It is a truism that when an economic system is operating at capacity, the amount of investment (capital formation) undertaken must be matched by an equal rate of saving. Yearly capital formation in excess of the year's savings will cause scarcities and inflation. This statement requires only the qualification that if capacity is expanding, this expansion creates room for a slight excess of investment.

On the other hand, if production in the country is below capacity—if there is underemployment and slack—then it is highly desirable that capital formation should exceed saving in order that the excess of expenditures for capital formation may create new jobs, increase employment and incomes, and pump new money into circulation.

These economic axioms apply in Burma as elsewhere. However, these generalizations do not provide a guide to the amount of development expenditures within Burma which the country can successfully finance. It is necessary to answer such questions as: How much saving by firms and individuals can be anticipated? How much saving can the Government do? Exactly what is meant by "government saving"? If capital formation in excess of saving is anticipated, how large an amount, in the present slack state of the economy, is desirable?

These questions are considered in this section. The conclusion is reached that the contemplated programs of private investment and of government investment are both feasible. Whether present revenue measures and related policies are adequate to finance the Government's program, or on the contrary new measures are needed, is uncertain. The relationship of government revenues to expenditures and the trend in the money supply must be watched from year to year to decide whether and when new measures may be needed.

1. GOVERNMENT AND PRIVATE INVESTMENT

It will be convenient to consider separately the financing of government and private investment, and, as the first step, to estimate the amount of each. Of total capital expenditures of K6,600 million anticipated during the remaining seven years of the development program, planned projects recommended in this Report will require a little more than K3,000 million. It is reasonable to suppose that the Government itself will execute almost all of these. Some, however, in industry and possibly in mining may be joint ventures. Capital expenditures by the Government on presently planned projects during the years 1953-54 to 1956-57 are therefore assumed to be moderately below the total expenditures for planned projects in these years programmed in Part VIII. On the other hand, it is assumed that with continuing planning, a number of additional projects will be planned before the end of the decade. Government expenditures on planned projects during 1957-58 to 1959-60 are therefore assumed to be somewhat above the totals now programmed for planned projects during those years.

In addition to the planned productive projects, the Government will build houses, schools, health facilities, and other social capital, and government buildings of various types for administrative purposes. It is reasonable to estimate this construction at a rate rising throughout the seven years but averaging about K100 million per year or K700 million in all. Total capital expenditures by the Government may be estimated at K3,650 million. Private net capital formation, the balance of the development program, will be considerably less than that by Government, or K2,950 million.

These are "net" figures, that is, figures for the necessary increase above the present amount of productive and social capital. In addition, some capital must be built every year to replace the depreciation of existing capital which goes on year by year. Also, Government must construct a considerable number of buildings and buy considerable capital equipment for the defense forces, not included

in the preceding figures. Capital formation by the Government for these two purposes will total almost K1,000 million during the seven-year period, bringing the estimated Government total to K4,620 million. Private capital formation to make good depreciation is much larger than that by government, both because the existing amount of private capital is larger and because houses constructed of bamboo and thatch must be completely replaced every three to five years. Private capital formation to offset depreciation is estimated at K1,655 million for the seven-year period, and total private capital formation at K4,605 million.

These estimates are used as the basis for the discussion which follows. The pattern which the capital expenditures may take over the seven-year period is indicated in Table III-7.

TABLE III - 7
GOVERNMENT AND PRIVATE CAPITAL
FORMATION, 1953-54 to 1959-60
(millions of kyats)

1 Year	2 Gross Domestic Product	3 Government Capital Formation		4 Private Capital Formation		5 Net	6 Gross	7 Per cent Col. 4 to 2	8 Per cent Col. 6 to 2
		Pro- ductive and Social —Net	Pro- ductive and Defen- sive— Gross	Net	Gross				
Jan.-Sept. 1952	4,121	150	230	255	385			5.6	9.3
1952-53 (est.)	4,650	220	375	265	460			8.1	9.9
Programmed:									
1953-54	5,200	390	565	265	470			10.9	9.0
1954-55	5,550	550	695	280	495			12.5	8.9
1955-56	5,950	605	745	345	570			12.5	9.6
1956-57	6,300	605	740	410	645			10.7	10.2
1957-58	6,600	540	670	490	735			10.2	11.1
1958-59	6,800	490	615	560	815			9.1	12.0
1959-60	7,000	470	590	600	865			8.4	12.4
Total, 1953-54 to 1959-60		3,650	4,620	2,950	4,595				

2. FINANCING PRIVATE CAPITAL FORMATION

These estimates, of course, include both expenditures within Burma and purchases of materials and equipment abroad. If foreign firms invest in Burma and bring capital in from abroad, no saving within Burma is needed to finance this capital. However, if private firms within Burma invest, they must surrender funds here in Burma to the foreign exchange

authorities to obtain the foreign currency needed for purchases abroad. Hence total private capital formation, i.e., the expenditures both abroad and in Burma, may have to be financed out of savings within Burma.

Government expenditures for productive capital reach a peak in 1956-57, mainly because of the urgency of key power and transport projects. (See Parts IV and VI, and also Part VIII, which summarize expenditures on planned projects.) Private capital formation is expected to be stimulated by these key public projects and to rise rapidly during 1955-60.

Private saving within Burma will almost certainly be ample to finance the total shown. The financing of that share which makes good each year's depreciation raises little question, since it will be covered by the provisions for depreciation normally made by business firms, plus the arrangements for regular replacement of short-lived housing customarily made by the inhabitants. For many individuals and firms in the Burmese economy, these arrangements are not formalized, but the provisions do exist, and in a period of rising income they are easy to make. Hence attention can be concentrated on the financing of the net private additions to capital.

Private net capital formation is estimated to rise from K265 million in the current year, 1952-53, to K600 million in 1959-60. In 1952-53, it constitutes 5.7% of the value of the nation's output; in 1959-60, this percentage will have risen to 8.6% of the much larger national output of that year.

The private capital formation in 1952-53 was financed wholly from current private saving, except for some agricultural improvements financed by government loans to cultivators. Loans and advances by commercial banks diminished during the year. This indicates that the saving by individuals and firms during the year was sufficient not only to finance the capital formation which occurred (other than the agricultural improvements mentioned), but also to make loan repayments to the banks.

If private savings rise during the remainder of the decade from 5.7% to 8.6% of the value of the nation's output, they will be sufficient to finance all of the private capital formation which is anticipated.

They will almost certainly rise by at least this amount. During the six years intervening the nation's output (and income) will increase by more than one third, and per capita income will increase by approximately 25%. With such a rise in per capita income the percentage of income saved by individuals and firms always rises fairly sharply. In 1938-39, with per capita income slightly below that anticipated in 1959-60, private saving totaled 14.2% of the value of

the nation's output. Private activity in that year included a number of industries since wholly or partly nationalized (rice exporting, teak extraction, mining, Irrawaddy flotilla), and the profitable mineral extraction industries will be operating at much lower levels of activity in 1959-60 than before the war, so that private saving cannot be expected to equal the prewar percentage of the value of the nation's output, 14.2%; but that it will reach 8.6% or more seems reasonably certain. The prospects are good, not only that private saving will readily finance all of the private capital formation anticipated, but that if private capital formation does not exceed this amount there will be savings looking for outlets and available for the purchase of government bonds.

3. FINANCING GOVERNMENT CAPITAL FORMATION

Column 4 of Table III-7 indicated anticipated expenditures for government capital formation year by year, including not only those within the development program but also those for defense capital and those needed to offset each year's depreciation. Table III-8 indicates the probable division of this total between expenditures abroad and those within Burma.

TABLE III - 8

GROSS GOVERNMENT CAPITAL FORMATION, INCLUDING DEFENSE, AT HOME AND ABROAD (millions of kyats)

Year	Total	Abroad	At Home
Jan. Sept., 1952	230	40	190
1952-53 (est.)	375	150	225
Programmed:			
1953-54	565	303	262
1954-55	695	356	339
1955-56	745	360	385
1956-57	740	352	388
1957-58	670	312	358
1958-59	615	267	348
1959-60	590	259	331
Total, 1953-54 to 1959-60	4,620	2,209	2,411

The preceding section has indicated that ample foreign exchange will be available to finance both private and government expenditures abroad. The remaining question concerning the financing of the entire development program is whether any new measures must be adopted to finance without economic strain the domestic expenditures by the Government, or whether present measures and economic policies are adequate.

The expenditures within Burma must be financed out of current government receipts by drawing on accumulated cash balances, or by creating new money.

a. The Government's Budget

The primary source of funds must of course be government revenues (though as will be noted below this is by no means the only important source). Government revenues do more than merely provide income for the Government. The taxes paid by individuals and firms curtail their purchases of goods and services. In the main, therefore, government spending of its revenues merely replaces private spending. But, unfortunately so far as their use in financing government expenditures within Burma is concerned, a large part of the present revenues of the Union Government are not paid by the people or firms of Burma and do not curtail private spendings within Burma. By far the largest single source of budget revenues since the war is the taxes or contributions paid by the State Agricultural Marketing Board from its net income or "profits" on rice exports. This revenue is derived from foreign buyers of rice. It is in fact received in foreign currencies—checks or drafts on foreign banks—and not in kyats. It is converted into kyats by selling it to the Union Bank of Burma, which holds the deposits abroad and creates new deposits, exactly as it would if it bought government bonds. This revenue does not in the least reduce private spending in Burma or free labor or other resources in Burma for employment by the Government. To the extent that withdrawal of funds from private spending may be necessary to prevent inflation, such revenues must be disregarded for financing expenditures within Burma. However withdrawals in addition to those accomplished by the present structure of the Government's domestic revenues are not inescapable, as developed further in paragraph e.

The importance of this fact may be seen by considering the 1952-53 budget. (The original budget estimates, presented to Parliament in August, 1952, are used.) The budget estimated total receipts of K835 million—K699.4 million of "revenue receipts" and K135.5 million of "capital receipts." But of the total, K364.6 million consisted of revenues from SAMB—a "rehabilitation contribution" of K250 million, export duties of K14.6 million, and a "capital contribution" of K100 million. Only the remaining K470.4 million was from within Burma.*

To determine the amount of government revenues available for capital formation within Burma, this sum must be set against the Government's expenditure

*There are other minor sums derived from abroad, but these are so small that they may be disregarded.

within Burma for other purposes. The budget for 1952-53 showed total "current expenditures" of approximately K655 million. Of this total however about K30 million are actually capital expenditures for the rehabilitation of buildings destroyed or damaged in war or insurrection. Only K625 million are true "current expenditures." To these must be added expenditures included in the capital budget which are not for physical capital formation. They include part of the loan to the Burma Railways (to cover its operating deficit for the year, the remaining part being for capital formation), and loans to agriculturists, cooperative societies and others. These loans total about K50 million, bringing total non-capital-formation expenditures to K675 million. Of these, about K100 million are abroad (the largest single category being defense purchases abroad) and K575 million in Burma.

This figure is K105 million in excess of revenues from within Burma. The contrast between this fact and the over-all budget data, which include revenues and expenditures both at home and abroad, is striking. Though there is a budget surplus of K180 million over current expenditures, there is a deficit of

BUDGET ESTIMATES, 1952-53, SELECTED DATA (millions of kyats)

Revenues (current plus capital)	835.0	Revenues from within Burma	470
Current expenditures	654.9	Non-capital expenditures within Burma	575
Surplus available for capital expenditures	180.1	Surplus available for government capital formation in Burma	105

K105 million of revenues within Burma below non-capital expenditures within Burma. The reason for this discrepancy is that the budget estimates include a huge surplus of estimated revenues abroad over estimated expenditures abroad. Such amounts are not relevant to an analysis of financing within Burma.

The table, it should be noted, is based on the original budget estimates. An estimate may be hazarded that current budget expenditures within Burma during 1952-53 will total some K40 to K50 million less than the budgeted amount, while revenues will approximate the total indicated, so that the actual deficit is K40 million less than indicated in the table.

Estimates may be made of the corresponding surpluses or deficits of domestic receipts compared to domestic non-capital-formation expenditures, during the period 1953-54 to 1959-60. To do so, receipts and

expenditures must be forecast. As national income rises, revenues will rise significantly even without change in present revenue laws. (A new schedule of tariff rates will take effect on October 1, 1953, with termination of the preferential agreements now in effect. The estimates below assume that the new rates will yield the same total revenue as the former ones.)

In forecasting expenditures, account must be taken of the fact that a number of types of current expenditures for education, health, other social services, and general administration are being expanded fairly rapidly. Such other expenditures as those for technical education and training, research and extension work must expand if the development program is to be carried out effectively. Because of these expanding programs, current budget expenditures will rise steadily year by year unless they are firmly controlled, and in fact may over a period of several years threaten the success of the development program. Current expenditures (at home and abroad) budgeted for 1952-53 are K650 million. In the estimates below, it is assumed that those budgeted for 1953-54 will total K700 million, and that they will be held at this level in subsequent years. This is not merely a forecast of present trends. Such a forecast would present increasing figures in subsequent years. The figure is held at K700 million because it is believed that the Government must hold it at approximately this level if enough resources are to be available for the development program.

It was noted that current expenditures in 1952-53 will probably not reach the budgeted level. Similarly,

it is estimated that those in 1953-54 will not reach the higher level which will presumably be budgeted for that year, but that they will reach this level in subsequent years.

Table III 9 presents the estimates. The decline in non-capital-formation expenditures in the years following 1954-55 reflects the anticipated decline in the operating deficit of the Burma Railways from between K20 and K30 million this year to a "black ink" budget by the end of the decade.

Table III 9 indicates that not until 1955-56 will the domestic revenues and expenditures provided in the budget yield a surplus for capital formation expenditures within Burma. These estimates, however, give by no means a complete indication of the funds available. It was suggested above that there are important sources of funds outside the budget. These must also be considered.

b. Sources of Funds outside the Budget: State Enterprises and Minor Funds

As the functions of the Union Government have expanded and diversified in recent years, an increasing number of government activities are carried on by State enterprises whose receipts and expenditures are reflected in the budget only insofar as they suffer losses which must be met by appropriations from the budget, or as they obtain an appropriation of capital or make a repayment of capital. Among these are the Inland Water Transport Board, Burma Railways, the Board of Commissioners of the Port of Rangoon, and the Union of Burma Airways. There

TABLE III - 9

BUDGET SURPLUSES AVAILABLE FOR EXPENDITURES IN BURMA FOR CAPITAL FORMATION 1952-53 to 1959-60

(millions of kyats)

1	2	3	4
Year	Revenues from within Burma (Current plus Capital)	Expenditures within Burma Other than for Capital Formation (In Current and Capital Budgets)	Available for Expenditures in Burma for Capital Formation
1952-53	470	525	55
1953-54	530	540	10
1954-55	580	585	5
1955-56	630	580	50
1956-57	670	575	95
1957-58	705	570	135
1958-59	735	570	165
1959-60	760	570	190

TABLE III - 10

NET NON-BUDGET RECEIPTS

(millions of kyats)

Year	Amount
1952-53	100
1953-54	105
1954-55	110
1955-56	115
1956-57	120
1957-58	125
1958-59	130
1959-60	140

are many others. The losses of those boards consistently incurring losses, notably Burma Railways, are reflected in the budget. The net profits of the enterprises earning profits are not. Those profits, plus the share of their gross receipts allocated to depreciation and certain other reserve accounts, are available for capital expenditures. So also are the net deposits by the public in various government court, civil and savings funds. These are minor in amount. Offsetting these non-budget receipts in part are disbursements

of funds not reflected in the budget, such as the net loans of the State Agricultural Credit Bank created in 1953.

While the net receipts from this group of sources can be estimated only very roughly, it will clearly rise through the period of the development program. Table III - 10 (see p. 53) shows the estimated receipts.

c. Private Saving as a Source of Funds

A third prospective source of funds is private saving. It was suggested above that private saving may rise more rapidly than private capital formation. If it does, the firms whose savings exceed their capital needs may come into the market for government securities; or, as has happened in 1952-53, they may use excess funds to retire loans from commercial banks, while the banks in turn purchase government securities. In either case, the funds will be available for government expenditures.*

The estimates of capital receipts above include a nominal estimate of K10 million per year from this source. As national income rises, the amount available annually may be considerably greater. In calculating the prospective financial position, from zero to K50 million per year may be allowed from this source.

d. Government Receipts and Disbursements: Consolidated Estimate

A consolidation of the estimates presented in the preceding sections will indicate the relationship between prospective domestic receipts and disbursements of the Government and all of its agencies. Table III-11 presents the data. The term domestic receipts as used here includes both budget receipts from within Burma and the gross income (net profits plus accruals in depreciation reserves) from within Burma of all agencies operating outside the budget. The term domestic disbursements includes both the disbursements within Burma recorded in the budget accounts and the capital expenditures of the agencies outside the budget. Such a consolidated picture presents information concerning the impact of the development program on the economy which cannot be gleaned from the Government's budget data.

The excess of disbursements would have to be financed from accumulated cash balances or from new money (i.e., new deposits) created for the purpose.

From a purely financial viewpoint, there would be no difficulty in obtaining these funds. The commercial banks will probably be in the market for government

* Or private savers may hold funds idle, and the banks may offset this by the purchase of government securities. The effect on the money supply will be different from that if bank loans are retired, but the effect on funds available for investment will be the same.

TABLE III - 11

DOMESTIC RECEIPTS AND DISBURSEMENTS, 1952-53 to 1959 60, ALL UNION GOVERNMENT AGENCIES, CONSOLIDATED

(millions of kyats)

1 Year	2 Consolidated Domestic Receipts Including Loans from Current Private Income*	3 4 5 Consolidated Domestic Disbursements			6 Excess of Disburse- ments
		Non- Capital Forma- tion	Capital Forma- tion	Total	
1952-53	630	525	225	750	120
1953-54	635-685	540	262	808	123-173
1954-55	690 740	585	339	924	184-234
1955-56	745-795	580	385	965	170-220
1956-57	790-840	575	388	963	123-173
1957-58	830 880	570	358	928	48- 98
1958-59	865-915	570	348	918	3- 53
1959-60	900 950	570	331	901	(-49)-(+1)

* The lower figure in this column is from column 2 of Table III - 9 and Table III - 10. This figure (for each year) includes K10 million of receipts from the sale of securities to persons or firms who purchase out of current income; the higher figure includes K60 million.

securities in considerable amounts. (Their purchases will automatically create new deposits.) Further, under present statutes and with present reserves, the Union Bank of Burma possesses the authority to create new deposits or issue new currency vastly in excess of foreseeable requirements, and if desired, by statutory change the authority could be made limitless.† Actually, no deposit creation would be required for some time; the accumulated cash balance of the Union Government in the bank totaled K511 million at mid-1952. Only a fraction of this amount is needed as minimum reserve.

The creation of new deposits would not necessarily require securities purchases from the Government either by the Union Bank or by the commercial banks of the country. It was noted earlier in this chapter that the State Agricultural Marketing Board converts its foreign revenues into kyats by selling them to the Union Bank, which creates new deposits in return. Such deposit creation is the source of the Government's present cash balance. Any excess of SAMB revenues in near-future years over the foreign

† Present law requires the Bank to hold foreign exchange equal to 25% of its deposits plus currency outstanding, or, in other terms, permits creation of deposits or issue of new currency equal to four times the foreign exchange holdings. At the end of April, 1953, foreign exchange holdings of the Bank totaled K1,041 million. This would permit deposits or currency totaling K4,164 million; the actual amount at that date, on the basis of a preliminary estimate, was about K1,120 million. The theoretically permissible increase of more than K3,000 million is vastly in excess of any conceivable increase which will be desirable or which will be undertaken.

exchange needs of the Government will result in additional deposit creation. The amount of this will probably be sufficient to finance the excess of domestic disbursements over domestic receipts shown in Table III-11. If however this should not be the case, securities issues to the Bank could be used.

e. Effects on the Money Supply

The question to which these estimates lead is not therefore whether the money can be obtained. The answer to that question is obvious. The pertinent question is whether the prospective excess of government domestic disbursements over receipts indicated in Table III-11 is healthy, or whether it is excessive. In the latter case, if domestic disbursements progress as indicated, measures should be taken by the Government to increase its domestic revenues.

It has already been noted that in the conditions of slack and underemployment which now prevail in the Burmese economy, government expenditures within Burma on capital projects in excess of current government savings—or, in other words, total domestic disbursements by the Government in excess of its total domestic receipts—are highly desirable. They create jobs and increase the level of income, and in the process inject into the economy the increase in money supply needed to provide working capital for the increased production which is stimulated by the increased spending. Of course there is a limit to the rate at which new orders for materials should be placed, but this is a question of bottlenecks in the production of specific materials (such as construction materials) and in the availability of skilled workers of specific types, and not a question of the total rate of spending. The advisability of a given total rate of spending will be tested by the presence or absence of general scarcities, scarcities of most types of goods and of most kinds of labor, when the economic system approaches capacity. One convenient way to test this is to ask whether government programs will still be increasing the total money supply in private hands when the economic system is operating at capacity, and whether in the interval before capacity operation is reached government disbursements will have contributed so much new money that its presence in the hands of the public will in itself stimulate excessive spending and create scarcities and inflationary pressure.

These pressures, however, may be mitigated by two other factors: the loan policies of commercial banks, and import-export operations. The former will probably be a fairly passive factor in the circumstances facing Burma, but the balance between receipts and payments of firms and individuals in importing and exporting and in related foreign

exchange transactions will be an important influence, offsetting in part the excess of government domestic disbursements over receipts.

When an individual or firm makes a payment abroad for imports, ocean freight, marine insurance or other remittances abroad—he surrenders funds to his bank in order to purchase the necessary foreign exchange. This decreases the total money supply in Burma. On the other hand when he receives a payment in a foreign currency, he sells the foreign draft to his bank, which creates a new deposit in exchange; this increases the total money supply. This “monetization” of foreign exchange is a normal part of banking operations. When SAMB is the exporter, it receives the new money (from the Union Bank) and may hold part of it idle, but its payments to firms or individuals for rice purchased for export increase the money supply in private hands.

If the total income of firms and individuals from exports exceeds private payments abroad for imports, the money supply in the hands of firms and individuals is increased; if the payments abroad exceed receipts, the money supply is decreased.

Preliminary data suggest that during 1952-53 receipts from exports by firms and individuals and from rice sales to SAMB exceeded their payments abroad by K110 million. This increase, combined with an excess of government domestic disbursements over receipts of K120 million, offset in part by a K30 million contraction of bank credit, increased the money supply in private hands by K200 million. (These are estimates based on nine months' data, and may be inexact. The increase in money supply in private hands will however obviously be between K160 and K220 million.) The excess of receipts from sales for export was due in large part to unusually large purchases of rice by SAMB. Since rice and paddy stocks in private hands are now probably down to a minimum, SAMB purchases in 1953-54 may be below those in 1952-53 in spite of a larger crop. Other exports will probably rise, and in subsequent years both other exports and rice sales for export will rise. At the same time, however, with increasing incomes the people will spend increasing amounts for imports; and as private capital formation increases they will also spend increasing amounts abroad for the purchase of capital equipment and materials. It seems probable that purchases of foreign exchange in 1953-54 to pay for imports will almost equal receipts by individuals and firms from exports, and that in subsequent years they will exceed receipts, thus causing a shrinkage in the money supply which will offset in part the effect of government expenditures.

Table III-12 (*see next page*) presents estimates of

ECONOMIC AND ENGINEERING DEVELOPMENT OF BURMA

TABLE III - 12

CHANGES IN THE PRIVATELY HELD MONEY SUPPLY DUE TO FOREIGN EXCHANGE TRANSACTIONS

(millions of kyats)

Year	Private Imports of Consumer Goods and Materials and Non-Trade Payments	Private Imports of Capital Equipment and Materials	Total Foreign Exchange Payments	Receipts from Exports plus Rice Sales to SAMB	Excess of Receipts (Increasing Money Supply)
1952 53	671	104	775	885	+110
1953-54	770	139	909	900	9
1954-55	865	147	1,012	970	42
1955 56	955	171	1,126	1,040	86
1956-57	1,025	175	1,200	1,125	- 75
1957-58	1,095	188	1,283	1,205	78
1958-59	1,165	187	1,352	1,280	72
1959 60	1,210	186	1,396	1,365	- 31

prospective foreign exchange transactions of the private sector of the economy.

Finally, Table III-13 presents estimates of the change in the privately held money supply due to the combination of government and import-export transactions, together with related data. The table ignores the effects of commercial bank loan contraction or expansion, since they are apt to be small.

The money supply in the hands of the public in

1952-53 is equal to 16.3% of the value of the nation's output. The table indicates a minimum increase in this percentage to 19.5% in 1955-56 and a maximum increase to 22.2% in 1956-57. What can be said of the effect of these ratios?

Per capita income will rise rapidly during the next several years. As it does, people will find it desirable and possible to keep more money on hand, and an increased ratio of the money supply in private hands to the value of output is necessary to meet this desire. It is not possible at this time to forecast with confidence how great the increase should be. An increase in the ratio to 19.5% by 1955-56 would probably merely provide a desirable stimulus to output, whereas an increase to 22.2% by the following year might cause excessive spending and inflationary pressures.

These facts lead to a very important conclusion. An excessive increase in money supply could be prevented by increasing revenue rates so that a larger share of expenditures is covered by revenues; it might be prevented by allowing slight price rises in domestic goods to stimulate imports. If the increases in per capita income find their outlet in increased imports there will be little or no inflationary pressure. The tax increase may or may not be necessary. If the forecasts presented in this chapter are valid, and if non-capital expenditures are held within the limits indicated, it is entirely possible that Burma can carry out her entire development program without any increase in her present tax rates. But it is only possible, not certain. Revenues imposed by the present tax

TABLE III - 13

TREND IN THE MONEY SUPPLY IN THE HANDS OF THE PUBLIC

(millions of kyats)

Year	Change Due to Government Domestic Transactions (from Table III 11)	Change Due to Foreign Exchange Transactions (from Table III-12)	Total Change during the Year	Total Money Supply in Hands of the Public		Gross Domestic Product	Per cent of Money Supply of Gross Domestic Product
				End of Year	Average during Year		
1952 53	120	+110	200*	859	759	4,650	16.3
1953 54	123 173	- 9	114-164	973-1,023	916- 941	5,200	17.6-18.1
1954-55	184-234	- 42	142 192	1,115 1,215	1,044 1,119	5,550	18.8 20.2
1955-56	170 220	- 86	84-134	1,199 1,349	1,157-1,282	5,950	19.5-21.6
1956-57	123-173	75	48- 98	1,247 1,447	1,223-1,398	6,300	19.4-22.2
1957 58	48- 98	78	(30) (+20)	1,217 1,467	1,232-1,457	6,600	18.7-22.1
1958 59	3- 53	- 72	(-69) (-19)	1,148 1,448	1,183-1,458	6,800	17.4-21.4
1959-60	(-49)-(+1)	- 31	(-80) (30)	1,068 1,418	1,108-1,433	7,000	15.8 20.4

*Net decrease in commercial bank credit of K30 million is reflected in this figure.

system may prove not to be adequate, and to carry out the program without inflation it may be necessary for the Government to prepare in a year or two to stiffen its tax structure, presumably by raising the rates of some existing tax measures.

The indicated decline in the money supply in the hands of the public in the last years of the decade, as now projected, reflects a failure of capital formation expenditures within Burma in those years as projected to equal total government plus private saving within Burma during those years. This, if it occurred, would be deflationary. However, the precise trend of events five or six years in the future is so uncertain that it would be absurd to assume that the precise turn of developments now projected for that period has significance for future policy. If, for example, government projects are not executed as rapidly as now programmed, the pattern of expenditures from year to year will change even if the total for the seven-year period should not.

D. CONCLUSIONS

What is the significance of these forecasts?

The first fact which must be noted in assessing their significance is the margin of uncertainty in them. They assume certain things about the future and forecast others. They assume that the development program will be carried out as scheduled. They also assume that current government expenditures will be held to K700 million per year. They forecast the amount by which government revenues will increase under present revenue laws. They forecast also the value of exports, the value of imports and other foreign exchange payments, and the level of saving by firms and individuals as income rises.

The actual magnitude of all the data which are assumed or forecast may differ appreciably from the estimates presented. As a consequence, the conclusions drawn may require considerable modification

as the development program progresses. In these circumstances, what is their usefulness?

(1) In general, they indicate the feasibility of allocating to the development program enough resources to carry it out. With regard to foreign exchange, they indicate that in spite of any probable future development, it will be possible to finance all foreign purchases necessary to carry out the development program. With regard to domestic expenditures, they indicate that the program is neither markedly too large nor markedly below the economic capacity of the country. No radical discrepancy exists between the magnitude of the program and the magnitude of the resources which will be available under present measures. New revenue measures or other fiscal measures may or may not be necessary to obtain sufficient reserves to finance the program. If they are, only moderate changes in present measures will be necessary.

(2) The forecasts indicate that for the immediate future the problem is one of organizing with maximum speed the administration and management of sound development projects. There need be no financial limitations on immediate expansion of the development program.

(3) The forecasts indicate the nature of the conditions and trends which must be watched. A development program as comprehensive as the one on which Burma is now entering requires equally comprehensive planning of economic policies. If such comprehensive policy planning is to be performed intelligently, it must be based on analysis not merely of the Government's budget but of the factors which are discussed in the present chapter.

While future trends are not fully certain, they are sufficiently clear to indicate the policy measures which must be taken now and those which must be planned for adoption if necessary. Chapter IV deals specifically with these questions of central economic policy.

CHAPTER IV

CENTRAL ECONOMIC POLICIES FOR THE PROGRAM

A. INTRODUCTION

The successful implementation of the development plan will not depend wholly upon sound design of individual projects and programs and effective arrangements for their execution and operation. It will depend in considerable measure also on the formulation and execution of appropriate economic policies to facilitate the balanced expansion of economic activity. This chapter examines major policy issues in the fields of fiscal, banking and foreign exchange and foreign trade policy.

On the assumptions of no general world war, continued rapid improvement in civil order within Burma, and effective prosecution of the development program, the preceding chapter arrives at the following economic forecasts:

(1) Production in Burma will increase rapidly throughout the remainder of this decade—more rapidly during the first half of the period than thereafter.

(2) Burma's exports, especially of rice, will increase rapidly. Their value will probably be adequate to finance all imports and other expenditures abroad, even if restrictions on imports from non-dollar areas are completely removed.

(3) During the next one or two years there will continue to be slack and underemployment in the country in spite of increasing output. At some time thereafter, however, as output approaches the economy's capacity, the economy will probably become tight.

This third development merits further description. As security conditions continue to improve, additional workers will be able to return to cultivation and other village pursuits. This together with an expansion of governmental and private investment will gradually absorb underemployed workers. Shortages of some types of labor and of some materials will appear. If administrative problems and problems of technical and skilled personnel can be overcome, total developmental expenditures will reach a level which will bring fairly general tightness of supply of labor and of commodities. The process if it occurs will be gradual, with specific shortages and bottlenecks emerging in growing numbers. As shortages become common in many sectors of the economy, progress in solving particular problems will no longer be enough. The problem of *general* shortages must be met by measures which will curtail total expenditures

in the country or divert them to expenditures abroad. The Government's revenue, expenditure, and banking policies must be altered to accomplish this effect.

Policies concerning foreign exchange and foreign trade which will be advantageous can be stated at this time, subject of course to modification if major unforeseen changes occur. The precise development of domestic conditions is sufficiently uncertain, however, that the situation must be reviewed from year to year, and policies modified if developing conditions warrant. Anti-deflationary policies should be vigorously prosecuted now. The timing of appropriate changes will depend in some degree upon price trends in Burma and abroad, but mainly on year-to-year trends in governmental expenditures (developmental and other), private capital expenditures, and the country's productive capacity.

This chapter discusses appropriate policies and the principles which must govern policy. Following a section outlining the improvement in information which is needed for effective policy control, succeeding sections discuss fiscal, tax, banking and foreign exchange and foreign trade policies.

B. IMPROVEMENT IN FISCAL INFORMATION

The annual budget document of the Union Government presents a (still somewhat imperfect) classification of budget expenditures into current and capital and a corresponding division of receipts. Appended Ways and Means Accounts trace in varying detail the sources and uses of all funds handled by government agencies. Supplementary tables detail the activities of important agencies. If the governments of the world were listed according to the degree of information conveyed in their annual budgets, Burma would certainly rank in the top third of the list. However, if Burma is to manage effectively as comprehensive a development program as she is now undertaking, she needs still better fiscal information to guide her policies.

1. A BUDGET INCLUDING ALL AGENCIES AND FUNDS

What is needed is not merely more or more-detailed information of the sort now presented, but a broader budget concept. Chapter III has noted that with the expansion and diversification in recent years of the functions of the Union Government, an increasing number of state enterprises and other

government agencies operate outside the framework of the main budget accounts. As a result, the information conveyed in the budget concerning the effects of government financial operations upon the economic system is increasingly inadequate.

For analysis of the effects of its operations in stimulating or restraining incomes and expenditures in the economy as a whole, the Government must have an annual record which includes every government agency, and which shows on the one hand total receipts from the public by the treasury plus all government agencies in combination, and on the other hand the capital disbursements of all the government agencies. Receipts in these inclusive accounts must include any revenues of enterprises allocated to reserve accounts as well as net profits, so that the total net inflow of cash from the public to the enterprises is recorded. All cash receipts of miscellaneous "funds" or accounts will be included. Transfers of funds from the general government account to state boards or corporations, which are not disbursed to the public, will be stricken from the record of disbursements. They are red herrings; they appear to be disbursements of funds, but are not.

Such a record of cash flows between the public and all government agencies taken as a group, divided between expenditures and receipts at home and those abroad and classified to permit analysis of their nature and their probable trend, is known in modern fiscal accounting as a "cash consolidated budget." To guide her economic policies, Burma must develop such a set of accounts.

While the present Ways and Means Accounts in principle deal with all receipts and disbursements of money by all agencies, in fact the data presented are inadequate for analysis. In many cases a budgeted transfer of funds from the general government account to a state enterprise or corporation is treated as a cash outflow, without analysis of whether it will in fact be disbursed. For some agencies only capital transfers—loans or repayments—between the treasury and the agency are specifically recorded; cash receipts or disbursements from or to the public are lumped in a catch-all account, "other deposits." For some agencies, only the unanalyzed record of cash receipts or disbursements is recorded, without indication whether receipts are net profits or unspent allocations to reserve accounts, and whether disbursements are losses or disbursements for the purchase or construction of capital facilities.

2. FOREIGN EXCHANGE TRANSACTIONS

Further, the usefulness of the present budget for fiscal analysis is limited by the incomplete separation

of payments abroad from other expenditures. Even within the main budget accounts, not all expenditures abroad are separated from total expenditures; only sterling expenditures are distinguished, other expenditures abroad being indistinguishable from disbursements within Burma. For agencies which operate outside the framework of the budget, no separation whatever between domestic and foreign transactions is made. Officials endeavoring to judge the nature of the Government's foreign exchange expenditures, and hence their probable magnitude in the future, are forced to resort to estimates and pieces of information obtained from individual agencies.

Present budget practice with regard to foreign exchange expenditures presumably derives from a time before the war when all foreign expenditures were made in sterling, and a record of sterling expenditures or an estimate of them for the coming year was in fact a record or estimate of all foreign exchange disbursements. In present circumstances the practice has little usefulness. The Ministry of Finance, recognizing the obsolete nature of present procedure, is arranging to obtain in future years from all agencies whose records appear in the main budget accounts a separation of foreign exchange and other expenditures. This will, however, not permit analysis of other agencies.

Estimates of past and prospective government financial operations which are incorporated in the tables of Chapter III are based upon a painstaking attempt to estimate data of the sort which would appear in a cash consolidated budget. Some of the estimates are undoubtedly in error because of inability to obtain accurate information; furthermore, it would not be feasible for the Government annually to go through this item-by-item process of obtaining information or estimates for this specific purpose. For the annual budgeting required, improved procedures must be established.

3. PROMPT BANKING REPORTING

Budget information, to be most useful, must be available much more promptly than has been the case in recent years. Even though the budget accounts are on a cash basis, so that accounts are presumably closed by each disbursing or receiving officer promptly at the end of each fiscal year, the delay in assembling the information is such that it has not been possible in recent years for the budget presented to Parliament each autumn to show the record of receipts and disbursements for the year which ended ten months earlier. The most recent information presented is that for the year which ended twenty-two months before the presentation of the budget document. The delay, originally caused by

disturbance to normal procedures arising from war and insurrection, has persisted. The usefulness of the budget as an indication either of the financial position of the Government or of trends in receipts or expenditure items is thereby greatly impaired.

As in the case of foreign exchange transactions, the officials of the Ministry of Finance and Revenue and the Auditor-General are aware of the unsatisfactory nature of this delay in accounting, and are striving to obtain agency records for more recent periods. Unpublished accounts now available show a reasonably complete record of budget receipts and disbursements for the year which ended ten months ago; it is to be hoped that by next year the records will be in such shape that it will be feasible to publish in the annual budget document accounts for a period one year closer to the date of presentation than is now the case.

4. EXPENDITURE ESTIMATES AND EXPENDITURE AUTHORIZATIONS

Quite apart from the deficiency in scope and lack of timeliness of the budget accounts, they suffer from inaccurate estimating of each coming year's expenditures.

However ideal conceptually the budgeting framework might be, budget estimates for each coming year will not be an efficient guide to action unless they are roughly accurate. An exaggerated estimate of total budget expenditures for a coming year, for example by estimating expenditures which in fact can be accomplished only over two or three years, distorts the entire analysis of budget requirements and of the economic effects of the expenditure programs. Within the total decided on as feasible, excessive estimates by one agency, if incorporated at face value, force unnecessary cuts in the funds allocated elsewhere, may retard other programs, or may cause improper and harmful revenue action to meet an expenditure total which will in fact not occur. The narrower the margin becomes between production and capacity in the economy, the more important will be the margin of inaccuracy in budgeting.

In recent years, budgeting by the Union Government has contained large errors of estimate. This is not due merely to careless or reckless budgeting by the officials concerned. In part the errors are inevitable in a period of changing and especially of rapidly expanding programs of expenditure because estimates of rates of increase in connection with such changes are subject to large margins of error.

But in part the errors are due to the method of presenting the budgeting estimates: to the fact that the forecasts of expenditures for each project serve as the legal authorization for the expenditure. The

budget estimate for each project for the coming year is at the same time the forecast of the amount of expenditure for which financing must be provided, and the legal ceiling on the amount which the agency may spend for the purpose.

So ingrained is this procedure in Burma (and in a number of other countries) that some Burmese officials with whom the matter has been discussed have found it difficult to visualize clearly that any other mode of presentation is possible. Actually a change would be simple to make, and would improve greatly the usefulness of the budget. The reason why the amount set as the legally permissible expenditure is often a bad estimate of the amount which will actually be spent is this:

When a new program of any size is initiated, it is literally impossible to estimate accurately how fast it can be implemented. If it is a capital project requiring complex engineering design, neither the time when the design can be obtained, nor the time required to obtain tenders for construction and to award a contract, nor the time for construction can be accurately estimated. The time required for receipt of equipment or materials obtainable only from abroad is subject to variations beyond the control of the procuring agency. Whether a given step in the procedure is completed and the next one begun two months before or one week after the end of the coming fiscal year cannot possibly be foretold, but may make a difference of one hundred per cent or one thousand per cent in the amount which can efficiently be expended during the year. If the project is one requiring only simple engineering work, some but by no means all of the uncertainties of timing are eliminated. Even if it merely requires rapid expansion of a staff of specialized workers, a wide range of uncertainty in the speed with which this can be done is inevitable.

In these circumstances, if the maximum possible progress is desirable, it is necessary and proper that the agency shall request, the government budget reflect, and Parliament grant, not merely the amount of funds which is the best single guess concerning the amount which will be spent, but the much larger amount which it may be possible to spend efficiently. If because of budget procedures this large amount then serves as the estimate of actual expenditures, and if there is a number of such expanding programs in the budget, the budget estimate of total expenditures will necessarily be considerably in excess of the total which expenditures will actually reach. The remedy is not to reduce each estimate to the level of the single best guess of actual expenditures. The result of this procedure would be that many projects will be held below the rate of progress which,

as the facts later show, they could have attained. The possibility of a supplementary appropriation at the spring session of Parliament is not a solution to this problem, for if only a "most probable" estimate is presented, programs which develop favorably may be legally handicapped in making desirable expenditures and entering into contractual obligations for the balance of the year, long before the spring session of Parliament meets.

The most effective remedy for this situation is one which has been regarded as a startling departure from established practice by some persons in Burma with whom it has been discussed, but which in reality is quite simple. The budget estimates for the coming year for each expanding program should be presented in two columns. One would present the expenditure *authorization*, the other the expenditure *estimate*. The expenditure authorization would set the legal ceiling to the expenditure. The expenditure estimate would present the best single estimate of the probable expenditure during the year. The sum of the expenditure estimates would be the total for which financing is planned. The total of expenditure authorizations for a number of new projects or expanding programs might be greatly in excess of the total of the expenditure estimates. Though for any one project the expenditure estimate, like any forecast in the circumstances, may be considerably in error, the total of ten such expenditure estimates is almost certain to be far closer to the later actuals than the total of ten estimates under the present method, or the total of ten expenditure authorizations.

A capital budget whose expenditure authorization properly totaled K500 million might conceivably have expenditure estimates totaling only K350 million. The latter total could be expected to be a far better estimate of total budget expenditures; yet if any one of the authorizations were reduced, it might retard a program which could otherwise go ahead rapidly.

Until some change is adopted which accomplishes the effect of the proposal above (which is the method of budget presentation used by the Government of the United States), it will be necessary for the Ministry of National Planning and the Economic and Social Board, if they are to plan effectively, to disregard the estimate of expenditures formally presented in the annual budget, and to make their own more realistic estimates of expenditures during the year.

C. FISCAL POLICY: THE LEVEL OF CURRENT EXPENDITURES

The rise in defense expenditures in recent years has overshadowed other budget trends, but non-defense expenditures for current purposes have also been increasing steadily. Their rise has resulted from

the expansion of government activity in general but especially from the expansion of government programs for social welfare.

Expenditures for capital formation by their nature terminate when the project is completed; but a current program, once enlarged, requires increased expenditures in every subsequent year. Further, small initial expenditure on a new current program may commit the Government to increasing expenditures in subsequent years to develop the program to its full scale. Thus the current expenditure budget may develop a momentum of its own if the future consequences are not fully analyzed when small-scale initiation of new programs is undertaken.

The current expenditure sector of the Union Government budget has acquired such momentum that its size in future years, unless controlled with a view to the later expenditures involved in programs introduced in any year, may threaten the successful execution of the development program.

The social welfare programs, justifiable though each is in its own right, call for thorough appraisal because of the tendency of each to expand in this way. Health, housing, labor and other welfare programs, in addition to having their own immediate merits and justifications, contribute to other developmental programs but also compete for finance and manpower with them. Healthier and better educated workers are more productive workers. Too great expenditure on a large supply of complex machinery at the expense of schools and hospitals may mean that healthy and trained people will not be available to run the machines. However, if the welfare programs are expanded to a size which forces curtailment of expenditures for the more direct increase in the nation's productivity, they may, paradoxically, depress the nation's standard of living by preventing the execution of other programs which would raise it. Better housing for one worker may mean poorer equipment for another; shorter hours for one may mean higher cost of products bought for the other, and so on. This element of choice and balance must always be present in decisions concerning welfare programs if the nation's long-run welfare is to be most effectively advanced.

The balance between current and capital expenditures, and among specific programs within the current and capital budgets, must be decided only after complete examination of each. It would be foolish to propose any specific ceiling as the absolute limit beyond which current expenditures must not go, and to which they may safely expand. Yet it is obvious from the analysis presented in Chapter III that if the development program is to be carried out fully, current expenditures will need to be restrained, or

alternatively, revenue rates must be sharply increased in future years to finance the added expenditures. It is therefore suggested that to establish a point of departure for budget control, K450 million per year, or about K50 million above the budgeted 1952-53 total, should be regarded as a ceiling during the period of the development program for current expenditures other than for defense, and that any advance of budgeted expenditures beyond this amount should occasion increasingly rigorous examination of them. It is believed that non-defense current expenditures will not reach this level in 1953-54 even though it may be budgeted, but if not they may reach or exceed it in the following year.

The momentum of programs under way will be a major obstacle in budget control, if budget evaluation looks only one year in the future. In receiving each request for funds for any new project or any increase in expenditures, the Ministry of Finance and Revenue should require the submitting agency to supply an accompanying estimate of the required expenditures for the ensuing three years. This should be the initial step in projecting the entire current expenditure section of the budget three years in advance. In analyzing new programs, it should be remembered however that a new program may merit an increase, even at the cost of reducing an existing one. Not all of the savings which may seem necessary should be in new programs.

In holding down current budget expenditures, it must not be overlooked that some programs which appear in the current rather than developmental budget are in fact among the most vital to the success of economic development. Among these are programs for technical education, mass adult education, education in skills, and "extension" work. The Government Technical Institute, the Artisan Training Center, the Rehabilitation Brigade, the technical colleges of the University of Rangoon, programs for training abroad, and new training programs now being planned, are examples. Among such vital expenditures are also salary increases to attract the best skilled and administrative workers; and programs to propagate improved methods in agriculture. It is believed that the rejection in recent years of proposals for pay increase for workers with selected skills in Government, and for administrators at the higher levels, will retard the development program. It is believed also that the refusal in recent years to grant budget funds for pay increases and for expansion of staff in the extension service of the Department of Agriculture is a grave economic error. Very few other developmental expenditures of equal size will bring as large results in increasing the nation's standard of living as expenditures to increase the

effectiveness of the agricultural extension service. This need is discussed at more length in Chapter VIII, Agriculture. These current items should receive high priority not merely in the current budget, but also priority above all but the most urgent capital items. To curtail these programs in order to finance capital projects might indeed be to gain the appearance of technological progress and lose the substance.

Capital projects as well as current programs require advance programming. A small initial expenditure for, say, a hydroelectric project may commit the Government to rapidly increasing sums during the three ensuing years. However, capital projects are apt to be thought of as units and the advance programming done as a matter of course, whereas with respect to current programs it may be overlooked.

D. FISCAL POLICY: THE LEVEL OF TAXATION

Tax rates should not now be increased. The possible desirability of increasing revenue rates at some time in the future should not lead to tax increases now, when the economy needs stimulus rather than restraint.

It is highly desirable, however, to establish a commission now to study the problem of the nature of tax increases when and if such increases become necessary. When, at a future date, developmental expenditures do reach the level at which further increases will run into limitation of labor force and productive capacity, choice must then be made between limiting these expenditures or increasing tax rates so as to reduce private spending. Policy decisions to increase taxes must be predicated on full understanding of the economic impacts and incidence of different types of taxes. Both incentives and restraints can result from changes in tax rates. It is not too early to begin to prepare a tax program which will be available for implementation as changes in fiscal impacts are needed.

Sale of government securities to the public should be considered as a supplement rather than as an alternative to additional taxation. Though every effort to sell such securities should be made, their availability is not apt to reduce private expenditures greatly and is therefore not apt to be an effective substitute for a tax increase as a means of reducing excessive spending.

E. THE STRUCTURE OF THE REVENUE SYSTEM

1. TAX POLICY VERSUS FISCAL POLICY

The foregoing section relating to fiscal policy has treated the problem of when to increase or to decrease the total tax burden. Quite apart from this question, there exists the question of the nature of the taxes

which make up that burden. Is the best combination of taxes, and the best schedule for each tax, being used to obtain the necessary total revenue? This question will become more important at the stage of execution of the economic development program when resources are more fully used and the Government needs to gain the maximum results from its tax system.

The three most important characteristics of the tax system will be its equity, the degree to which it brings in added revenue as national income rises and more revenue is needed for the expanding development program, and the degree to which it stimulates or impairs the incentive to produce.

2. THE REVENUE SYSTEM, PREWAR AND POSTWAR

Table IV-1 presents revenue data for 1938-39 and 1951-52. The 1951-52 data, except for the profits of state enterprises, are revised budget estimates. They are believed to be approximately the actual receipts. It is important to note that the 1951-52 data include not merely budget receipts (both current and capital) but in addition total estimated profits of state enterprises. Whereas those profits are estimated at K370 million, only K210 million appeared in the budget as revenues, the remainder being retained by the agencies earning them. The data presented are thus more comprehensive in concept than budget revenue data and give a more accurate picture of the economic impact of revenues.

TABLE IV - 1

GOVERNMENTAL RECEIPTS, CLASSIFIED BY TYPE, AND INCLUDING ESTIMATED NET INCOME OF GOVERNMENTAL ENTERPRISES

Type of Revenue	Millions of Kyats		Per cent of Total	
	1938-39	1951-52 (Rev. Est.)	1938-39	1951-52 (Rev. Est.)
Land Revenue	54.2	21.5	33.0	2.6
Profits of State Enterprises (est.)	—	370.0	—	45.6
Customs	36.4	193.0	22.2	23.8
Excises and Excise Duties	23.0	34.8	14.0	4.3
Sales Tax	—	23.0	—	2.8
Taxes on Income	19.1	44.5	11.6	5.5
Other Taxes	5.7	24.1	3.4	3.0
Forest Revenue	14.3	13.0	8.7	1.6
Other Revenue	11.6	88.1*	7.1	10.8
Total	164.3	812.0	100.0	100.0
Gross Domestic Income	1,460	4,116		

*Excludes non-cash transfer of K30 million from the International Monetary Fund, matched by an equal non-cash payment to the Fund, the two together canceling out.

The major source of revenue at present is profit from state enterprises, predominantly profit from the State Agricultural Marketing Board on exports of rice. Together with land revenue, this made up almost 48% of total receipts in 1951-52. Commodity taxes—customs, excises, excise duties, and sales tax—yielded an added 31%. "Excise duties" is a term applied to all excises other than those on alcoholic beverages and dangerous drugs. Minor indirect taxes yielded 3%. In descending order of importance, these are state lottery, betting taxes, stamp taxes, entertainment tax, business premises tax, hotel and restaurant tax, motor vehicle taxes and document registration fees. Taxes on corporate and individual incomes produced between 5% and 6% of total receipts. Various non-tax revenues make up the remaining 12.4%. Chief among them are interest receipts on government loans, the gross revenues of the posts and telegraphs department and import license fees. Interest receipts are mainly an intra-governmental transfer, two thirds of the total consisting of interest on the loan to Burma Railways.

Two major changes in the tax system occurred during 1952 and 1953. One was abolition in 1952 of the turnover tax and substitution of a selective single-point sales tax collectible at import or point of production, with schedules of 5%, 10%, and 15% respectively on three schedules of covered goods. This change improves the equity of the tax as between different traders by eliminating the previous large-scale evasion, and also improves its equity as between different classes of buyers by introducing progressivity of rates. Basic "cost-of-living" goods are exempted altogether. Luxury goods bear the highest rates.

The other major change, which will be effective on October 1, 1953, is abolition of preferential tariff rates. This may not result in major change in the total burden of customs duties. Following notification in March, 1953, that preferential tariff agreements with Britain, India and Pakistan would be terminated effective on September 30, 1953, the Government has been considering the tariff rates to be adopted effective on October 1. The degree of preference which has been granted and the importance of the decision being made are demonstrated by a study of customs revenues for a recent three months' period, December, 1952, to February, 1953. The results are tabulated overleaf.

They indicate that revenues would have been increased by 42% if the present standard rates had been paid on the same imports, and decreased by 31% if the present preferential rates applying to the largest quantity of imports had been paid. The actual imposition of the rates indicated would of course not have produced these precise results, since the

pattern of imports would have shifted, but the calculations show the importance of the decisions being made. Adoption of rates at intermediate levels might of course leave the average burden of customs at approximately the present level.

	(K million)	(Per cent Change from Actual Revenue)
Actual customs revenue	41.6	
Estimated revenue at prevailing standard rates	59.3	+ 42
Estimated revenue if all rates were reduced to the level of the preferential rate applying to the largest quantity of imports	28.6	-31

Less important tax changes were simplifications of the hotel and restaurant tax and abolition of the business premises tax, which had been adopted in 1949 as an emergency revenue measure.

3. THE REVENUE BURDEN, PREWAR AND POSTWAR

Total governmental receipts in 1951-52 were a considerably larger percentage of gross domestic product than in 1938-39. Profits from rice exports are properly to be regarded as in large part windfall gains at the expense of foreign buyers, resulting from the inflated world price of rice, which had risen to more than ten times the 1938-39 level, or more than twice the rise in the price level within Burma.

If paddy prices had been permitted to rise in the same ratio as the average of other prices, they would now be at say K450 per 100 baskets instead of K300. The profit margin on exports obtained by SAMB by holding paddy prices below this figure may be

TABLE IV - 2

RATIO OF EACH TYPE OF REVENUE TO GROSS DOMESTIC INCOME 1938-39 and 1951-52

	1938-39	1951 52
Land Revenue	3.7	.5
Profits of all State Enterprises (est.)		
Total	0	9.0
Share regarded as tax burden (250)	0	6.0
Customs	2.5	4.6
Excises and Excise Duties	1.6	.8
Sales Tax	0	.6
Taxes on Income	1.3	1.0
Other Taxes	.4	.6
Forest Revenue	1.0	.3
Other Revenue	.8	2.1
Total Revenue, Adjusted*	11.3	16.5

*For 1951-52 includes only K250 million of SAMB profits, the share regarded as part of the tax burden.

regarded as a tax burden; the remainder of its profits should be regarded as a windfall gain at foreign expense (though they are at the expense of cultivators or landowners in the sense that control of the price of paddy prevents the windfall from being passed on to them).

On this basis about K250 million of the 1951-52 profits of SAMB should be regarded as a tax burden. Remaining profits may be regarded as windfall gain.

Table IV-2 indicates the composition or character of tax burden in 1938-39 and 1951-52 by showing the percentage which each type of revenue bore in each of the two years to the gross income of Burma. The gross domestic income was K1,460 million in 1938-39 and K4,116 million in 1951-52.

The data indicate that even on the adjusted basis the total tax burden in 1951-52 was about the same as in 1938-39. The greater postwar burden of customs, and of land revenue plus rice exports profits as against prewar land revenue alone, is offset only in part by the reduced burden of internal commodity taxes, income tax, and forest revenue. Miscellaneous revenue is also up sharply. The ratio of government receipts to the country's gross income will probably not decline as income rises. Land revenue is now only partially collected; its burden, though it will remain small, will increase as civil order is fully restored. When security permits revival of forest extraction, forest revenue will also rise sharply. The decline in income tax revenue as a percentage of aggregate income has occurred in spite of a stiff increase in income tax rate since prewar. It is probable both that enforcement is less effective now and that it can be improved. Income tax liability should rise relatively to national income as national income rises. As rice production and exports rise, rice exports profits allocable as part of the tax burden will probably be an appreciably higher percentage of national income than prewar, when output, income, and tax enforcement have become more normal. This is as it should be if the revenue system is to contribute appropriately to the financing of the development program.

4. EQUITY: PROGRESSIVENESS OF THE TAX SYSTEM

The revenue system cannot yield the necessary amount of total revenue without imposing burdens on all of the people. It is important that in doing so it bear most heavily on those most able to pay, i.e., that it be "progressive." The present system has a progressive nature, because of the income tax and the selective nature of commodity taxes, which cause them to bear most heavily on goods purchased by higher income groups.

Three postwar tax changes have tended to affect

this progressivity, namely, the substitution of rice export profits for land revenue as the dominant revenue source, together with the imposition of legal limitation on the rates for agricultural land; the reduction in importance of excises and excise duties on widely used commodities and substitution of the graduated sales tax; and a sharp (and probably excessive) increase in the progressivity of income tax rates.

The influence of present paddy policy and rent restriction on the progressivity of the revenue system is mixed. In combination, their influence on the net income of cultivators and farm laborers, considered as groups, is about the same as the effect of prewar land rental and land revenue rates. While price control has reduced the return to the paddy grower, relative to other prices, a very large percentage reduction in rental costs brought about by rent restriction has reduced his expenses. The income of landowners has been reduced by rent restrictions to a fraction in typical cases one sixth to one tenth—of its prewar purchasing power. Urban purchasers of rice benefit from the low rice price. Since before the war cultivators and agricultural laborers had the lowest income of the three groups and most landowners the highest, these changes reduce income differences between landowners and the other two groups but increase the difference between rural workers and cultivators on the one hand and urban workers on the other.

In the interest of equity between individuals and between groups, certain changes should be made in the tax laws. One example of such a change in the income tax is the substitution (if administrable) of allowances for wife (or husband), children and other dependents, in place of the present K3,500 minimum income rule.* Another example is change in the taxation of dividends. Company profits are subject to the company income tax; dividends are thereupon exempt from the personal income tax. They might better be taxed as personal income, with credit for tax paid by the company. This change would be feasible, however, only if the progressiveness of the upper-bracket individual income tax rates is reduced. These rates are discussed below in relation to the incentive to produce.

In the interest of equity between groups as well as of a rational tax structure, reconciliation of the present schedules of customs, sales, and excise taxes, and of licensing provisions should be undertaken. Present customs schedules are presumably based

*Though the tax schedule provides for taxation of all income above K600 per year, a separate provision designed to prevent hardship to low income individuals provides that no tax shall be paid unless the income is in excess of K3,500. The tax is identical regardless of number of dependents.

primarily on two considerations: ability to pay, with goods used mainly by higher income groups being dutiable at a higher rate; and admitting without heavy duty those items which enter into the cost of producing goods within Burma. (Other principles are of course applicable in specific cases.) The sales tax schedules are presumably based on the same principles, as are also decisions concerning the severity of license restrictions. Yet differentiations in sales rates between various goods are in a number of cases directly inconsistent with those in the customs schedules, tending to reverse and narrow the margin which the customs schedules establish, rather than reinforcing them. Again, in the cases of some goods taxed by customs and sales tax at low rates, because regarded as non-luxury items, import license restrictions so hold down the supply as to boost the domestic price sharply, thus being the equivalent of high protective customs or sales tax rates. However, the benefit accrues to the importer and not to the Government. Some excise duties on alcoholic beverages are heavier than the import duties on competing liquors. These various anomalies should be investigated and corrected in order that the indirect taxes as a group will impose a relative burden on various groups which is the planned and equitable result of those taxes as a group.

These comments present major examples rather than an exhaustive list of matters of equity which should be considered. The tax structure has been changed rapidly during postwar years. Various inconsistencies and inequities are bound to arise during such a period of change. A comprehensive study to eliminate them is advisable.

5. RESPONSE OF REVENUE TO INCREASE IN OUTPUT AND INCOME

It has been noted that governmental revenues must be increased as the development program gathers full speed. The greater the extent to which the revenue system automatically yields such an increase as output and income rise the less is the need for changes in revenues rates. In principle, Burma's revenue system scores well in this respect. Aggregate revenues from within Burma will probably rise somewhat faster than national income, as output increases. As noted above, land revenue will increase markedly as security improves. Forest revenue will increase with forest output, which is now very low. Revenue from customs, excises, excise duties and sales tax will very probably increase by a slightly greater percentage than national income. Purchases of consumer goods will probably rise at least as rapidly as national income, and in addition there

may be some tendency with increasing per capita income to shift to the consumption of the less essential items bearing higher rates of customs or sales tax. Finally, income tax liabilities will undoubtedly increase considerably more sharply than does national income. As national income rises, the incomes of many individuals will rise, making them liable to higher rates of tax. Further, as national income rises many companies now making small profits will make increased profits and be liable to correspondingly increased income tax.

Whether these increased tax liabilities will be converted into increased revenues will however depend on the effectiveness of tax administration. It is clear that there is considerable evasion of income tax at present. To obtain maximum increased revenue as income rises, definite steps to improve income tax administration are desirable. There is no evidence of laxness on the part of present enforcement staff. But the job of enforcement requires a larger and better equipped and trained staff. The Report of the Income Tax Administration Advisory Committee presents sound recommendations for enlargement of the income tax enforcement staff, provision of vastly improved equipment and improvement in training procedures. These recommendations should be adopted in full. They can and probably will result in increased tax yields far in excess of their cost.

In addition, it is recommended that the services of one or more tax enforcement experts be obtained for a limited period. The problems of income tax enforcement in Burma and other undeveloped countries are more acute than those of countries with more elaborate accounting and other records, but they are of the same nature. It should be possible to obtain the services of one or more experts who are experienced in the methods which tax evaders have used in countries which have had high individual and corporate income tax rates for many years and with the requirements and procedures which have been devised to checkmate them. Such experts should be able to make valuable suggestions to Burma's income tax enforcement staff.

One feature of Burma's income tax which has met with some objection from taxpayers should by all means be retained in the interest of maximizing revenue as income rises, namely, the advance payment provision. Its abolition would in effect mean forgiveness of a large part of one year's taxes, in that from the date of its abolition, taxes would forever after be due one year later than otherwise. The advance payment provision is a valuable aid in obtaining complete payment under any system of stiff income taxation. It is especially desirable when income is rising, for the increasing income should

be siphoned off as promptly as possible to have the maximum benefit in providing resources for a governmental development program. Further, it is relatively more enforceable. However, in fairness to those who are effectively taxed under this system, greater enforcement must be assured with respect to others who are not subject to the advance payment provision.

6. THE TAX SYSTEM AND INCENTIVE TO PRODUCE

The third important characteristic of a revenue system, in addition to equity and increase in revenue as income rises, is avoidance of interference with the incentive to produce. Burma's present income tax is not well designed in this respect. Various changes are needed.

One of these is related to the business profits tax. By this tax, which was introduced as an emergency revenue-raising measure, every individual, firm or company pays a tax of $16\frac{2}{3}\%$ of income arising as business profits, in addition to the other taxes on company or individual income. This provision is not in lieu of an allowance for earned income, i.e., income from personal services, for there is a separate allowance for that. It is an additional feature which sets profits off in contra-distinction to income from rents, interest on capital owned, and similar matters so that the man who uses his own funds in a productive venture retains one sixth less of the income from them than the man who acts as a money-lender or purchases property and rents its use to someone else. The law could hardly be more effectively devised to discourage productive ventures in favor of money-lending or landlordism. It should be repealed. If it is felt necessary to avoid a resulting loss of revenue, the rates of the individual or corporate income tax or of other taxes should be raised in compensation, thus leaving the total tax burden no greater, but eliminating the bias in favor of the rentier.

A second change desirable to increase incentive is to provide for the carry-forward of business losses in any year to any of the ensuing three or more years. By this provision, an individual, firm or company which sustains a loss in one year may subtract it from a profit in an ensuing year (within the term of years specified) in calculating its taxable profit for each year. For example, under present law a company which sustains a loss of K10,000 in one year and gains a profit of K10,000 in the next year must pay K5,000 tax on the profit, thus paying K5,000 in income tax even though its net income combined is zero and, in fact, on an after-tax basis, it suffers a loss. If carry-forward of loss were permitted, the company might subtract the K10,000 loss from

the K10,000 profit and pay no tax. Such a provision, which permits a company or individual or firm to pay tax on its true net income over a period of years, rather than on each year's record separately, is especially valuable for new businesses, since losses are often to be expected during the first years of a business venture, and the right to set them off against possible later profits will be one of the determinants in deciding initially whether to undertake the venture.

A third desirable change is reduction in the progressiveness of the upper brackets of the income tax on individuals.

Any new employment-creating venture involves risks; if the tax schedule provides a scale of rates which rises too sharply, the increase in income which may be retained if increased income is earned is not worth the additional risk, and the venture is discouraged.

This feature of a progressive income tax must always be balanced against the prime advantage and reason for progressivity, namely heavier taxation where there is greater ability to pay, for the sake of equity. The balance of rates which is held to place no intolerable bar in the way of incentive, while yet yielding equity, must be decided by each society in the light of its own standards of income and reasonable goals of personal attainment and its own need for productive enterprise.

The present ordinary plus super-tax rates on individuals or unincorporated firms in Burma rise so sharply that they seriously reduce incentive. Modification of them may increase rather than reduce tax revenue. Yields in the upper brackets of the income tax are in any case rather small, because of the relatively few individuals who have sufficient income to be liable to the upper-bracket rates; and modification which increased the incentive to increase income might enlarge aggregate yields or at worst leave them unchanged.

Most persons in upper income brackets undoubtedly avoid the heavy upper-bracket tax rates by incorporating their businesses and receiving their income in the form of dividends, which are not subject to the individual income tax. Only if the upper-bracket rates are rendered much less progressive should the present treatment of dividends be altered. The two changes in combination would improve the equity of the tax system without unduly impairing its effect on incentives.

7. RE-APPRAISAL OF THE TAX STRUCTURE

The various suggestions made above for study of the tax system relate to two different purposes: (1) Determination of the most desirable method of increasing

total revenues, if the need for more revenue develops, and (2) improving the internal structure of the tax system, the various rate schedules and the relationship of various taxes to each other. It is recommended that an intensive and comprehensive analysis of both questions be undertaken. After proper tax principles have been formulated, specific tax measures should be spelled out. Top technical assistance should be secured for the study.

F. BANKING POLICY

1. IMPORTANCE OF THE COMMERCIAL BANKING SYSTEM

Credit expansion in Burma through the monetization of foreign exchange or through the sale of government or government-guaranteed securities to the Union Bank of Burma will be regulated, not by banking policies, but by decisions concerning fiscal policy. Banking policies as such will, however, limit the third source of credit expansion, that by commercial banks.

The consolidated balance sheet below indicates selected assets and liabilities, on December 26, 1952, of the 23 commercial banks then in operation in Burma.

TABLE IV - 3

CONSOLIDATED BALANCE SHEETS, COMMERCIAL BANKS, DECEMBER 26, 1952, SELECTED ITEMS

(kyats)	
<i>Liabilities</i>	
Deposits—Total	29,25,81,717
Demand—Total	24,36,63,677
Inter-bank	2,30,51,122
Other	22,06,12,555
Time Total	4,89,18,040
Inter-bank	28,644
Other	4,88,89,396
<i>Assets</i>	
Cash—Total	85,88,471
Notes	85,59,665
Coins	28,806
Balance with Union Bank	
Head Office	6,80,21,957
Branches and Treasury Agencies	26,60,026
Advances	14,62,96,175
Bills	45,15,714
Investments—Total	3,60,54,874
Government and government-guaranteed securities	2,51,78,098
Other	1,08,76,776

Their deposits constituted 35% of the money in circulation. Of their cash and earning assets 57.7% consisted of loans and advances, practically all

payable on demand; only 9.5% consisted of government securities, and only 4.1% of other securities. The bulk of their loans and advances relate to import or export trade and are typically secured either by foreign trade documents or by stocks of goods which are under lock and under guard in warehouses owned or controlled by the banks.

Since the date of this balance sheet, one added bank has been chartered. Of the 24 banks in existence at the end of June, 1953, 13 are branches of foreign banks; only 6 small ones are owned by Burmese nationals. Thirty-one banking offices are maintained by these banks; 22 are in Rangoon, 5 in other seaboard towns (Moulmein, Akyab and Tavoy) and 4 inland (in Mandalay, Maymyo and Taunggyi).

In any country, the part which commercial banks can properly play in financing economic development is limited by the fact that they cannot appropriately purchase either shares or industrial bonds and that their lending resources are of necessity limited. Because of the location, ownership and interest of the commercial banks of Burma, and because of the absence of developed credit institutions in the country in general, the present commercial banks of Burma will play an even smaller part during the coming decade in financing the country's economic development than may be the case in some other undeveloped countries, and would be the case in more developed countries.

Yet credit creation by the commercial banks can be large enough so that its regulation will be of importance. Table IV-4 indicates the advances and bills discounted by commercial banks at the annual high and low points since January, 1948. During the five-year period, the peak amount of loans and advances increased by 160%.

TABLE IV - 4

COMMERCIAL BANK BILLS AND ADVANCES,
ANNUAL HIGH AND LOW POINTS, FEBRUARY
1948 to JUNE 1953

(millions of kyats)

<i>End of</i>	<i>Advances plus Bills Discounted</i>
February, 1948	81.3
November, 1948	51.1
January, 1949	86.9
November, 1949	44.5
April, 1950	117.6
October, 1950	88.1
February, 1951	179.9
September, 1951	135.8
February, 1952	203.3
October, 1952	130.1
January, 1953	211.1
June, 1953	130.2*

*Most recent date available. Probably not the seasonal low, which usually occurs later in the year.

There is some evidence that the February, 1952, peak would have been higher if the banks had had greater financial resources. The central banking legislation in effect at the time made it impossible for the Union Bank to extend credit to the commercial banks. In June, 1953, bills and advances outstanding were only K1 million above the 1952 low level; it may fall much below it during the autumn months, because of the increased amount of money injected into circulation during the year by government disbursements and SAMB rice purchases.

2. CENTRAL BANK CREDIT CONTROL

The changes illustrate the large credit swings which might occur in the future, if not regulated. It is important that the expansion or contraction of commercial bank credit be regulated, so that it will reinforce rather than counteract governmental policies designed to coordinate economic activity of the country during the development program.

Under the 1952 Act, the Union Bank of Burma has adequate power both to regulate and to assist the commercial banks of the country. Its power of control over foreign exchange transactions, and the power granted in the 1952 Act to fix the share of the assets of a Burmese branch of a foreign bank which must be employed in Burma, give the Union Bank as effective control over a branch as over an indigenous bank. The high level of competence of Union Bank management to date suggests that credit regulation will be effectively carried out.

For the control of credit expansion, the fundamental regulatory power can best be exercised by varying from time to time the reserve which scheduled banks must keep on deposit in the Union Bank. At the present time, the requirement is set at 8% of the demand deposits liabilities plus 3% of the time deposits of each scheduled bank. These low reserve requirements make it possible for the commercial banks to extend additional loans at their discretion. This is the appropriate policy for a period of economic slackness. Unfortunately, the Union Bank can only set the stage for such credit expansion; its action may be completely ineffective in terms of precipitating credit expansion.

On the other hand, Union Bank restriction on commercial bank credit can be an absolute bar to undue expansion. At a later date, if tightness appears in the economy, it will be appropriate to increase reserve requirements. A moderate increase can retard the rate of increase by commercial banks in their loans and advances; a greater increase in reserve requirements can completely check loan expansion, or even in the extreme case force reduction in the volume of loans outstanding.

Loan expansion results in corresponding increase in the money supply in circulation; restriction of it, by restricting private business expenditures, can check the demand for labor and commodities and so prevent scarcities and inflationary pressures. Stated in another way, preventing loan expansion by commercial banks would limit private investment expenditures to the sums which can be obtained from current saving plus advances, if any, from governmental development corporations. By thus restricting the funds available for private investment, it would permit the execution of a larger public development program. This would not impose a severe restriction on private investment, for there is evidence that the firms of Burma save a considerable portion of their current income. These savings would be available for investment. Of course even this moderate degree of restriction may be undesirable. Commercial bank credit expansion, by facilitating an increased rate of private investment, will reduce the volume which the government must undertake to reach a given total goal. This may be the desirable policy. The appropriate agencies will have to formulate, in the light of circumstances and prospects at the time, projections of the appropriate volume of governmental and private investment respectively, and to recommend budget and banking policies consistent with this program. Through its relationship with the Ministry of Finance and Revenue and its representation on the Economic and Social Board, the Union Bank will share in such a decision.

In the past, funds to handle seasonal needs for increased credit have been provided in part by Burma branches of foreign banks by drawing on their home offices. Seasonal flexibility of the money supply is important, as Table IV-4 indicates, and inflow of funds from abroad to meet seasonal needs should be encouraged. To permit it without permitting other credit expansion, if the occasion should arise, will require skillful regulation. Some flexibility in foreign exchange rates, rather than direct quantitative control of the import of funds, may be desirable. The rigid relationship to the pound sterling which has prevailed in the past may not be desirable when foreign exchange regulation becomes a necessary part of domestic credit control.

The following paragraphs present the background significance, and desirable sources of action relating to the provision of adequate loan facilities in villages and rural communities.

3. VILLAGE FINANCE

The fact that the branches of large foreign banks in Rangoon are commonly known as "exchange banks" is testimony to the extent to which they have concentrated on the financing of foreign trade. In addition to the

financing of exports and imports, their business has consisted mainly in lending to the large foreign-owned companies engaged in the extraction of minerals or timber and in the 1920s in lending to the Chettyars. The Chettyars, in turn, using primarily their own capital but also some borrowed funds, financed agriculture, but not adequately. In considerable parts the business of the commercial banks has resembled a large-scale pawnshop business, in which they made loans against the physical possession of actual stocks, keeping the stocks under lock and key until the loans were repaid. Making crop or consumption loans to Burmese agriculturists or loans for current purposes to small indigenous industry would have required close supervision in the field and a knowledge of Burmese practices and enterprises which the banks were unable to acquire, or felt it unprofitable to acquire. With very few exceptions, notably Dawson's bank, the large western-type banks had no desire to enter this loan market.

The absence of commercial banks in most of the smaller cities and towns of Burma has undoubtedly a number of other causes: lack of capital among Burmese nationals and lack of the experience necessary to operate a commercial bank successfully; the great profitability of using one's capital for personal lending, as in sabape loans; the limited volume of potential banking business in smaller towns; lack of public acquaintance with commercial banking facilities and their advantages, as a result of which banking would perhaps not quickly have been profitable even in communities whose volume of business might seem on the surface to justify the establishment of a commercial bank.

The scarcity of capital in the villages at reasonable loan rates has created a vicious circle which has made it extremely difficult to improve agricultural practices, even if the necessary knowledge and incentive existed, and extremely difficult for an enterprising individual to climb the ladder from agricultural worker to renter to landowner. So rapidly does a debt increase, once usurious interest rates begin to be compounded, that one mishap such as the death of a yoke of oxen may start a landowner on an almost certain road to the loss of his land.

The absence of credit facilities and available capital has hampered the growth of indigenous industry and trade, both by preventing the increased use of a system of checks and other credit instruments and, more important, by depriving local businesses access to credit in necessary amounts and at reasonable interest rates. Because agriculture dominates the economy of Burma, it is obvious that conditions in the agricultural loan market determine the conditions in the market for loans to indigenous traders and small industry as well. Adequate organized sources of long-term or short-term capital loans for trade and small industry do not exist. The same exorbitant interest rates have interposed an often insuperable barrier to entry into operation or the expansion of a trading enterprise or a small industrial venture, even though the enterprise was sound under conditions of reasonable loan rates. Even the sabape loans have their counterpart in trade loans to cottage industries. For example, it

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TABLE IV - 5

GOVERNMENT LOANS TO SMALL-SCALE INDUSTRY

(kyats)

	1947 48	1948 49	1949 50	1950 51	1951 52	1952 53	1953-54
	<i>Loans to Weavers</i>						
Loans							
Budget Estimates	6,00,000	6,00,000	5,00,000	5,00,000	5,00,000	7,50,000	7,50,000
Actuals	1,96,074	1,16,324	2,85,112	5,01,424	4,11,846	3,00,000†	—
Repayments							
Budget Estimates	5,99,000	5,91,000	1,00,000	4,00,000	3,00,000	4,00,000	5,00,000
Actuals	3,12,044	58,246	52,509	1,00,569	2,19,230*	3,00,000†	—
	<i>Industrial Loans</i>						
Loans							
Budget Estimates	5,00,000	4,99,500	2,50,000	2,50,000	3,00,000	13,00,000	10,00,000
Actuals	1,30,154	80,650	25,705	51,372	82,434*	5,00,000†	—
Repayments							
Budget Estimates	nil	30,000	1,00,000	1,00,310	1,00,000	1,61,000	5,00,000
Actuals	6,963	6,476	16,825	35,049	33,361	60,000†	—

*May be somewhat modified by supplementary figures.

†Revised estimates, not actuals.

appears common for merchants to make short-term loans to weavers in return for pledges to sell all output to the lender at prices so much below current market prices that the gain is equivalent to an interest rate of 400-600% per annum.

The Government has endeavored to alleviate somewhat the shortage of capital not only by the loans to agriculturists discussed in Chapter VIII but also by loans to small-scale industry. Government loans to small-scale industry in recent years are shown in Table IV-5.

Additional loans are made to non-agricultural cooperative societies, but these are primarily to consumer cooperatives and to cooperatives concerned with marketing and basic processing of agricultural products. In total, they were about equal to industrial loans for the period 1947-48 to 1950-51; thereafter they were radically increased. In 1952-53, the revised budget allocation for such loans was K7.5 million. Preliminary figures indicate that about K1 million was issued to small-scale industrial cooperatives.

Even if the total allocations of all types of loans to small-scale industry in 1952-53 materialize into actual loans, they would represent only a few kyats per worker per year. Budget allocations, however, are not all being converted into actual loans. This is shown by the figures in Table IV-5. Only 30% of government allocations materialized into loans over the five-year period, 1947-48 to 1951 52, for which data on actual loans made are available. The rate for loans to non-agricultural cooperative societies was even lower up to 1951-52, in which year large loans, only a small amount of which probably went to small-scale industry, raised the five-year ratio of actuals to allotments to 65%.

Loans to weavers are administered by the Office of the

Superintendent of Cottage Industries, and industrial loans are administered by the Board of State Aid to Industries, both of which agencies fall under the Directorate of Industries. (Loans to non-agricultural cooperative societies are administered by the Cooperative Societies Department and are mostly channeled through district cooperative societies; their distribution is a matter of cooperative organization and is not considered in this chapter.) Actual loan operations follow a complex procedure in which final action is taken within the channels of ordinary civil administration.

The problem of which the separate pieces have been discussed in preceding paragraphs is not four problems, one in agriculture, one in industry, one in trade and one in personal finance. It is rather one problem, the problem of village finance. Personal loans, for example, cannot be separated from production loans in agriculture or industry or trade. The process of living until harvest, or until goods are sold, is a part of the process of production. Denying credit for prudent personal loans would merely drive the borrowers to usurious sources which would create a heavy drain on family income and might threaten the soundness of production loans.

Legal prohibition of usurious interest rates will not alone meet the problem; the high rates result from shortage of capital. As long as the shortage exists, there will still not be enough funds available to meet all needs. Lower interest rates will of course result in larger demands for loans. Indigenous enterprises can be furnished adequate finance only if enough capital can be supplied to meet all prudent demands for loans which will appear when money is available at the lower rates.

As the development program progresses the level of economic activity will increase and a larger share of it

will become industrial or commercial. It will be imperative that commercial banking expand in scope, to play its full part in the development. However, it would be undesirable to establish commercial banks in interior towns before business activity and methods justify them. Failure of banks because of premature establishment would retard the further development of banking. On the other hand, the development of banking will expedite economic development. If private capital does not come forward to establish commercial banks when and where their need is manifest, the Government should carefully consider the problem involved in the establishment by it of commercial banks in one or more centers.

Commercial banks will not however fully solve the problem of village finance, since by their nature they can operate efficiently only in the larger towns.

The State Agricultural Bank which has been recently established by the Government can solve a large part of this problem. The program calls for establishment in each village of a locally managed village bank to make crop loans on the signature of three cultivators, to provide the financial basis for multi-purpose cooperatives, and in other ways to promote village welfare. The village banks would be supervised by branches of the State Agricultural Bank located in the districts, which would provide funds and which would directly administer intermediate term loans and loans to cooperatives. During 1953, branches have been established in four districts and about fifty village banks have been organized. With the experience gained this year the Government can gradually extend the banks' operation to other areas.

If these banks are to contribute most effectively to raising the standards of village production and living, each village bank must develop as the heart of a multi-purpose village cooperative movement, in which villagers actively participate and whose purposes as an accumulator and distributor of savings they understand. If the village banks operate simply as government loan agencies, they may serve a useful purpose in financing production, but they will not serve with full effectiveness in integrating and energizing village life and their "easy money" aspect may lead to the same mismanagement which brought disaster to the prewar cooperative banking system. Consequently, the system of village banks should be extended only as cooperative society members and administrative officials can be trained in the responsibilities involved in operating them, even if this precaution involves delay in the expansion of the system.

Until the time when banks are established throughout the country facilities for issuing direct government loans will continue to be necessary. Present plans for the State Agricultural Bank provide for loans to village cooperatives by the Bank from its own funds, where cooperatives are organized; and for administration by the bank of direct loans to cultivators from government funds, where cooperatives do not exist. This administration will consist only of disbursement of funds to local civil administrative officials, who will make individual loans and collect repayments. Where multi-purpose village cooperatives exist, they may extend loans to small-scale industry and

other local borrowers on a cooperative basis, receiving the necessary funds from the Bank; but is it not intended that the Bank shall administer direct loans to non-cultivators where cooperatives do not exist. Indeed, where the loans are disbursed by special officials, as for example by the supervisors of loans to weavers, there is little point in interposing the Bank into the mechanism.

It is desirable that over-all credit policy continue to be formulated at the top levels of administration generally responsible for fostering small-scale industry. But individual loan transactions should be made in the local community through personal contact. A system which requires correspondence and the filling in of long forms will never reach the small commercially unsophisticated producer. Moreover, experience in other countries shows that personal contact offers a valuable opportunity for counseling the borrower concerning the operation of his enterprise. However, a loan office cannot be established in every community where credit is needed. The operation of a small-loan system is costly. For example, the supervisors of loans to weavers, on the average, handle less than K20,000 of loans each annually. The best solution to this problem is three-fold: (1) The Directorate of Industry should send out mobile units in areas, not served by multi-purpose village cooperatives, in which the anticipated volume of business is sufficient to justify the expense. (2) Isolated cases should be handled by the regular officials of the civil administration who now handle direct agricultural loans. In these cases the branch of the State Agricultural Bank could administer the loans in the same sense as it administers direct loans to cultivators. (3) Loans to non-cultivators should be made by multi-purpose village cooperatives, as soon as village banks can be developed on a sound basis.

Another basic feature of the loan system should be that it in fact deals in loans, not subsidies, i.e., it must insure that loans are repaid. As indicated in Table IV-5, repayments in the five years 1947-48 to 1951-52 have been only between a fourth and a half of the volume of loans. The rate of interest charged should be very low. As part of the over-all program of reducing interest rates in Burma, this will not subsidize one sector of enterprise as against another, but will serve to stimulate activity throughout the economy. However, the repayment provisions must be strictly enforced, otherwise, in effect, the defaulters are being subsidized. Indiscriminate subsidization resulting from lax repayment provisions is economically capricious and is more apt to be harmful than to be beneficial. It undermines public morale and morality. The decentralized local and personal loan system recommended above would facilitate debt collection and thereby tend to avoid these evils.

While the State Agricultural Bank and the direct loan program can be expected to meet much of the need for production credit, facilities for small single-signature consumer loans will also be required. Existing pawnshops operate at high interest rates and often do not have adequate facilities for storing pawned articles. A mission has returned from Indonesia where it studied the system of state pawnshops which has proved so successful in meeting

small loan requirements. A state pawnshop has subsequently been opened in Insein and personnel are being trained for a second shop to be opened in Rangoon in 1953-54. Additional pawnshops are planned in subsequent years as personnel are trained. One important development is that borrowers will share in the profits of the pawnshop. The government program for opening pawnshops can probably be accelerated if the experience of the Insein pawnshops proves to be successful. So far it appears that the scheme is progressing favorably.

These programs for increasing the amount of credit available at reasonable rates cannot be considered to be a complete remedy for the financing problems of cultivators and small industries. Many cultivators and operators of small industries appear to have encountered financial difficulties because of an inadequate understanding of the role of credit in production and the need for accumulating savings. Current savings are often spent without sufficient regard for future financing requirements. An unexpected mishap or sickness usually causes serious financial difficulties. At present, however, there are no facilities for saving in the village other than investment in gold and jewelry. The savings departments of commercial banks are available in only very limited areas and even the facilities for postal savings are limited to the township headquarters. Gold and jewelry have the benefit of prestige as well as being easily hidden and being safe from deterioration. To substitute the idea that a paper document in one's possession or in the safekeeping of a bank or cooperative is more desirable will take a long time. Yet a country as urgently in need of capital for development as Burma must utilize every possible avenue for increasing the country's domestic savings and every means for channeling these savings into productive channels. For this reason educational campaigns should be instituted and administrative improvements sought after to popularize the increased use of savings departments of commercial and village banks, of postal savings banks and similar institutions, and the use of cooperative societies for the purpose of saving as well as a place to obtain loans. State pawnshops, too, should be so managed as to develop into institutions for the safekeeping of valuables and later as savings institutions rather than mere loan offices.

G. FOREIGN EXCHANGE AND FOREIGN TRADE POLICY

1. FOREIGN EXCHANGE CONTROLS, GENERAL CONSIDERATION

The basis for Burma's policy concerning foreign exchange controls should be the fact that foreign exchange will probably be plentiful even at the height of the development program. The implications are far-reaching.

(a) Whereas continued watch should be kept on foreign exchange trends, there is no reason to plan now for periodic tightening or loosening of foreign exchange and foreign trade restrictions. Instead stable policies may be planned with the expectation that they will be appropriate throughout the decade.

(b) There is no reason why Burma should construct a productive enterprise in Burma in order to save foreign exchange. Some countries must establish uneconomic enterprises at home because they cannot afford to buy abroad. Burma need not produce any item at home which she can more advantageously buy abroad. Unless non-economic considerations require production in Burma even at the cost of an economic loss, Burma can select for execution in Burma only those projects which will raise her standard of living.

(c) Since domestic resources are much more apt to become scarce than is foreign exchange, in her advance planning Burma should plan to purchase as large a share of the materials for her development program abroad as is economic.

(d) If bottlenecks and scarcities appear in Burma, the Government should encourage the residents of the country to spend abroad rather than here, by minimizing the restrictions on obtaining foreign exchange. One way to do so would be to liberalize the rules concerning remittances abroad. Raising the share of income which may be remitted abroad monthly, and the absolute limit on such remittances, and relaxing foreign exchange regulations concerning expenditures during travel abroad are examples of desirable changes. The principle that it is good, not bad, for Burma to have her residents exchange kyats for foreign currency should become a principle of action.

This does not carry any implication concerning the export of capital. The quantities involved may be too large even for sizable annual net receipts of foreign exchange to cover. Permission to export capital, if it is to be granted, should initially be granted on a restricted and experimental basis and in successive steps, until by trial and error the amount of capital which may wish to fly is roughly determined.

A possible corrective to an excess of domestic spending is a slight increase in domestic prices, which of itself will cause some shift to increased imports, as has been suggested in Chapter III. However, the degree to which this shift would occur can easily be exaggerated, and it would be dangerous to assume that a slight price rise will bring on automatic corrective action.

(e) The desirability of freeing foreign exchange expenditures does not imply the desirability of reducing the cost of foreign goods through tariff reduction. What will be wanted, if resources in Burma become scarce, will not be the maximum physical volume of imports but the maximum expenditure for them, to drain as much purchasing power as possible from the Burmese economy. Expenditure may be maximized by high rather than low tariffs. Considerations such as this, plus the question whether the

time has arrived to siphon income away from Burma, plus considerations of the effects on the cost of living and the cost of production in Burma, should govern changes in tariff rates at any given time.

Even though Burma's prospective foreign exchange earnings continue to be plentiful, foreign exchange should not be wasted. Foreign exchange is not sterile; it can be invested abroad to earn income which will raise the future living standards of the country.

2. FOREIGN TRADE POLICY

It does not necessarily follow from the prospective ample supply of foreign exchange that Burma should free all imports from controls. Import restriction is urged for two reasons not connected with foreign saving; to protect infant industries in Burma and to foster the Burmanization of import trade.

3. INFANT INDUSTRIES

Temporary protection is clearly desirable for industries which cannot otherwise gain a foothold and which when they have gained a foothold will be able to produce as efficiently as abroad. However, there are alternative methods of granting protection. The use of a protective tariff is normally more advantageous than a licensing system. With a tariff in effect, both traders and domestic producers know that no added supply can be brought into Burma at a cost below the export country's price plus freight and other costs, plus the tariff. They also know that an unlimited amount can be brought in at that price. Consequently, the domestic price will be stable, at or near the cost level.

Both the infant industry and the consumer are protected from fluctuations, whereas under a licensing system the price may vary depending on the accuracy with which the licensing authorities estimate the appropriate amount of imports to be authorized. Limitation of imports by license provides a windfall gain to the lucky recipients of licenses; a protective tariff obtains this increment for the Government. Finally under a licensing system there is always the possibility of deliberate abuse of personal discretion by licensing authorities; use of a protective tariff eliminates this risk. For these reasons, it is recommended that tariff protection be adopted rather than direct quantitative restriction of imports, where protection of infant Burmese industries is deemed desirable.

In some cases, a temporary subsidy to the domestic industry might be preferable to restriction of imports by either quota or tariff. Whatever method is determined upon, an essential requirement for effective stimulus of new industry is that the policy be known

and dependable so that trade and production can adjust to it and be conducted efficiently. Import licensing can never be as dependable as a tariff schedule or an announced subsidy schedule.

4. BURMANIZATION OF FOREIGN TRADE

The question of use of a licensing system to foster the wider participation of Burmese nationals in the import trading business is more complex. A subsidy system is ill adapted to the purpose, and a tariff is of no use whatever, since it gives no advantage to indigenous firms. An import licensing system, with a generous share of import licenses available only to Burmese nationals, was adopted by the Government.

It is of course true that an import licensing system is subject to great abuse. The granting of licenses without investigation to wholly unqualified persons provided only that they were Burmese nationals, when licensing was first undertaken, the open sale of these licenses to foreign trading firms, the accompanying favoritism and sometimes corruption, the maintenance of exorbitant profit margins on scarce commodities—these things are commonly acknowledged.

These may be said to be imperfections of a system in its infancy, which have since been corrected. By the present time, the majority of imports are under "Open General License," which permits import without license. Although the licensing process has not functioned as smoothly and flexibly as is desirable, licenses for the import of many other goods are generally granted rather freely, so that exorbitant profit margins are far less common. Procedures for the investigation of applicants for licenses have been established. Favoritism, corruption, and the sale of licenses have been greatly reduced.

Certain difficulties remain. The evils referred to above still prevail, though in smaller degree. It remains true that future import of every commodity is subject to the discretion of the licensing officials. Abuse of personal discretion is still possible. No importer has assurances that imports can be continued without interruption. There are often delays, even when licenses are finally obtained. When licenses are obtained, they lapse if not used within a specified time. Hence there are gluts of goods under license at some times and shortages at others, with resulting price fluctuation. There is always the danger that continued artificial protection will promote inefficiency. Such conditions are in some degree inherent in any licensing system and provide powerful arguments for the elimination of the system when it is no longer seriously needed. Under a free import arrangement, prices of imports would be more stable and on the average lower. The cost of living

as a whole would be reduced somewhat, though this effect would probably not be great. There would be no incentives to hoard supplies and little opportunity for speculative gains.

Elimination of the present uncertainty concerning future imports would stimulate economic development. An enterprise using imported materials is dependent upon an uninterrupted supply. Any basis for skepticism on this matter causes hesitation in the establishment of new ventures.

Another advantage of freeing trade which is of peculiar importance to Burma at the present stage in her development is the freeing of administrative officials needed in the administration of licensing procedures. Any means by which Burma can economize on administrative talent will be to her advantage for it is her scarcest resource.

In spite of these difficulties, the continuation of import licensing may be desired because of its one important advantage. The system has been responsible for establishment in the import trading business of a number of Burmese-owned firms which would probably not otherwise have gained entry. The degree of protection furnished by the license quotas still in force is perhaps necessary to protect Burmese firms until they gain further experience, and is probably fostering continued growth in the number of Burmese nationals who are traders and also the volume of their business.

The facts are uncertain. It is recommended that an inquiry should be undertaken to ascertain how many recipients of licenses have actually established contacts with foreign suppliers, and how many merely buy through foreign firms established in Rangoon; how many do a wholesale or retail trade in Burma, and how many merely import and sell to nonrecipients of licenses; in what lines of business the establishment of Burmese nationals has been and is apt to be most successful; and many related facts and judgements.

Import licensing, if continued, should be administered in accordance with two main principles.

(a) Licenses should be granted for at least as large a volume of imports of each commodity as would enter under open general license, the only protective feature of licensing being the limitation of the quantity of licenses granted to non-nationals. The burden on the cost of living will thereby be minimized without removing protection to Burmese nationals. Liberal licensing to Burmese traders will render less profitable or less valuable the transferring of licenses to foreign traders. Wherever such transfers can be ferreted out, the penalties should be severe.

(b) As a supplement, and where possible an alternative, to import licensing, Burmese traders should be helped by the Government to make contact with

foreign sources and outlets, and to improve their trading methods. The commercial staffs in embassies and consulates in countries with which Burma conducts most of her trade should be strengthened. It may be necessary to employ indigenous experts in these countries. It would be desirable for the Government to bring to Burma a top-grade foreign trade technician who would give direct advice to Burmese traders and also make concrete proposals to the Government on techniques and measures designed to facilitate the Burmanization of trade without protecting inefficiency. A careful study by an expert in the field of foreign trade is needed as a prerequisite to the formulation of an efficient program.

In any case, Burmanization should be administered and with full realization that the costs, in broad terms, must be evaluated against the advantages.

H. SUMMARY OF RECOMMENDATIONS

(1) The Government should prepare, as a partner to the present budget, a "cash consolidated budget" treating all government agencies as one group and showing their combined receipts from and payments to the public, classified between receipts or disbursements within Burma and those abroad, and classified also by type of receipt or disbursement (current or capital). Such a consolidated budget is a basic necessity for intelligent control of fiscal policy.

(2) Budget reporting must be speeded up, so that the records for a fiscal year are available before the budget for the second following year is prepared.

(3) Expenditure authorizations should be separated from expenditure estimates, in order that the latter may not be biased by the need to make the estimate high enough to cover all contingencies. The present system forces exaggerated estimates for expanding programs and makes it necessary to disregard the official budget in order to budget accurately.

(4) Expenditures for current purposes must be controlled. It is recommended that an attempt be made to hold expenditures for all non-defense current purposes during the remainder of this decade to K450 million per year or K50 million above those budgeted for 1952-53. Since new programs once under way create demand for increases in funds which are difficult to resist, advanced budgeting to determine the future expenditures implicit in small beginnings before approving them is necessary.

(5) In restricting current expenditures, expenditures for research, technical training and extension work must not be made the objects of restriction, for these services are key phases of the development program.

(6) Tax rates should not now be increased, but study should be made of a tax increase program if tax increases should become necessary later.

(7) Various changes should be made in present tax laws to remove inequities.

(8) To insure that increasing tax liabilities will be fully reflected in increasing governmental revenues as the national income rises, steps recommended in the report of the Income Tax Administration Advisory Committee for improvement in tax administration should be adopted and the services of one or more tax enforcement experts should be sought.

(9) To remove deterrents to the incentive to produce, various changes should be made in corporate and individual income taxes. The so-called business profits tax should be abolished, other taxes being substituted for it if necessary.

(10) A comprehensive study of the tax structure *as a whole* embracing the questions summarized above, should be made.

(11) Union Bank control of credit expansion by commercial banks should be integrated with other phases of fiscal and monetary policy.

(12) The State Agricultural Credit Bank system should be gradually extended, until there is established in each village a village bank which will be at the heart of a multi-purpose village cooperative society. This expansion of the system, however, must proceed only at the rate at which thorough training of village residents and of administrative officials can be accomplished.

(13) Until this development can be brought about other loans to agriculturists through cooperative societies and direct government loans to agriculturists and small-scale industry should continue, under procedures by which mobile units will reach every village in person, and by which repayment in full will be enforced.

(14) The present experiment in establishing state pawnshops should be pursued energetically but carefully.

(15) Burma need not plan to introduce inefficient industries into Burma to save foreign exchange; her foreign exchange prospects are good.

(16) Tariffs rather than import licensing should be used to protect infant industries.

(17) If import licensing is continued to foster Burmanization of import trading, licenses should be issued for as large a quantity of imports as would enter under free trade, but with restriction of the number issued to non-nationals; and positive steps should be taken to aid Burmese traders in establishing efficient contacts with foreign suppliers and efficient trading procedures.

(18) To diminish the pressure of spending within Burma, restrictions on remittances abroad should be relaxed. Cautious experimentation should be made to determine the volume of funds which would seek to leave Burma if restrictions on export of capital were relaxed.

CHAPTER V

ORGANIZATION FOR COORDINATING THE PROGRAM

Having determined to achieve the fullest possible development of the country's productive resources by the end of the current decade, and to promote to the fullest possible extent the welfare of the Burmese people, the Government of the Union of Burma not only must formulate plans, programs and policies but must also develop satisfactory means for coordinating and integrating them. The larger the degree of government participation in economic activity, the greater the need for coordination of all activity by Government. Not only must the individual features of the development program be coordinated with each other, but the program as a whole must be coordinated with all other production and utilization of goods and services.

A. THE FOUR MAJOR STEPS IN COORDINATING ECONOMIC ACTIVITY

This chapter is concerned with the organization and activities of central governmental agencies in coordinating economic activity. It therefore does not discuss the planning of individual projects, their execution, or their operation. The major steps in coordination are long-range, over-all planning, annual programming, implementation of supporting policies, and progress reporting and expediting. These are logically successive steps. They do not always lend themselves to precise lines of demarcation, but they provide a sound basis for the allocation of responsibility within the Government. While progress reporting and expediting are distinct functions, they may be discussed in combination because of their intimate relationship with each other.

(1) The over-all planning function in Burma encompasses the preparation of the over-all development plan designed to maximize production by the most effective use of total resources. The plan must incorporate both goals for aggregate output and balance between the various industries and sectors. Planning also involves fiscal, banking and other economic policies designed to govern the distribution of income, the division of total income between consumption and savings, the flow of savings into investment, both public and private, the level of exports and imports and the use of foreign exchange, and other major aspects of economic activity. In addition, planning involves the establishment of

functional policies designed to govern the adequacy of both the programmed operating activities and such supporting activities as investigations and analysis, contracting and purchasing, organization and management and personnel and personnel training. It involves also continuous review and possible modification of the comprehensive development plan in the light of changing conditions, both foreign and domestic.

(2) The programming function consists essentially of the formulation of detailed objectives, policies, and programs of action for the year immediately following. The comprehensive plan and program must be carried out in successive steps. There must be a determination, each year, in the light of prevailing and prospective conditions, of how much of the total plan can be achieved in the coming year, and of how this may best be accomplished. Annual programs, in some sectors, may be broken down into semi-annual or even quarterly programs. Provision must be made in programming for the year ahead for lags or failures in certain elements in the program during the current period.

(3) The implementation of central economic policies involves the development of specific economic measures which must be conceived, approved and carried through if the policies decided on as necessary for the program are to be put into effect. These will include not only the major central economic policies discussed in Chapter IV, but also policy in a number of scarcely less important fields, such as wage policy, price policy, agricultural credit policy, and the like, all of which will have a profound significance for the economic development program.

The implementation of functional policies requires the development of standards and specific functional measures which must be likewise conceived, approved and applied generally throughout the program in order to insure against failures through functional incompetency of men, their methods, or their materials and equipment. Goals must be established for the quality of performance or results to be achieved in different areas of the program and general criteria developed to insure the competence of studies, plans, field investigations, contracting and purchasing procedures, operating and management attitudes, personnel training, and the interflow of information and services.

(4) The progress reporting and expediting functions, which may be discussed in combination because of their intimate relationship with each other, entail continuous analysis of the progress being made toward achieving the development goals, the analysis of factors tending to retard or accelerate economic progress, and the expediting of appropriate activities. Statistics bearing on progress must be carefully assembled and incisively analyzed and evaluated, so that those responsible for the progress of the program may at all times have a clear picture of where remedial action is needed, and what kind of remedial action will do the job. With analytic progress reporting of this nature, expediting can be undertaken with good prospects for success.

The operation function consists of the actual execution of each specific project and undertaking. Organization for this will be dealt with separately in Chapter VI.

B. ORGANIZATION FOR PLANNING

A comprehensive plan for the economic development of Burma for the remaining years of the current decade is presented in this Report. Plans for the level of the total output and consumption goals, the magnitude of the investment needs, the appropriate fiscal, monetary and other economic policies for achieving the objectives, the required activities in each sector of the economy, and specific projects within these sectors constitute together a comprehensive framework for Burma's economic development for the remainder of the decade.

The plan presented here should be reviewed by the Government and approved as submitted or with reservations or amendments. Approval in principle would provide each of the ministries and other government organizations concerned with a framework for their own planning and activities.

Many steps have already been taken to improve the scope and reliability of the statistical and scientific information needed for planning. As the results of these efforts become available, it will be possible to give certain aspects of the plan greater refinement and precision. Also, as economic developments both within and outside Burma diverge from those now foreseen and as conditions change in unanticipated ways in the countries from which Burma purchases materials and supplies and to which Burma sells its products, it will be necessary to make revisions in the objectives and policies of the basic plan. Planning is a living function. A plan cannot be made once for all time. It must adapt itself to changing circumstances. The fact that a comprehensive plan has been prepared does not mean there is no more planning to do.

Planning in Burma has had a good start. It must be continued.

Though planning must be participated in by all agencies of Government and at both the central and local levels, it must be coordinated as the major function of a single agency. The Ministry of National Planning should therefore continue to bear full responsibility for economic planning. It should review and continually refine and perhaps revise the basic development plan. Some change in the balance between productive sectors may be required, or between the private and public sectors. Experience may indicate that total goals and objectives need some modification. Dedication to the achievement of the objectives set forth in the present development plan should not restrain the Ministry of National Planning from making warranted adjustments in the plan itself; on the contrary, the adoption and implementation of timely and well-considered changes may be regarded as indispensable indices of healthy attention to the plan.

In the development of the present plan, the help of various ministries and boards was sought to the maximum feasible extent. However, in the revisions and modifications which should and will have to be made from time to time in the basic development plan, much fuller participation by other ministries, boards, and agencies of Government should be sought and secured. Each ministry and each agency of Government must play a positive part in the over-all development plan if the plan is to have the best quality and realism. Further, and equally important, successful implementation can be achieved only to the extent that each agency shares a sense of responsibility for the evolution of the plan and accepts responsibility for its share of the execution of the plan.

Participation in the planning process should not stop at the central or national government level. To ensure that the programs adopted respond to the conscious needs and desires of people in the various localities, there must be a means through which people throughout the country can contribute. Such an organizational instrument has been created in the divisional, district, and township Pyidawtha committees which have been assigned responsibility and provided opportunity to recommend projects and programs annually for consideration and possible incorporation by the Government into the national plan. These committees can make a contribution of great significance to the execution of plans and programs as well as to the planning process.

For some time the indigenous staff of the Ministry of National Planning will need economists and engineers from abroad. This need should be reviewed from time to time to minimize reliance on foreign

experts and maximize the responsibility of Burmese personnel. Some progress has been made in training Burmese technicians in the field of planning. To the fullest possible extent, this training policy should be accelerated by more education abroad and by added experience under competent guidance at home.

C. ORGANIZATION FOR PROGRAMMING

In programming policies and projects for each year the need for a top-level coordinating government agency is especially great. This need applies with equal force to over-all fiscal and financial policies and to specific projects and functions.

As Chapter IV has indicated, at this stage in Burma's development expansionist and stimulatory fiscal, banking and foreign exchange policies are essential. At some later date, the expansionist effect should be reduced or possibly even reversed. The proper timing of such adjustments and the exact measures appropriate to carry them out cannot now be projected several years in the future. They must be geared to the realities of each current year and prospective conditions during the ensuing year. The timing is extremely important, because it must be based on analysis of the time required for new policies to have the desired effects.

Just as the broad economic policies must be integrated to complement each other in accelerating development, so must activities in the various productive sectors and on individual development projects be coordinated effectively. Available raw materials, power, transportation, manufacturing equipment, management and technical personnel need to be integrated in a practical manner. It would make little sense, for example, to construct a factory without making power available or providing effective management by the time the factory is completed. Perfection in relationships and timing is too much to expect, yet coordination cannot be left to chance. Determination of orders of priority and timing must be the responsibility of a single organization.

The Ministry of National Planning should be responsible for programming. Thus the planning and programming functions will be integrated. The Ministry should set forth the goal for the year's production and should prepare both a schedule of the year's progress on development projects in each sector of the economy and a plan for any needed changes in the fiscal and other economic policies. The annual economic program will then be in essence a budget for the economy of Burma.

The first step in evolving the nation's economic budget for the year should be preparation by the Ministry of National Planning of tentative goals for governmental development expenditures and their

composition, for government current expenditures, and for private activity. The Ministry should then submit to each operating agency a tentative target for its developmental expenditure, consistent with the over-all economic budget, and should submit to the Ministry of Finance and Revenue the tentative target for current expenditures together with proposals concerning fiscal and banking policies. Each agency should in response submit its proposed capital expenditure budget, and the Ministry of Finance and Revenue should notify the Ministry of National Planning of the proposed current expenditure and revenue budget. While the agencies will be guided to some extent by the proposed targets they will be free to deviate from them. On the basis of these materials, in close cooperation with the operating agencies and the Ministry of Finance and Revenue, the Ministry of National Planning should prepare its program for the year, and should also discuss with the Union Bank of Burma banking and related policies involved in the program. To the degree that the Ministry of National Planning has sought and received cooperation, there should normally be little difficulty in securing acceptance of the program by each ministry and board.

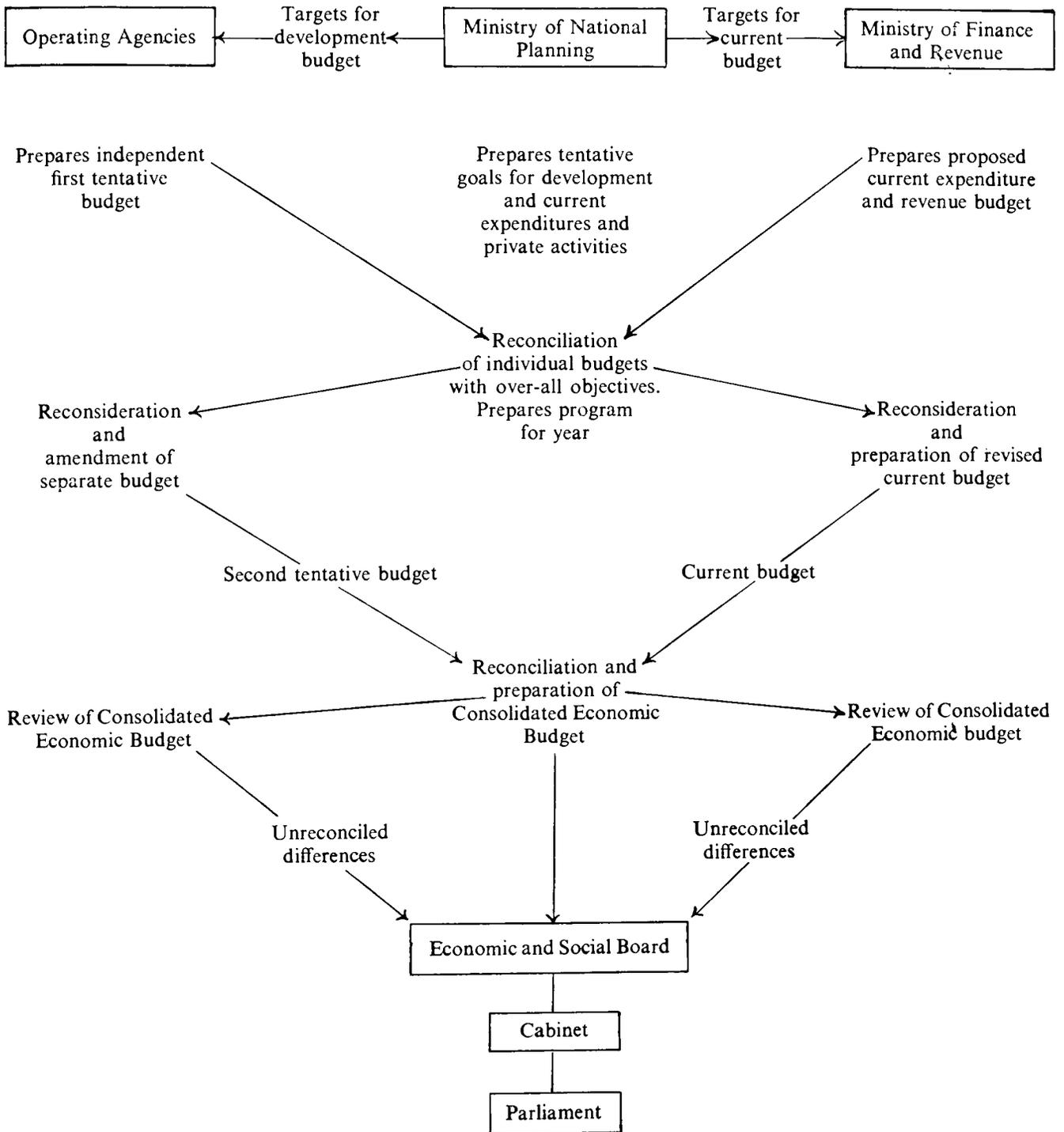
The economic budget should be submitted to the Economic and Social Board for review and approval. If the Ministry of National Planning has found it necessary to submit a program with which an individual ministry or board disagrees importantly, the Economic and Social Board should work with the Ministry of National Planning and the agency concerned to reconcile the difference and must arrive at a final judgement. Similarly, should the Ministry of Finance and Revenue believe that Government's budget should differ materially from that included in the economic budget, the Economic and Social Board must effect the necessary reconciliation in consultation with the two ministries.

The annual economic budget should then be submitted to the cabinet for approval. Once approved, it serves two chief purposes. First it provides a framework for the Ministry of Finance and Revenue in the preparation of the annual government budget. Secondly, when the program has been approved by Parliament it provides to the individual ministries and boards a framework for their detailed programs for the ensuing year. The chart, Plate 1, illustrates budget and program formulating procedures.

D. STAFF FOR PLANNING AND PROGRAMMING

The preliminary Report made a number of suggestions with respect to the internal structure and staffing of the Ministry of National Planning. No major modification of those suggestions is required here, but two passages may be quoted for convenient

BUDGET AND PROGRAM FORMULATION



Note.—At each stage there is direct consultation between the Ministry of Finance and Revenue and operating agencies on the current budget.

reference. It was suggested that in addition to an administrative staff and a Central Statistical Office, the Ministry should have an Economic Research and Planning Division and a Project and Resource Use Division.

"The Economic Research and Planning Division should be responsible for the preparation of the over-all plan for the country's development on a continuing basis and for recommendations of basic policies. The creation of a staff of economic specialists is an absolute necessity, without which the Ministry of National Planning will not be able to discharge its function adequately. Such a staff should include as a minimum specialists in the following fields: national income analysis; fiscal policy; taxation; money, credit, and banking; foreign trade and exchange; labor and labor relations; marketing and distribution; and cooperatives.

"The Project and Resource Use Division should be responsible for guiding and coordinating the work of the several agencies in the preparation of projects, for evaluating specific projects in relation to each other, and for translating specific project plans into requirements for materials, facilities and manpower. This Division would require a small staff of experts, including specialists in the fields of agriculture, forestry, mining, industry, transportation, power, construction and manpower." To this list of fields should be added, as a minimum, cottage industry, social services and research and development.

The range of experts needed in the Ministry of Finance and Revenue to review and evaluate expenditure programs for current purposes is far smaller, but the present budgeting staff of the Ministry must be greatly strengthened. At the present time, even the detailed budget decisions concerning individual agencies are made by top officials with almost no professional staff whatever. Chapter IV has noted not only the necessity for evaluating many new programs against each other, against existing current programs and against capital programs, but also the need to project several years in the future the expenditure requirements of projects which are expanding or otherwise changing. Without recruitment of added capable professional staff this procedure will not be possible. The judgement of senior officials, based on years of acquaintanceship with the government administration, must be supplemented by thorough analysis prepared for their information by an expanded professional staff.

The general comments made in Chapter VI relating to problems of organization and administration are pertinent here as well.

E. ORGANIZATION AND PROCEDURE FOR IMPLEMENTATION OF ECONOMIC AND FUNCTIONAL POLICIES

Economic policies should be proposed for the long run in the comprehensive plan and for each year in

the annual economic budget. These policies should be suggested in broad outline, rather than in detail. Thus if the Ministry of National Planning concludes that for a given year anti-inflationary credit and fiscal policies will be needed, the general measures and steps required of the central bank and of the various ministries of the Government concerned with fiscal operations should be indicated as policies for the period in question. However, there are many intermediate steps to be taken between broad policy proposals, the consideration and elaboration of these policies in detail, and their implementation. If an increase in tax revenues is recommended, consideration must be given to such matters as which groups should bear the burden and what rate increases will bring the additional revenues desired. If, to tighten credit, an increase in the reserve requirements for scheduled banks is proposed, there must be considered what increase will achieve the desired objective and what action, if any, should be taken concurrently with respect to interest rates on various types of government loans or Union Bank loans. Similarly, broad functional policies affecting both the operations and the support of the operating agencies must be explored and reconciled with the various ministries concerned. Such questions cannot fully be explored by the Ministry of National Planning.

Clearly, responsibility for the considered review of economic and functional policy proposals must be fixed in the agency which will be responsible for supervising their implementation; namely, the Economic and Social Board. The Board having reviewed and obtained cabinet approval of policy proposals should direct the ministries and agencies concerned to submit concrete and detailed recommendations in connection with policies to be adopted and implemented. For instance, if the cabinet approves the proposal of the Ministry of National Planning for a tax increase, the Economic and Social Board should request the Ministry of Finance to formulate a specific program in harmony with the board policy proposals of the Ministry of National Planning. The resulting tax proposals should be subject to the approval of the Economic and Social Board, which must carry the primary responsibility for assurance that these policies are coordinated with other basic policies. In the area of credit expansion or contraction, the Board should secure from the Union Bank of Burma a specific program which it will review and approve. The same procedure will apply in other areas.

Where given policies directly affect the functions of various ministries, the Board should secure the fullest cooperation of every such agency in the preparation of properly coordinated and integrated policies. In the field of transportation, for example,

the Board should exercise approval authority of rate structures proposed by the Transport Commission, since these directly affect many ministries and agencies. In short, the Economic and Social Board should act much as a subcommittee of the cabinet.

F. ORGANIZATION FOR PROGRESS REPORTING AND EXPEDITING

The body responsible for program review must be given responsibility for keeping track of over-all progress and of progress in various sectors, and must be assigned responsibility for expediting the program. The functions are intimately related. A highly competent staff must prepare regular reports on the progress of the development program for the expediting body. Some of these should be for publication and some should be confidential, for use only within the Government. These reports should include not just statistics, but primarily analysis of program progress, and criticism of lack of progress, along with proposals for accelerating it. They must not deal merely with individual projects but must deal with the inter-relationships between projects and between program areas, and must show the implications for the program as a whole, of lack of progress or of accelerated progress in various projects or areas. In addition to regular reports, the staff should prepare from time to time as required special studies and reports on important policies, problems and projects.

Armed with these analyses, the expediting body can pin-point trouble spots and take the steps necessary to remedy the situation. It should be stressed that the expediting organization cannot in and of itself execute the program. Operations must be handled by operating organizations and agencies. The expediting body can only review progress, analyze reasons for failures to fulfill objectives, make suggestions for improvement and extend assistance where necessary. It cannot do the operations job itself.

Responsibility for progress analysis and for expediting must rest in the body responsible for program review and policy implementation, for each pair of functions depends upon the other pair. Progress analysis and expediting can be done only in relation to the program goals, and conversely annual program proposals or policy changes can be formed realistically only in the light of progress analysis. The body responsible for expediting must be a high-level operating, not the planning, body. Responsibility for progress reporting and for expediting should therefore be vested in the Economic and Social Board.

Progress reporting must however be available to the Ministry of National Planning as well as to the

Economic and Social Board, so that the Ministry can take progress analysis fully into account in its annual programming. The progress reporting staff must in effect be a joint staff of the Economic and Social Board and the Ministry.

It is appropriate that the Economic and Social Board has as its chairman the Prime Minister, thus giving it high level authority in its expediting work. But not all the pressure for positive results can be expected to be exerted by the Prime Minister. Obviously he should be called upon to lend his prestige and authority to the expediting of the most important matters, but he must not be called upon every time there is trouble. The "Big Gun" cannot be used all the time. Expediting will not succeed unless most of it is accomplished by the board members and the staff.

Effective expediting, given skillful progress reporting so that the state of affairs is clearly understood, is partly a matter of effective devices and techniques and partly a matter of personal relationships. The mere issuance of critical progress reports or even of directives to operating agencies will not be adequate. The Board and staff should give special consideration to the developing of devices for facilitating and motivating action. They must avoid becoming so critically negative in their relations with operators as to damage their effectiveness. The members of the Board should devote themselves assiduously to the task of knowing what is going on, and of working as closely and harmoniously as possible with the operating arms of the Government. The staff should attempt to develop harmonious relationships with working staffs in the operating agencies, in order to perform as much expediting themselves as possible. There must also be the closest possible relationship between the staff, the Executive Secretary, and board members, so that the staff members will know that they are accurately and fully reflecting board policies and so that the board members will possess more than a formal knowledge of developing problems and can expedite where the staff cannot succeed.

The Board and its staff should not try to expedite where detail is concerned. That is the function of the head of each operating agency. The Board should concern itself with top-level implementation only.

There is no easy road to implementation. Expeditors are seldom popular. Effective expediting requires understanding of construction, production and administration, excellent judgement and unlimited tact. The expeditor must help the operating head analyze his problem. He must listen more than he talks, and on occasion must be overwhelmingly persuasive. This task is a difficult and demanding one but an essential one for Burma.

G. ECONOMIC AND SOCIAL BOARD STAFF

The size and composition of the staff of the Economic and Social Board must be determined by the functions of the Board. In summary, the major functions of the Economic and Social Board will be: the review and determination of the plans and programs proposed by the Ministry of National Planning; the review and determination of policy proposals with special attention to their details and timing; the review of program progress; and top-level expediting. Staff performance will be divided between these four functions.

The staff requirements will therefore comprise both engineers and economists capable of advising the Board as to the desirability, feasibility and optimum implementation of the plans, programs and policies presented to it, and of assisting it in analyzing the progress made and in expediting where necessary to keep progress on schedule.

Narrowly viewed, the staff work of the Economic and Social Board will be performed by its own staff personnel. Realistically, it would be desirable for the small nucleus of staff of the Board to be supplemented as required by the professional staff of the Ministry of National Planning. The broadest view would regard the staff of the Board as embracing the staff specialists of every government ministry, agency and department as required. This indeed is the proper view. All the specialized manpower resources of Government should be brought to bear on any problem with which the Board has to deal.

H. SUMMARY

(1) The Ministry of National Planning should continue to bear full responsibility for long-range over-all economic planning. The development plan should be subjected to continuing review and refined and modified to fit changing circumstances. In doing this the Ministry of National Planning should give due regard to the suggestions of local Pyidawtha committees and obtain full participation by other ministries, boards and agencies.

(2) The annual economic program will be an economic budget for the nation. The Ministry of National Planning should prepare it in close cooperation with each operating agency and with the Ministry of Finance and Revenue and the Union Bank of Burma. The economic budget should set the goal for each year's total production; should plan the allocation of production between consumption and capital

formation; should recommend fiscal and other economic measures for achieving the allocation and for otherwise regulating economic conditions, and should present an allocation of government development expenditures among projects.

(3) The Economic and Social Board should review the economic budget and all aspects of the development program, reconcile any important differences between the Ministry of National Planning and other agencies which the Ministry of National Planning has not been able to resolve, and should submit the final budget and development program to the Cabinet for approval. The approved economic budget and program will provide the framework for the preparation of the annual government budget and provide individual agencies with the framework for their detailed programs for the year.

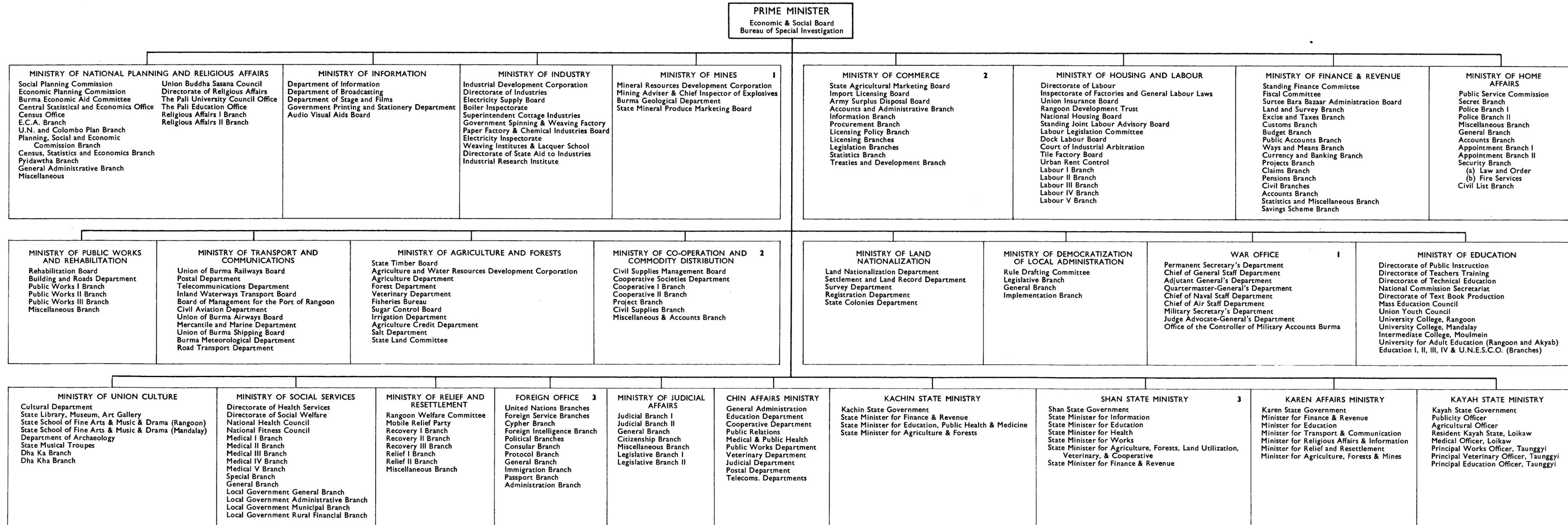
(4) The Economic and Social Board should be responsible for reviewing and implementing broad economic and functional policies proposed in the comprehensive plan and in each year's economic budget. The board should see that specific proposals and programs are consistent with the broad policy proposals of the Ministry of National Planning.

(5) The Economic and Social Board should be responsible for keeping track of the progress and competence of the development program and for expediting the program. The progress reports should analyze the status of each program and its contribution to the over-all program. They will enable the Economic and Social Board to pin-point trouble areas and effect remedial measures. They will also be needed by the Ministry of National Planning in its annual programming.

(6) The economic and Social Board should concern itself with top-level expediting only. Details should be the responsibility of the head of each operating agency.

(7) The staff of the Economic and Social Board should comprise both engineers and economists capable of advising the Board on all phases of the planning, programming and implementation of the proposals presented to it. The staff should assist the Board in analyzing the progress made and in expediting where necessary to keep the program on schedule. The staff should be supplemented as required by the professional staff of the Ministry of National Planning and specialists of every government agency. All the specialized manpower of Government should be brought to bear on any problem which comes before the Board.

CHAPTER VI, PLATE I
PRESENT MINISTERIAL ORGANIZATION
GOVERNMENT OF THE UNION OF BURMA
(As of 15th July 1953)



NOTE.—In the case of three pairs of ministries (designated by the figures 1, 2, and 3 respectively), one minister presently holds two portfolios.

CHAPTER VI

ADMINISTERING THE DEVELOPMENT PROGRAM

A. THE MINISTRIES

Consideration of how governmental organization and administration in the ministries can be improved to carry out more effectively the economic development program should take into account the assignment of responsibilities and functions among the various ministries and the internal organizational structure within the ministries, as well as the problems of personnel and operating procedures which are common to other agencies and are discussed later in the chapter.

1. ASSIGNMENT OF MINISTERIAL RESPONSIBILITIES

The Cabinet is composed of 23 ministers who head 26 ministries; three of the ministers hold double portfolios. The question naturally arises as to whether the assignment of government functions and responsibilities among the ministries might not be improved by judicious consolidation. In every government there is apt to be a tendency toward proliferation of cabinet-level agencies. This alone would probably warrant a periodic re-examination of the distribution of responsibilities for the various governmental functions, in order to consolidate closely related functions and to achieve greater operating efficiency. Another reason for such a re-examination is that as government policies change to take on new emphasis in response to changing conditions, a modified allocation of responsibilities may be more appropriate to the new conditions and policies. There are other compelling reasons why the various governmental responsibilities should be divided to the extent possible among a relatively smaller rather than a relatively larger number of ministries. Where superior executive and administrative abilities are in great demand, reduction in the number of ministers and secretaries will result in the availability of more able people for key posts elsewhere in the development program. Finally, where two or more closely related ministries are not consolidated, many questions will arise which will require coordination of their activities, or reconciliation of their differing views at a higher level. This will impose an unnecessarily heavy load on the Cabinet and on the Prime Minister. The responsibilities of the Prime Minister and of the Cabinet are already so burdensome that it would seem highly desirable to minimize to the greatest

possible extent that part of the burden which arises out of the necessity for such coordination and reconciliation.

The above observations arise not merely from study of the situation in Burma. They are theoretical as well. Such consideration as it has been possible to give to the ministerial structure in Burma has not been detailed. Nevertheless, even a superficial examination of the structure of the present ministries, as shown in Plate I, suggests that in a number of instances functions presently distributed among two or more ministries might be consolidated in one ministry with useful results. Thus, for illustrative purposes, it is suggested that consideration be given to the consolidation of the Ministry of Culture with the Ministry of Education; of the Relief and Resettlement Ministry with that for Social Services; of the Land Nationalization Ministry with the Ministry of Agriculture and Forests. A considerable number of more far-reaching consolidations might be proposed. It may well be that there are good and compelling reasons in some of these instances for the separate existence of the ministries concerned. What is suggested is that a thorough study of the allocation of governmental responsibilities among the several ministries conducted by competent experts might lead to greater administrative efficiency and more rapid attainment of the goals of the development program.

2. INTERNAL MINISTERIAL STRUCTURE

Such examination of the internal structure of several ministries as it has been possible to make suggests that, in a number of instances, reorganization of existing organizational structures within the ministries would assist in the improvement of their operations. The internal organization of the ministries in large part is an inheritance from the colonial administration, when the Government played a lesser role in the direction of economic life in Burma than is now the case. What seems to be lacking in these instances is a structure in which separate organizational units and sub-units are established with a clear delegation of authority for certain functions for which the ministry as a whole has responsibility.

A desirable organizational structure may be illustrated as follows: if a given ministry has responsibility for six major functions, it should be so organized

internally that six separate organizational units within the ministry are each assigned responsibility for one of those functions. The officers in charge of each of the six major organizational units should report directly to the secretary and the minister. If a larger number of major functions exist, they should normally be combined so that six or a smaller number of persons report directly to the secretary and minister. Normally, each of the major units should be further sub-divided with the same clear assignment of responsibility. In the language of public or business administration, such an organizational structure is called an administrative pyramid or hierarchy. The pyramid does not normally constitute the entire organization of the ministry; there may for example be at one side a planning unit concerned with all the work of the ministry, but it must merely be advisory to the top officials and must not blur the lines of responsibility by sharing with them responsibility for operation. There must also be clear arrangements for coordination between units, but these arrangements must not diffuse responsibility or create conflicting lines of authority.

The internal structure of many ministries in Burma seems not to be organized in this manner. A number of the ministries seem rather to be organized in such a way as to foster undue deliberation, an excessive number of lateral clearances, delays and blurred responsibility and accountability. It has been stated that, in some instances, nobody seems to be clearly in charge of anything. The internal structure within each ministry should be one which encourages the orderly delegation of responsibility, prompt action and sharply focused accountability for results in specific areas of responsibility.

Another defect of the top-level structure of the executive branch is the lack of "deputy ministries." Ministers are frequently on tour, both in the course of their executive duties and for legitimate political and other purposes. When they are away, work on important matters often comes to a standstill. The secretary is hesitant to make decisions, except on relatively minor matters, and business is delayed. Efficiency would be increased if some official acquainted with the minister's views and the principles which guide his decisions were placed in position to make final decisions in the absence of the minister. Perhaps the elevation of parliamentary secretaries to the role of "deputy ministers" is a feasible solution.

B. THE DEVELOPMENT CORPORATIONS

The Agricultural and Water Resources Development Corporation, the Industrial Development Corporation and the Mineral Resources Development

Corporation have major roles to play in the economic development program. These organizations have been established by acts of parliament vesting imposing responsibilities in them. The duty of the Industrial Development Corporation is to promote the establishment and development of industrial enterprises. The responsibility of the Mineral Resources Development Corporation is the exploitation, development and utilization of the nation's mineral resources. The Agricultural and Water Resources Development Corporation has the task, under its act, of sponsoring construction of irrigation canals, dams and reservoirs, making loans to farmers, and taking other measures to expand agricultural production. The Industrial and Mineral Resources Corporations are specifically authorized to carry out all activities necessary to their functions; and the powers granted to the Agricultural and Water Resources Development Corporation are correspondingly broad. The three have tremendously significant roles to play in the development program. It is therefore important to consider some of the major organizational and administrative problems which arise in connection with their activities.

1. AUTONOMY

First and foremost among these is the question of autonomy, namely, the proper balance between independence and democratic accountability. Experience indicates that the best answer here is for the development corporations to be organizationally outside of the ministries, and to enjoy complete freedom in respect to day-to-day decisions. In broad policy matters each may report to an appropriate minister, or alternatively the head of the corporation may himself have cabinet status. If the former arrangement is followed, as seems to be preferable, the minister should guide only the broad lines of over-all policy. If a development corporation acts merely as a division of a ministry, one of its main aims is frustrated. On the other hand, there must be effective provisions for integration of the corporation's operations with over-all government policy.

2. DIRECTION

Another extremely important and closely related aspect of the problem of organizing and administering development corporations has to do with the composition of board membership, and with the nature of the direction of the corporations. Experience in other countries has shown that where membership on the board of directors of a development corporation is heavily weighted with government officials, and especially with representation of ministerial rank, there is a tendency for such a board to be dominated by the minister or ministers and to lose its autonomy

and vigor of action. Experience in other countries has also led students of the question to the opinion that the chairman of the board of such a corporation should serve on a full-time basis, free of any other public or private responsibilities. Compelling reasons may of course exist for deviating from this general rule. Where the chairman of a development corporation cannot devote himself exclusively to its affairs it becomes the more imperative that the director-general or managing director of the development corporation be a person of the highest capability and willingness to accept the fullest possible range of authority and responsibility, subject only to the general policy guidance and review of his board and board chairman, and that the board in fact delegate such authority and responsibility to the director-general.

3. AVOIDANCE OF DIRECT OPERATIONS

The function of a development corporation with respect to new development projects should be to see to it that such projects are undertaken by bodies appropriate to the purpose. If, for example, it is desired to initiate a new pulp and paper plant, the Industrial Development Corporation should see to it that the job is done; it should not undertake the task itself. The Industrial Development Corporation may set up an autonomous, businesslike publicly owned corporation to do the job; it may make arrangements for a joint venture, in which government and private capital would jointly undertake the task; or it may insure initiation and proper execution of the project in any other way which seems desirable and feasible. The Industrial Development Corporation itself, however, should not become engaged in direct operations. Its role should be confined to initiation, financing and the subsequent exercise of such controls as would be appropriate to any large owner of an enterprise, to insure that it was well managed and efficiently operated. If the development corporations go beyond the exercise of such functions, and extend themselves into the sphere of actual operations, they will become hopelessly bogged down in detail, and they will be unable to carry on their development activities on the scale and with the objectivity required for satisfactory performance.

4. FOSTERING PRIVATE ENTERPRISE

While the responsibilities of the development corporations will undoubtedly be primarily the initiation and guidance of new development projects, an exceedingly important aspect of their work, and one which should not be slighted, should be the encouragement and fostering of modernization and expansion by existing private enterprises. This can be done

more effectively, and without diverting time and energies from the basic task of new development, if separate divisions with separate personnel are established in the development corporation to handle these essentially different, although complementary, jobs.

5. BOLD CONCEPTS

It is important that the managements of the development corporations think in large terms, and that they display imagination, enthusiasm and energy in their approach to their tasks. Management must not be timid or hampered by fears of petty criticism from higher authority because of mistakes that are bound to be made in good faith by the most capable of people, if they are doing a dynamic job. One of the chief purposes of development corporations is to provide organizations which can act boldly and responsibly, unhampered by the many restrictions which so often make action by government agencies cautious and time-consuming. It is essential that the boards of directors of the development corporations approach their responsibilities with a determination to do a big imaginative job in a dynamic way, and that they convey this feeling and attitude to the executive officers of the corporations. In fact, the managing director of a development corporation should be made to feel that unless he undertakes a large-scale and ambitious program, and seeks to accomplish it in a relatively short time, he will be subject to censure by his board.

This vigor of action does not mean action uncoordinated with the rest of the Government. The scope of the program of each development corporation must be planned in relation to the over-all plan and the annual program whose formulation is discussed in Chapter V. But each corporation will not be a passive recipient of an assignment within that plan. It must propose action, indicate the work it is prepared to carry out and its desirability, and so partake actively in the formulation of the over-all plan.

6. FUNDING POWERS

It is exceedingly important that the development corporations be empowered to finance new and existing enterprises, whether by loans or equity participation, that they be empowered to raise money by the issuance of bonds, debentures and stocks, and that they be empowered to raise very substantial sums initially for these purposes without the necessity for seeking further specific authority for so doing. Initial authority to employ substantial sums before being required to obtain further financial authority will help develop the necessary vigorous approach to the development program.

7. STAFFING

If the new corporations are to perform the major role assigned to them in the development program, it is essential that they swiftly build up sizable staffs composed of capable people with adequate training and experience. In June, 1953, after the Industrial and Mineral Resources Development Corporations had been in existence for eight months and the Agricultural and Water Resources Development Corporation for a slightly shorter period, the total staff of the Agricultural and Water Resources Development Corporation, including stenographers and messengers, was reported as including less than two dozen persons, and of the other two corporations combined, a smaller number. It is important that the development corporations proceed without delay to recruit necessary staff of the highest possible caliber in order to be in a state of readiness for operations once programs and projects presently under consideration are approved.

8. INTERNAL STRUCTURE

As in the case of the several ministries, it is highly important that the internal structure of the several development corporations be appropriate to the execution of their functions. The specific internal organization of a corporation should differ from that of a ministry, because of the difference in functions, but the same principles of organizations divided according to function, with clear-cut lines of authority and responsibility and clear provision for internal coordination of related functions should govern.

C. OTHER GOVERNMENT CORPORATIONS AND BOARDS

Like other modern governments, the Union Government has found it advisable to create a variety of other corporations and boards. These fall into three groups: state enterprises presently or potentially engaged in the production of commodities, such as the State Cotton Spinning and Weaving Factory Board, the State Timber Board (which also has other functions), the Tile Factory Board; state enterprises engaged in other productive activity, such as transportation or marketing; and boards engaged in regulatory activities.

Comment has already been made concerning the appropriate relationship between the development corporations and subsidiary operating corporations. The latter should be set up in simulation of private business corporations, and be guided by the same principles of good management, good service and reasonable profit as should motivate the privately owned corporation which has a sense of public responsibility. The direction of such a corporation

should be in the hands of a board of directors selected, not on the basis of political considerations, but on the basis of the capabilities and experience they can contribute to the policy direction of the enterprise.

Where actual production activities are presently engaged in by existing government boards, these should be converted to public corporations subsidiary to the appropriate development corporation, and thus made part of a uniform organizational plan. New legislation will in some instances be required to accomplish this.

The problem of the quality of management of existing and prospective state enterprises is crucial. Probably no other aspect will be so important a determinant of their success or failure. Management is further discussed in Chapter VII.

The organizational and operating problems of the transport, marketing and other productive boards are similar to those of the boards engaged in commodity production. Those of the regulatory boards differ. Careful studies are needed of both types of bodies, with respect both to their internal organization and procedures and to their direction and administrative relationships to other agencies. In some cases the chapter of this report dealing with a given field makes recommendations concerning the direction, organization and operation of the government board or boards operating in it.

D. PROBLEMS OF PLANNING, REPORTING AND EXPEDITING

Successful administration of any agency requires that the top executive be informed concerning the relationship between the agency's goals and those of related organizations, the degree to which the agency's work is progressing satisfactorily toward those goals, and the need for special attention to problem areas of the agency's work. In any large agency, special arrangements are necessary to accomplish this most effectively.

In agencies carrying out a changing program rather than merely a continuing operation, such arrangements are especially important. This will be true of almost every agency of the Union Government during the period of the development program. Specific arrangement is necessary within each agency for planning, reporting and expediting.

In Chapter V it was emphasized that planning of specific projects and programs must typically originate in the operating agencies rather than in the Ministry of National Planning or any other central body. The formulation of an integrated program must be a process of mutual fertilization, stimulus and adjustment between the planning agency and

the operating agency. Each operating agency must "feed" ideas and information to the central planners. Without such aids, central planning soon becomes sterile and unrelated to actual conditions "on the front line" of the work of Government. Conversely, each operating agency must receive from the central agency a clear understanding of the role of its work in the over-all plan. Without it, cooperation in executing programs is not as effective as is possible.

It was also pointed out in Chapter V that expediting by the Economic and Social Board must not enter within the operating agencies; expediting within the agency must be done by the agency itself. There are several good reasons for this. In the first place, the staff of an implementing ministry or development corporation will commonly know much more about one of its projects than will anybody in the central planning or coordinating groups. Secondly, the operating agency will be legitimately resentful if there are unsolicited intrusions in matters which are properly within its jurisdiction. Third, in addition to the resentment generated, interference within the area of responsibility of an implementing agency weakens energy and initiative and is apt to retard the solution of the problems which required the expediting action.

The top official of each government ministry, department or agency will, of course, be responsible for both planning and implementation. The first requirement for effectively carrying out this responsibility is capable people and proper organization and procedures throughout the agency. The principle of the administrative pyramid has been discussed.

The second requirement is effective assistance by one or more officers or groups who are in a "staff" rather than a "line" relationship to him; that is, who are direct advisers to the head but without administrative responsibility or authority over operating units. Each agency should have at least one such planning and implementation officer and unit under him. The officer should be attached administratively to the secretary, in the case of a ministry, or to the chief executive officer of the government agency concerned. He should be strictly a staff adviser, having no executive authority in his own right; any other arrangement would tend to blur responsibility and accountability by interfering with the prerogatives of the line executives whose job is the actual execution of programs and projects.

His planning function should consist not merely of initiating project plans, but also in translating, in terms of the work of his agency, the Government's over-all plans, and in making continued adjustments in the agency's plans in the light of changing conditions. His planning should be solidly based on the factual data gathered and analyzed by the research

and statistics section of the agency, which he should direct.

He should develop and maintain a progress reporting system. This should show the status of each major program, of all the projects composing it, and of the component elements of each project, all in relation to pre-established time schedules. Where programs, projects, or parts of projects are falling behind schedule, he should attempt to discover the reasons, and should recommend corrective measures. Where performance is ahead of schedule he may make recommendations for advancing the schedule or for shifting resources to other programs or components of programs which are lagging. Thus the planning and expediting functions merge.

It is extremely important that expediting staff avoid issuing orders or edicts. Informal personal contacts, conferences and brief memoranda will be the principal tools. Any orders which the expeditors may consider necessary should be issued by one of the heads of the agency concerned; the expeditors must not constitute separate lines of authority reaching down into units.

The expeditors should, in the course of dealing with actual cases, recommend administrative improvements which will prevent the recurrence of the problem. This is the most important aspect of an expeditor's job; preventing recurrence of failure by administrative improvement multiplies his effectiveness many-fold.

E. OTHER GENERAL PROBLEMS

1. PERSONNEL TRAINING, RECRUITMENT AND MANAGEMENT

The pervasive shortage of trained and experienced administrators and specialized workers, mentioned repeatedly throughout this Report, is as acute in government administrative agencies as elsewhere in the economy. The needs of the development program require early and large increases in the staffs of a number of key ministries. Analysis, as previously recommended, of the internal organizational structure and procedures of the several ministries is bound to involve estimates of the number and kind of personnel necessary to execute efficiently the responsibilities assigned. Analyses should provide quantitative appraisal of the personnel needs of the several ministries and of the Government Executive Department as a whole. Somewhere the necessary trained and experienced people must be found.

a. Training

The problems of training specialized workers for government service are similar to training problems for any other organization. Such problems are

discussed in Chapter VII. One special type of training should, however, be instituted: training in public administration itself. To this end the University of Rangoon (and Mandalay College if maintained as a four-year college) should establish a public administration curriculum including courses to teach the role of the Union Government in the economy, the purposes of the development program and the requirements for its success, the principles of government organization and operation, public personnel administration and similar matters. The Ministry of Home Affairs, either independently or in appropriate circumstances in collaboration with the University, should conduct public administration in-service training and research available to suitably qualified personnel of all public agencies. In addition, scholars and officials should be sent abroad for postgraduate public administration studies and practical observation.

In the Government as elsewhere, in-service training can contribute greatly to efficiency. The worker who is plunged into a job without understanding its relationship to the over-all work of the agency or to other jobs is not effective as he might otherwise be. Further, the worker's effectiveness is increased if he is offered a means of preparing for promotion as he works. In-service training of both types should be introduced. A Center for Training Aids is recommended in Chapter VII. Its services should improve the effectiveness of orientation and in-service training throughout the Government.

b. Recruitment

There should be well-defined and well-publicized avenues into the public service. Yet the majority even of educated Burmese seem to have slight knowledge of routes into a public service career. The Ministry of Home Affairs should, therefore, regularly publish and disseminate bilingual cumulative announcements of all vacancies, the qualifications needed and procedures for applying. Through arrangements with the Director of Posts, these announcements should be exhibited in post offices throughout Burma. The Ministry of Home Affairs should also collaborate with the Ministry of Information to issue and widely distribute a readable and attractive bilingual pamphlet describing opportunities in Burma's public service and steps necessary to qualify for positions.

Every effort should be made (*a*) to encourage promising young people to aspire to government service, (*b*) to guide them in taking appropriate training, and (*c*) to make sure that, once they are properly qualified, they can, without hindrance or undue "red tape," receive public service appointments. To this end the Ministry of Home Affairs and the

Ministry of Education should cooperatively foster the establishment of guidance programs at high schools, technical institutes, Mandalay College and the University of Rangoon, with the object of interesting promising students in public service careers and of counseling them in respect to proper training for such careers.

In addition, Government should study the need over the next few years for temporary foreign personnel and should develop more systematic means for recruiting such people. An important function of such experts should be to teach the maximum number of Burmese to understudy their work and to perform specialized jobs; this function should be stressed in recruiting such experts.

c. Conditions of Work: Salary Scales

Success in recruiting personnel depends in part on the conditions of work to which people are being recruited. The desirability of in-service training has been mentioned. The general atmosphere of work, discussed in Chapter VII, is as important in Government as elsewhere. There are other questions. Are government pay scales adequate to attract and to keep in Government desirable personnel of the capabilities desired? Are existing personnel practices such as to encourage the most able staff members to exert themselves to the fullest extent of their capabilities in the search for monetary rewards or promotion? Without intensive study of such questions, a few general observations can be made.

The time would seem to be long overdue for adopting pay scales adequate to meet the existing cost of living of government employees. Present salary scales are too low to attract and to retain in government service people of the desired qualifications and abilities, and a general pay increase throughout the government service would seem to be in order. This recommendation is made with due consideration of the desirability mentioned in Chapter III of limiting current government expenditures. A salary increase is an expenditure which it would be wasteful not to make. The caliber of government workers of some types and grades is low because even at the reduced level of private activity the best workers find it possible to obtain positions in private industry paying much higher salaries; many leave government service to accept them.

In considering such a general pay increase, it must be kept in mind that the most significant services are those performed by officials at the upper end of the civil service ladder. These highly responsible officials, plus those in the ranks next below, merit increases just as much as do those at the lower end of the salary scale. Reaction against the top civil service

salaries under the British regime, which were based upon British living standards and were believed excessive, plus the financial crisis of 1948-49, have caused a reduction in top-level salaries to much below the prewar level in spite of the several-fold increase in living costs since before the war. Even though the top salaries may have been adequate, the reduction of 75% or more in purchasing power is conducive to inefficient administration and is contrary to the public interest.

Consideration of a general salary increase throughout the government services should be linked with investigation of the extent to which standards of performance may be raised, more efficient workers employed, and currently employed inefficient personnel released. Many government positions are of such a nature that the actual work accomplished per day varies tremendously, depending on the efficiency of workers. An inefficient typist or clerk, even though paid a low monthly wage, is a very expensive employee. In many posts, the work would be done at considerably lower cost to the Government if the salary paid were higher. A study of the possibility of increasing efficiency would be necessary in order to estimate the increase in expenditures which would be required by a general wage income.

One road to increased output per worker should be lengthened hours of work. Presumably, the higher the productivity in an economy, the larger the share of time which can be afforded for leisure and the shorter need be the number of hours devoted to labor. Yet in none of the higher productivity countries of the world is it deemed feasible to afford as short a work week in government employment as is the practice in Burma. This practice like others referred to above is apparently a colonial practice, which an independent nation striving for an increased level of living cannot afford. Effective institution of a longer work week, at the time of a general pay increase, could offset a considerable share of the cost.

Improved office procedures, discussed below, could also offset the cost of a pay increase.

d. Personnel Management and Administrative Management

A central personnel management staff and a central administrative management staff (often combined) are accepted parts of the government structure of most countries. Their effectiveness depends on the degree to which their work is integrated with the execution of the current work and problems of the operating agencies. The planning-reporting-expediting unit recommended in previous paragraphs for each agency would in effect constitute an administrative and personnel management unit oriented

toward the solution of pressing current problems. Similarly, the expediting staff of the Economic and Social Board, discussed in Chapter V, would constitute a central administrative management staff. The improvement of procedures and organization to prevent recurrence of problems and to increase the efficiency of work is one of its central functions. The need for administrative talent and experience in administrative analysis must be recognized in selecting its staff. The staff should not be thought of as merely an *ad hoc* group meeting emergencies.

2. OFFICE PROCEDURES

It seems clear that considerable improvement in operating efficiency could be effected throughout Government by introducing improved office equipment and methods. Typewriters, calculating machines, card files, billing and posting machines and similar equipment could be effectively used in many places where they are not now used, and would be a source of economy. Modern files and filing systems should be introduced. The various steps required in the work of each office should be analyzed, and office layouts and procedures arranged in such a way as best to facilitate the logical work flow. Progress in these matters will make for a more effective utilization and conservation of staff as well. A centralized pool of four or five messengers in a building for example, could serve fifteen individual officials fully as well as fifteen individual peons sitting outside their individual doors to respond to the occasional call of a bell, and could do so at far lower cost.

3. STATISTICS, ACCOUNTING AND REPORTING

The Preliminary Report stressed the importance of well-selected, comprehensive, reliable and timely statistics as an indispensable tool in the planning of economic development programs and their execution. It suggested the need for continuous effort to improve the statistical data available in Burma. It also stressed the benefits of full public reporting and financial accounting throughout Government. These recommendations continue to be of great significance to the effective organization and administration of the economic development program, and continuing efforts should be devoted to these problems.

F. THE PRIVATE AND MIXED SECTORS OF THE ECONOMY

Examination of how Government can improve organization and administration best to promote the execution of the economic development program must take into account what Government can do to improve the scale and efficiency of economic activity in the private and mixed sectors of the economy.

Although the Government must plan for all economic activity, it will not wish to plan all economic activity. It will certainly not wish to conduct all economic activity. Private enterprise, in the form of the individually owned business, the partnership, the corporation and the cooperative will exist and function. It will undoubtedly be dominant in many important sectors of the economy, such as agriculture, trade, various services, and small-scale or cottage industry; its participation will be desired in many other areas as well. Progress toward economic development goals will be facilitated if that significant part of total economic activity which is conducted in the private sector operates more efficiently than is presently the case. The same is true of public-private joint ventures.

The responsibility for achieving efficiency in private and mixed public-private enterprises rests in the first instance with the individual enterprises concerned. They must make a determined effort to modernize their equipment and production methods; to keep up with the latest techniques; to develop better labor relations; to provide better incentives to workers; to aim at larger sales volume and lower profits per unit; to improve their record-keeping and accounting, and analyze their costs; to develop the art of salesmanship; and to give better service to the public.

1. GOVERNMENT ASSISTANCE

Nevertheless, there are a number of ways in which Government can and should render assistance to such enterprises. Examples include the provision of cheaper fuel and electric power, and of improved transportation and communication facilities; the development of natural resources and basic industries to provide a greater variety of cheaper raw materials; the fostering of adequate and low cost credit; the provision of research and technical assistance; the elimination of unnecessary restrictions on business activity; the more expeditious treatment of business matters where restrictions or regulations are necessary; the establishment of standardized weights and measures; the provision of incentives to new investment, through the tax instrument and by other means; the inauguration of training programs to develop skilled technicians and workers; and, above all, the creation of an atmosphere of security and confidence.

Government should also, to the extent necessary, regulate private and mixed enterprises to insure that they operate in a manner conducive to the general welfare. Such regulatory activities will apply to minimum wages, healthful working conditions, collective bargaining, satisfactory and honest quality standards, truthful advertising, uniform and reliable

weights and measures, competitive pricing, reasonable profits and the like. In a great many cases Government can better serve the general welfare by playing the role of umpire, by establishing the rules under which private production may be conducted, and by fostering the development of institutions which can assist producers, than by itself engaging in production.

2. CLARIFICATIONS OF GOVERNMENT POLICY

It has become clear that in a significant number of instances potentially desirable private economic activity has not been undertaken because the individuals or firms concerned were in grave doubt as to Government's policies in a number of matters. In some cases the chief question was whether Government would eventually nationalize the project concerned if it were undertaken. In others the question was whether Government would set up a competitive plant in the same field. In still others it was whether Government had sufficient interest to facilitate private development by granting visas for the technicians who would be necessary from abroad, by granting import licenses for the equipment that would be required, or by similar measures. Hesitations, doubts and fears of this kind have apparently deterred much new investment and resulted in lower levels of output, production, income and welfare than would otherwise have been the case.

In view of the many declarations which have been made in the past with respect to the industrial policy of the Government, beginning with the Constitution of 1948 and continuing through those declarations contained in the Two-Year Plan of 1948, the statements of the Prime Minister on June 14, 1949, and September 29, 1949, and in the resolution of the Economic Council in 1949, it may be asserted that private enterprisers have been afforded a clear statement of Government's position on these questions and should have no real doubts about them.

In spite of these statements, doubts do exist. Their existence suggests the need, first of all, for a restatement of the 1949 Resolution on Industrial Policy. This would be desirable for several reasons. The Resolution was adopted more than three years ago. Conditions have changed greatly in the meantime. The Resolution related primarily to foreign capital, but does not cover the important question of steps to mobilize indigenous capital. It is concerned only with industrial development and does not consider the encouragement of private and mixed public-private development in agriculture, trade, and other fields. Finally, it related primarily to the starting of new enterprises; only by implication does it refer to the need for encouraging expansion and

modernization of existing enterprises. A restatement of the policy, expanded in scope as indicated above, and made as specific as possible, should be prepared. It should be disseminated widely both at home and abroad.

Such a restatement will not, however, be sufficient to allay fears and stimulate private investment. This effect can be achieved if Government will not only reaffirm and clarify its policies, but will also give evidence and assurance by its actions that it intends to implement these policies vigorously. Thus, the several government ministries and departments must be given to understand not only what are the Government's policies in this area, but how each agency and department of the Government is expected to contribute to the implementation of these policies.

In the area of new industrial development, for example, experience has shown that such specific practical questions as the following will be asked:

(1) How will *security conditions* affect location of the proposed factory? How will they affect sales as well as the smooth flow of raw materials?

(2) Can one get agreement from Government as to *non-nationalization* of the proposed plant for an agreed-upon period of years? Through what channels? How can necessary papers be expedited?

(3) How does one get prompt, responsible assurances as to freedom from *government competition* (especially on a non-full-cost basis) for a definite time?

(4) How will the proposed enterprise be affected by income, sales or other *taxes*? With whom may one discuss these points to obtain advance estimates necessary to help decide whether to establish the proposed enterprise in Burma?

(5) How does one go about requesting Government *loan or equity capital* participation? Does one apply in the first instance to the Industrial Development Corporation or to the Ministry of Industry? Are there forms to be filled in? Before one goes to the time and trouble to draw up a detailed application, with whom may one discuss the matter firsthand? Who actually makes the decision?

(6) In the case of a *joint venture or management contract*, what *terms* is Government likely to desire? Which responsible Government officials should one see for preliminary discussions?

(7) How can one without undue delay obtain *import licenses* for raw materials and equipment?

(8) If one can show that tariffs on raw materials or component parts are higher than on the corresponding finished articles, can one get *tariff relief* as an encouragement to manufacture finished products within Burma? Is there any quick standard procedure?

(9) Can one get assurance of *visas* for required foreign technical personnel? How can one avoid delays, sometimes of many months, in obtaining such visas?

(10) Can one determine in advance what proportion of

their *salaries* it will be proper for candidates for such technical positions to *send home*? How?

(11) How, in cases where the enterprise is to be in whole or in part foreign capitalized, can one get a determination of the percentage of the proposed factory's *profits*, after taxes, *to be remitted abroad*?

(12) Where foreign participation is contemplated, may the foreign group send representatives to Burma for an *on-the-spot survey*?

Nobody would wisely establish or expand an industry in Burma without obtaining official determinations on such matters as listed above. In addition, any enterpriser is likely to face other problems on which Government can provide assistance. For example, Government should constantly be collecting, for a variety of industries, data on the following: markets; labor; raw materials; suitable technical processes; plant cost and amortization rate; and income, sales, and other taxes. Government should make such information freely available to indigenous and foreign enterprisers who are contemplating establishing plants in Burma.

If the Government wishes to expedite private investment in certain fields, it would be desirable to establish an "Investors' Bureau," with which a prospective investor can communicate or to which he can go in person to determine what the Government's general policy is concerning the field in question, and to learn where he must go to obtain answers to various questions such as those stated above, and what he can do to obtain prompt replies and decisions. Such an agency would be most effective if it aided the applicant in obtaining expeditious treatment of his problems by the appropriate ministries, and attempted to coordinate their consideration by, for example, aiding in speeding action by a ministry whose consideration was causing delay. The Bureau would of course have no administrative authority. Since its functions would be inter-ministerial, perhaps organizationally it might most appropriately be attached to the Economic and Social Board.

If the Government makes clear that it is not, in principle, hostile to private economic activity in spheres which Government has not reserved to itself, and if it indicates further that it welcomes the contributions which private economic activity can in the non-reserved sectors make to the economic development of the country (providing, of course, that the private activity is conducted in accordance with clearly established rules set up by Government to protect the general welfare), it may be anticipated with confidence that private economic activity will increase in volume and in efficiency. If so, it will contribute in major degree toward the realization of economic development goals.

G. SUMMARY OF RECOMMENDATIONS

MINISTRIES

(1) A thorough study of the responsibilities of the several ministries should be undertaken with a view to consolidation of responsibilities into a smaller number of ministries.

(2) The ministries should be internally reorganized so that in each case the minister and secretary will be at the head of a pyramidal structure with straight lines of command running from top to bottom.

(3) Each minister (or each one significantly concerned with the development program) should be provided with a deputy who will act for him when he is absent and who will shoulder some of his administrative load when he is present.

DEVELOPMENT CORPORATIONS

(4) The development corporations should be organizationally outside of the ministries, and should enjoy complete freedom in respect to day-to-day decisions. In respect to broad policy only, each may appropriately report to a minister.

(5) The development corporations must be bold and imaginative, willing to risk some errors for the sake of action. Bureaucratic caution is out of place.

(6) The development corporations should be delegated power to raise and to employ substantial sums of money before being required to obtain further financial authority.

(7) The internal structure of the development corporations should be carefully patterned in the light of sound principles of public administration.

(8) Staffing plans, to include locally available personnel plus such temporary foreign consultants as may be initially required, should be formulated for achieving early and significant increases in the staff available to the development corporations.

(9) To initiate new production or other projects, the development corporations should establish subsidiary public corporations, organize joint ventures, or employ other indirect means; they should not directly establish or operate such projects.

(10) Preferably through separate divisions established for the purpose, the development corporations should, to the extent indicated by basic government policy, encourage the establishment of new private as well as joint-venture and public enterprises, and the modernization and expansion of existing enterprises.

(11) For improved administrative efficiency, existing government production boards should be attached to, and made subsidiary to, the appropriate development corporation.

OTHER GOVERNMENT CORPORATIONS AND BOARDS

(12) Each existing government transport, marketing and regulatory board should be carefully studied from the point of view of its internal organization and procedures and its administrative relationships to the ministries with which each is affiliated.

GENERAL PROBLEMS

(13) The operating procedures and personnel requirements of each government agency should be reviewed. In many cases revision in office procedures is desirable.

(14) Every major executive agency of the Government should have a planning, progress reporting, expediting, and administrative improvement officer or unit attached in a staff capacity directly to the secretary or comparable executive, to initiate plans and integrate the agency's plans with the over-all program of the Government, to maintain progress reporting systems, to recommend measures to break bottlenecks retarding specific projects and to recommend administrative improvements designed to prevent the same delays from recurring.

(15) To expand and improve the training of public servants in Burma, courses in public administration should be established at the University of Rangoon (and at Mandalay College if maintained as a four-year college); the Ministry of Home Affairs should conduct public administration in-service training and research; and state scholars and mature government officials should be sent abroad for public administration study and practical observation.

(16) The Ministry of Home Affairs should regularly publish and disseminate bilingual announcements of all public service vacancies, the qualifications needed and procedures for applying; these should be exhibited in post offices throughout Burma. The Ministry of Home Affairs and the Ministry of Information should publicize the opportunities provided by government service.

(17) The same ministries should cooperatively foster the establishment of guidance programs at high schools, technical institutes, Mandalay College, and the University of Rangoon, with the object of interesting promising students in public service careers and of counseling them in respect to proper training for such careers.

(18) To stimulate recruitment and retention of qualified personnel, public service pay increases should be instituted.

THE PRIVATE AND MIXED SECTORS OF THE ECONOMY

(19) With the aim of clarifying its attitude toward private and mixed public-private economic

development, the Government should restate the 1949 Resolution on Industrial Policy. The restatement should make specific reference to the role of indigenous as well as foreign capital; should include private and public-private agriculture, trade and other fields; and should include existing as well as new enterprises.

(20) The major stimulus to desired private investment (including private participation in joint ventures and other mixed enterprises) must be action by the Government in rendering decisions concerning the

many questions to which a prospective investor must have answers before he will feel assured that he can safely proceed. To expedite such action, the establishment of an Investors' Bureau to give information to prospective investors and to guide them to the appropriate officials is desirable.

(21) Other recommendations concerning personnel training, pertinent to government agencies as well as to other organizations in the economy, are made in Chapter VII.

CHAPTER VII

MANNING THE PROGRAM

A. THE PROBLEM OF SPECIALIZED MANPOWER

1. SPECIALIZED MANPOWER THE CRITICAL FACTOR

In terms of numbers of workers, Burma's manpower resources are more than adequate for meeting the requirements of the development program. Indeed, the fuller employment of labor is one of the broad objectives of the program. However, another and more profound objective, the employment of labor in a continuously more productive manner, will involve a serious manpower problem, in many ways the most serious economic problem to be faced for many years to come.

Burma possesses the other basic requirements for rapidly increasing output per worker employed: the adequacy of her natural resources in relation to the population and her ability to procure the necessary capital goods abroad. The situation is not as fortunate with respect to the third major factor, specialized manpower. The economic development program will generate needs for specialized types of manpower now either non-existent or very scarce in Burma. These include many kinds of professional personnel, technicians, skilled workers, managers and administrators. These persons will be needed throughout the economy, and especially in the fields of transport, communications, industry, power, mining, construction, irrigation, health, education and government. While the required number of persons of specialized skills and abilities will not be great in many of these sectors, it will in the aggregate be considerable, particularly in relation to the number of such persons presently available. It is this present and anticipated lack of specialized personnel which constitutes the critical manpower factor and the greatest obstacle to the development program.

The contribution which is made by specialized manpower—by managers and administrators, by scientists, engineers and other professional personnel; by skilled technicians; and by skilled workers goes far beyond their individual roles in the productive process. Their importance lies even more in their ability to promote the productivity of other workers. The scientist in the medical research laboratory who develops a cure for a widely prevalent disease contributes thereby to the health and productivity of the

entire labor force. The instructor in a technical or vocational training school who trains hundreds of machinists over a period of years makes a tremendous contribution to productivity and output in a number of industries dependent on such skills. The production superintendent in a factory who organizes and directs the work processes of a thousand workers with much higher efficiency than previously prevailed, contributes in effect the equivalent of the output of a great many additional workers. Such examples, which could be endlessly multiplied, illustrate the tremendous importance of skilled manpower resources and dramatize their significance to the economic development program. Unless the needs for such persons are appreciated in their full significance, and unless adequate steps are taken to assure their availability in time, the fulfillment of the development program itself within the time contemplated will not be feasible. While skills and special abilities can be imported, it will not be feasible or desirable to meet more than a small part of the total needs for specialized manpower in this way. A major effort will be needed, therefore, to develop the necessary personnel within Burma.

The treatment of the problem of specialized manpower resources in this chapter relates to every segment of the economy and not just to the specific projects which are recommended in the Report. The analyses and proposals apply to agriculture as well as to industry. They apply to existing enterprises as well as to new projects. The achievement of the aggregate goals of the development program rests necessarily on the assumption that improved methods, greater know-how, and better organization will gradually be applied throughout the whole economy. The problem of providing the specialized personnel who are the key to improved practices has, therefore, a very broad and general application.

Succeeding sections of this chapter will deal with this critical manpower problem in its several aspects: existing manpower resources, the requirements of the development program for specialized skills, and ways and means of satisfying those needs and increasing labor productivity in general. A special problem and the most difficult of all—that of top-level management—is dealt with separately in the concluding section.

2. EXISTING MANPOWER RESOURCES

The manpower resources in Burma were described in Section I of Chapter I. The known facts can be summarized briefly. Of an estimated population of 19 million persons in Burma about 45% some 8.5 million—may be considered workers, i.e., members of the labor force. As compared to Southeast Asia generally, the population and labor force in Burma are small relative to land area and the country's resources. The bulk of the population, and therefore of the workers, is located in the broad southern deltas and in the main river valleys from the deltas northward to the region of Mandalay. Limited concentrations are also found in the deltas around Akyab and Moulmein. This river valley and delta population is predominantly rural and widely dispersed. This is even more the case with the remainder of the population inhabiting the horse-shoe of hills which surrounds the central region. The migration into towns which has accompanied war and insurrection has not altered significantly this basic pattern. The industrial work force which mans the few existing modern industrial enterprises is concentrated in Rangoon, and to a lesser extent in Mandalay and Moulmein.

About 5% of the population and a somewhat higher percentage of the labor force is composed of non-indigenous races—primarily Indians and, to a lesser degree, Chinese. In the past the proportion of non-Burmese workers participating in industry, commerce, transport and administration was higher than for Burmese workers. This was true of jobs at both ends of the economic scale. At the bottom of the scale this had the result of sparing the Burman from some of the least desirable jobs. At the top, the result was relatively little training and experience for the Burman in the tasks of an advanced economy. Now, both deliberate policy and prevailing attitudes assure that opportunities will be granted to indigenous races to overcome any handicap suffered in the past.

No recent comprehensive data are available describing the composition of the labor force according to workers' occupations or according to the industries in which they are employed. Occupational data will have to await the completion of the present census operations. Industrial employment data must await more complete coverage by the Directorate of Labor monthly surveys. The types of skills possessed by the population have received little statistical attention. The best available description of the Burmese labor force in terms of any of these three interrelated characteristics—occupations, industries, skills is found in the 1931 census. The distribution of workers in that year according to a combined industry-occupational classification is shown in Table VII-1.

TABLE VII 1

DISTRIBUTION OF WORKERS IN BURMA BY MAJOR CENSUS CLASSIFICATION, 1931

<i>Major Census Classification of Workers</i>	<i>Total Number of Workers (in thousands)</i>	<i>Percentage of Workers in Each Group</i>
Exploitation of Animals and Vegetation	4,321.3	69.6
Ordinary Cultivation	4,009.1	64.5
Special Crops	118.6	1.9
Forestry	52.7	.9
Animal Raising	79.9	1.3
Fishing and Hunting	61.0	1.0
Exploitation of Minerals	21.9	.3
Exploitation of Petroleum	17.6	.3
Industry (including Cottage Industries)	664.4	10.7
Textiles	233.2	3.7
Sawyers	21.3	.3
Metals	21.6	.3
Ceramics	13.5	.2
Chemical Products	18.5	.3
Rice Processing	63.3	1.1
Other Food Industries	78.2	1.3
Articles of Dress	60.0	1.0
Misc. Construction and Wood Crafts	101.5	1.6
Misc. Industry	53.3	.9
Transport	222.0	3.5
Water Transport	73.7	1.2
Roads and Bridges	35.0	.5
Road Transport	80.5	1.3
Rail Transport	27.8	.4
Other	5.0	.1
Trade	557.4	9.0
Banks, Insurance, Brokerage, etc.	13.2	.2
Textiles	18.8	.3
Wood (excluding firewood)	14.9	.2
Trade in Foodstuffs (incl. petty trade)	446.7	7.3
Other	63.8	1.0
Public Administration	49.9	.8
Professions and Liberal Arts	199.0	3.2
Religion	128.3	2.1
Medicine (incl. unregistered healers)	29.1	.5
Instructors	20.7	.3
Arts, Sciences, Entertainment, Astrology, etc.	20.9	.3
Domestic Service	44.7	.7
Miscellaneous	118.1	1.9
Grand Total	6,216.3	100.0

Although considerable changes have occurred since 1931 and the total labor force has increased, its composition as shown above no doubt remains essentially the same. It is dominated by peasant farmers, petty traders and handicraft workers. Although some of these workers possess a high order of skill, their skills are oriented to traditional and primitive methods of production. In the fields where modern enterprises, rice-milling and mining have been introduced the Directorate of Labor in June, 1951, accounted for only some 40,000 permanent workers in 475

TABLE VII - 2

NEW SKILLED MANPOWER REQUIREMENTS, PLANNED PROJECTS CLASSIFIED
BY TYPE OF WORKER

*(Cumulative)**

	1953 54	1954-55	1955-56	1956 57	1957 58	1958-59	1959-60
Managerial and Supervisory							
Construction	382	484	583	554	516	472	454
Maintenance and Operation	0	47	135	351	456	510	583
Total	382	531	718	905	972	982	1,037
Professional							
Construction	430	525	580	585	554	508	496
Maintenance and Operation	0	20	50	103	145	159	192
Total	430	545	630	688	699	667	688
Sub-professional							
Construction	1,224	1,660	1,892	1,952	1,761	1,637	1,599
Maintenance and Operation	0	48	114	288	409	451	517
Total	1,224	1,708	2,006	2,240	2,170	2,088	2,116
Carpenters							
Construction	754	1,135	1,191	872	843	634	574
Maintenance and Operation	0	38	78	139	169	200	211
Total	754	1,173	1,269	1,011	1,012	834	785
Masons							
Construction	268	388	401	314	289	240	228
Maintenance and Operation	0	16	29	55	71	80	92
Total	268	404	430	369	360	320	320
Electricians							
Construction	378	553	546	456	435	400	420
Maintenance and Operation	0	31	124	267	361	442	509
Total	378	584	670	723	796	842	929
Machinists							
Construction	108	161	166	149	143	131	116
Maintenance and Operation	0	8	19	44	50	60	65
Total	108	169	185	193	193	191	181
Mechanics							
Construction	440	645	705	640	660	627	559
Maintenance and Operation	0	47	90	176	228	262	296
Total	440	692	795	816	888	889	855
Pipe Fitters							
Construction	313	518	576	517	516	460	439
Maintenance and Operation	0	16	33	61	75	98	121
Total	313	534	609	578	591	558	560
Foundry Workers							
Construction	93	146	152	146	151	147	144
Maintenance and Operation	0	8	18	37	45	51	61
Total	93	154	170	183	196	198	205

TABLE VII - 2 (contd)
(Cumulative)*

	1953 54	1954 55	1955 56	1956 57	1957 58	1958 59	1959-60
Smiths							
Construction	173	270	293	285	270	240	237
Maintenance and Operation	0	24	59	105	136	169	199
Total	173	294	352	390	406	409	436
Power Plant Operators							
Construction	124	209	219	202	196	172	171
Maintenance and Operation	0	11	22	71	81	109	132
Total	124	220	241	273	277	281	303
Processing Plant Operators							
Construction	0	0	0	0	0	0	0
Maintenance and Operation	0	25	122	522	560	700	705
Total	0	25	122	522	560	700	705
Drivers							
Construction	1,648	2,578	2,738	2,642	2,551	2,340	2,324
Maintenance and Operation	0	305	446	759	939	1,011	1,127
Total	1,648	2,883	3,184	3,401	3,490	3,351	3,451
Miscellaneous Skilled Workers							
Construction	135	229	241	208	235	208	205
Maintenance and Operation	0	22	80	211	274	318	339
Total	135	251	321	419	509	526	544
Total Skilled Workers							
Construction	6,470	9,501	10,283	9,522	9,120	8,216	7,966
Maintenance and Operation	0	666	1,419	3,187	3,999	4,620	5,149
TOTAL	6,470	10,167	11,702	12,709	13,119	12,836	13,115

*Figure for each year represents total requirements above 1952-53 level; figures for successive years are not additive.

establishments, which probably represented most of the larger ones. Even in the most advanced of these enterprises the technology typically has been kept as simple as possible, with an emphasis on brawn rather than skill for the great mass of the workers. The number of skilled personnel and their standards has always been very limited. Certain critical skills are almost completely lacking. Primarily these are the skills requiring advanced training and experience and falling into two broad classes: leadership (managers, supervisors, administrators of public institutions), and technical "know-how" (engineers, scientists, economists, highly skilled workers).*

There is, however, a brighter side to the picture. A small nucleus of skilled workers does exist, which can be utilized to fill the most critical jobs at present

*These classes overlap, as the best leadership material may have a "technical" background, but not all technical people need be good administrators.

and to some extent to help train other workers. Literacy, which is necessary for maintaining administrative organization and for transmitting skills rapidly, is relatively widespread and increasing. There is no problem, for example, of staffing the large clerical civil service. According to the experience of large employers of labor, the Burmese national is adept at assimilating modern industrial skills.

The over-all situation, then, is one of a relatively under-developed labor force, but a labor force which possesses a potential for rapid upgrading.

3. FUTURE SKILLED MANPOWER REQUIREMENTS

In general there is no existing reservoir of unemployed skills nor, in the present state of economic activity in Burma, is there any considerable unsatisfied demand for skilled manpower. In the past ten years, emigration and the economic disintegration due to war and insurrection have depleted the ranks

of skilled workers, caused deterioration of skills through disuse and retarded the previous rate of training of new workers. These same factors have also decreased employment opportunities. At the present very low levels of both supply and demand of skills, any disparity between them is negligible for planning purposes, and the two may be assumed to be in balance. Attention should therefore be directed primarily to the magnitude and nature of future additional requirements, and to ways of meeting them. In exceptional cases of surpluses, such as those of skilled sawmill employees, the workers can be absorbed by existing plants including those which are now closed down, and the demand for such workers is not reflected in the following estimates, which are based on *new* investment.

Estimates of managerial, professional and skilled manpower required in the next seven years for projects in the fields of power, irrigation, industry, mining, transportation and communications specifically recommended in this Report are presented in Table VII-2 (*see p. 96*). The personnel required are shown by major work categories and by the sectors of the economy within which the projects fall. Requirements for workers who will construct plants and install equipment in them, and for workers who will subsequently operate and maintain the plants, are shown separately.

The requirements shown are for additional workers; workers who are presently employed in an enterprise which will execute one of the projects, and who will be available for work on the project, are not included. This is true, for example, on the Burma Railways, where only a fraction of the workers who will be needed on construction are shown on the table, because many workers presently employed by the Railways will be available.

For 1953-54, the requirements shown should be regarded as applying to the end of the fiscal year; materials and equipment will not be received in time to create demand for this number of workers before the year's end. For other years, the figures are annual averages.

The needs for skilled manpower resources will not be limited to those shown in Table VII-2, which reflect only the requirements for projects specifically recommended. Total investment in the various sectors of the economy will substantially exceed that in specifically recommended projects. It is necessary, therefore, to estimate requirements for skilled manpower which will reflect the needs generated by total investment in these sectors. Estimates have been made for the additional manpower requirements of each sector for the entire development program. While they have wide margins of error, they indicate the order of magnitude of the specialized manpower

TABLE VII - 3
NEW SKILLED MANPOWER REQUIREMENTS, ENTIRE DEVELOPMENT PROGRAM,
CLASSIFIED BY TYPE OF WORKER
(Cumulative)*

	1953-54	1954 55	1955 56	1956 57	1957-58	1958-59	1959-60
Managerial and Supervisory	692	851	1,128	1,375	1,502	1,532	1,657
Professional	730	855	1,000	1,098	1,149	1,152	1,203
Sub-professional	1,824	2,328	2,716	3,040	3,070	3,018	3,166
Carpenters	3,754	4,773	6,469	7,411	8,612	9,184	10,485
Masons	1,268	1,654	2,230	2,619	3,060	3,320	3,620
Electricians	578	794	950	1,053	1,176	1,242	1,379
Machinists	168	231	261	277	280	281	281
Mechanics	640	902	1,075	1,136	1,223	1,239	1,255
Pipe Fitters	513	744	889	908	971	978	1,010
Foundry Workers	128	190	218	238	253	258	274
Smiths	248	372	457	510	531	539	586
Power Plant Operators	164	262	297	337	344	356	383
Processing Plant Operators	5	30	129	528	568	708	714
Drivers	2,348	3,723	4,294	4,746	5,070	5,121	5,431
Miscellaneous Skilled Workers	210	331	426	539	634	656	694
Total	13,270	18,040	22,539	25,815	28,443	29,584	32,138

*Figure for each year represents total requirements above 1952-53 level; figures for successive years are not additive.

problem. They are shown in Table VII-3. As in Table VII-2, they include only the additional persons needed. Allowance has been made for workers of each type who are now at work. It is believed that virtually no workers possessing these skills are now idle and available to meet the need for added workers.

The most important general conclusion to be drawn from this table is that it will be virtually impossible to meet the requirements indicated for the next several years. By the end of 1953-54, about 700 added managerial and supervisory personnel will be needed, more than 700 additional professional personnel, more than 1,800 sub-professional, and more than 10,000 skilled workers. The number of workers needed is much greater than the number now in training. To meet the requirements for many skills it would be necessary to go back several years in time to begin training the workers. To meet those at professional and managerial levels, it would be necessary to go back six to ten or more years in time to begin directing students into nonexistent courses of study and to begin giving necessary experience to young businessmen.

The significance of this fact is that management, professional abilities and skills will be the limiting factor in the progress of the development program. Unspecialized manpower and natural resources are available. Skills, professional training and management and every possible device must be used to economize on them. Foreign experts must be used liberally; sub-professional workers must be used wherever possible, saving the time of professional workers for guidance, management and purely professional analysis; and training must be accelerated in every possible way.

B. MEETING THE PROBLEM OF SKILL AND KNOWLEDGE

Taking into consideration the estimates of specialized manpower needs in 1953-54 to 1959-60, the means for developing the professional, sub-professional and skilled workers required are discussed in this section. Because of a number of special problems involved, meeting the need for top-level management will be separately discussed in Sections D and E of this chapter.

1. PROFESSIONAL WORKERS

The estimated needs for additional professional workers were presented in Table VII-3. The largest single group is engineers, but architects, physical scientists in a number of fields, lawyers, economists, statisticians and others will be needed. The number required is much greater than the number available.

Only a small part of these needs can be met by

hiring foreign specialists. A maximum effort will be required to meet the remaining needs with indigenous personnel. Almost all professional workers require formal training at the University level, often including advanced study in Burma or abroad, or both.

a. University Training

Training at the University level is provided in Burma by the University of Rangoon with its affiliates, the University College at Mandalay and the newly opened Intermediate College at Moulmein, and the University for Adult Education. The latter has some 500 working people enrolled but the facilities for professional training are limited. The trends in registrations and the number of students completing work at the University of Rangoon, by major courses, for the past several school years are shown in Table VII-4.

TABLE VII - 4
UNIVERSITY REGISTRATIONS AND PASSES*

Course	Number of Students Registered			Number Completing Course		
	1950 51	1951-52	1952 53	1950	1951	1952
1. Intermediate (first two years for all students)	1,501	1,205	2,903			
2. Intermediate, Mandalay	244	413	504	499	588	755
3. B.A.; B.A. (Honors)	437	394	486			
4. B.Sc.; B.Sc. (Honors)	230	266	310	152	251	264
5. B.A.; B.Sc., Mandalay	45	59	79			
6. M.A.	68	102	126	8	12	11
7. M.Sc.	6	52	36			
8. M.B.; B.S.†	580	530	657	19	26	29
9. B.Sc. (Engineering)‡	229	294	321	—	15	34
10. B.L.	198	224	226	49	43	45
11. B.A. (Ed.); B.Ed; Diploma in Teaching	57	96	128	23	30	64
12. B.Com.	75	69	101	11	32	23
13. B.Sc. (Agriculture), Mandalay	25	30	22	12	9	13
14. B.Sc. (Forestry)	14	28	42	—	—	—
Total	3,709	3,762	5,941	773	1,006	1,238

*The available classification of the student body at the University College at Mandalay is in two groups, which are shown separately. No data are yet available for the Intermediate College at Moulmein which was opened in June, 1953.

†Bachelor of Medicine and Bachelor of Surgery.

‡Approximately two thirds of the engineering registrations and passes were in civil engineering; the other third was in electrical and mechanical engineering.

The rapid increase in the number of University students, which is now equal to more than twice the prewar enrollment, is encouraging. Even more significant, in view of the different type of personnel required by the future Burmese economy, has been the postwar shift in composition of the student body in favor of professional studies. Within the professional field the number of law students, who in the past dominated the professional field, has been relatively stabilized, and increasing numbers are studying medicine, education and engineering. The fact that there are still almost twice as many students in law as there are in education and two thirds as many as there are in engineering suggests that further movement in this direction is desirable. The reallocation of the student body, however, can only meet a small part of the increased requirements of trained professional personnel.

It is plain from a comparison of Tables VII-3 and VII-4 that, in all professional fields, the number of students trained and graduated every year will have to be substantially increased. The existing training facilities, which are already over-crowded in many respects, cannot accommodate many more students. The sending of students abroad is largely for purposes of advanced training of university graduates, and properly so; the net number of university trainees will be only slightly augmented. It is clear, therefore, that university facilities within Burma, especially for training specialized personnel, will have to be expanded.

Along with the need for increasing the numbers of young people training for these professions, the quality both of the students and of the professional training itself should be improved. Improving the quality of students entering upon the professions is a task which goes back to the very beginning of the educational process, at the primary school level, and which continues through the middle school and the high school. The quality of instruction at these levels must be improved and the courses of study must be modified to prepare all young persons for modern living and working conditions and to prepare some of them for advanced university studies. Other aspects of this problem are treated in a section of Chapter XXIV dealing with general education and other social services.

Adequate financial assistance should be provided throughout the educational process in the form of scholarships and stipends for needy students of promise. It should be possible for all Burmese youths of ability, both male and female, to continue their studies until they have had all the education which their intellectual interests and capabilities warrant. Such development will not only prepare them for a

richer and more satisfactory life, but will also enable them to make a real contribution to the development of their country and people.

The problem of improving the quality of students in professional courses and of increasing their numbers as well has a forward-looking aspect also. More attractive rewards in the form of assurances of employment upon graduation and higher professional wage scales will have to be offered to prospective students to induce them to enter upon these fields.

In the natural course of events, these measures will induce many to seek professional education who are unqualified or who are not diligent students. Although existing facilities for such education should be greatly increased, they cannot be expanded indefinitely. Improvement in opportunities and rewards for professional education must be accompanied by positive steps to improve the selection of candidates for such education. Qualification for university work cannot be adequately established by a single formal examination, subject to passing by "cramming." A more comprehensive system is needed for weeding out from would-be entrants those whose preliminary training records and references do not give promise of satisfactory future educational and professional performance. Students in attendance at the university should be required to meet rather severe criteria of performance as a condition of continued study.

It may be possible by a series of related measures to expand the training facilities of the university, democratize the opportunities for university education, and apply rigorous standards of selection to students applying for entrance to advanced professional studies. Establishment of a number of intermediate colleges in the large cities, which would offer instruction only in the first two years of the university course, would provide an educational opportunity to many who are now deprived of it. It would also reduce the burden of elementary instruction at Rangoon, part of which is now inadvertently offered to students who are attending for reasons of social prestige, or who in any event are not qualified for studying further. The intermediate branch colleges could serve as training and testing grounds for advanced study, facilities for which could then be provided on a larger scale in Rangoon. Only the better graduates with acceptable grades and recommendations from the branch colleges would be admitted to the centralized "Upper Division" in Rangoon. For special reasons, advanced study in certain fields may be located elsewhere.

So far as improving the quality of university instruction is concerned, arrangements such as those already made between the University of Rangoon College of Engineering and the Massachusetts

Institute of Technology have produced encouraging results. Similar continuing arrangements for the training of local personnel abroad and for the provision of visiting instructors at the University of Rangoon should be made with other foreign universities in other fields, such as the natural sciences, agriculture, accounting, and statistics. Because of the more controversial nature of the social sciences, isolated exchanges with a series of foreign universities might be preferable in these fields of study.

b. Advanced Training Abroad

A continuing program of foreign study for qualified personnel is generally desirable because it assures that professional workers will be abreast of latest developments in their respective fields. It is especially

necessary in those fields for which adequate training facilities have not yet been developed in Burma. To the present, for example, no one has undertaken foreign study in public administration; a few selected students should be encouraged to study in this field. The program of state scholarships to meet these needs has become well established and is supplemented by deputation for training abroad of members of the public service and by scholarships granted under the auspices of the United Nations, Colombo Plan, US Technical Assistance Administration, British Council Fulbright programs, the Massachusetts Institute of Technology agreement, and others. The available data on the magnitude of some of these programs, which may be somewhat incomplete, are presented in Table VII-5.

TABLE VII - 5
DEPARTURES FOR STUDY ABROAD, BY COURSES OF STUDY, 1948 to 1953*

Course	1948		1949		1950		1951		1952		1953†		Total	
	State Schol- ars	Others	State Schol- ars	Others	State Schol- ars	Others	State Schol- ars	Others	State Schol- ars	Others	State Schol- ars	Others	State Schol- ars	Others
Civil Engineering	—	—	—	1	1	3	4	1	2	8	3	3	10	16
Mechanical Engineering	2	—	—	—	1	—	3	—	3	—	2	1	11	1
Electrical Engineering	6	—	1	1	1	—	—	—	2	—	1	—	11	1
Communications Engineering	4	—	2	—	—	—	—	—	—	—	—	—	6	—
Mining Engineering, Metal- lurgy, Geology	3	—	1	1	—	1	3	1	4	—	3	—	14	3
Marine Engineering, Naval Drafting	3	—	—	—	2	—	2	—	3	—	3	—	13	—
Aeronautical Engineering	8	—	1	—	—	—	1	—	—	—	2	—	12	—
Chemical Engineering, Chemistry	2	—	—	1	—	1	5	2	3	4	1	—	11	8
Physics, Meteorology	1	—	1	3	—	1	3	—	1	3	—	—	6	7
Medicine and related subjects	6	—	2	—	4	5	4	2	4	27	7	9	27	43
Marine Officers' training	4	—	—	—	3	—	5	—	1	—	—	—	13	—
Civil Aviation (pilots, control officers, etc.)	5	—	5	—	4	—	—	—	6	—	—	—	20	—
Textile Engineering	2	—	—	—	1	—	—	—	1	—	3	—	7	—
Agriculture and related subjects	7	—	1	—	2	2	3	2	5	4	3	—	21	8
Forestry	1	—	—	2	3	2	—	—	2	6	—	1	6	11
Education	3	2	—	—	—	8	2	9	4	8	2	—	11	27
Commerce and related subjects	2	—	3	—	1	1	2	1	3	5	4	—	15	7
History, Anthropology, Sociology	—	1	—	3	—	5	2	7	7	3	1	1	10	20
Literature	—	—	—	3	—	—	—	2	—	1	—	—	—	6
Economics	—	—	1	1	1	1	—	2	1	1	4	—	7	5
Others	6	—	4	1	3	7	2	9	7	16	8	16	30	49
Total	65	3	22	17	27	37	41	38	59	86	47	31	261	212

*Under each year, the figures in left-hand column represent state scholars departed; figures in the right-hand column represent departure for study abroad under all other training programs.

†Data for 1953 are known to be incomplete. Those for other years may also not be entirely complete.

Full data would undoubtedly show that the number of trainees sent abroad reached its highest postwar level in 1953. The further expansion of this program is strongly recommended. The loss of the services of even a few outstanding persons for a year or more, when there is a general shortage of competent personnel, represents large short-term sacrifices. However, it is well worth while from the longer-range point of view because the training and experience which such persons can acquire abroad enhances their value over many years.

A stage has now been reached when it is necessary to improve the foreign training program qualitatively as well as quantitatively. This is particularly important in the case of the state-scholarship system, which encompasses by far the largest number of foreign trainees. The most important aspects requiring attention are the selection of scholars, the determination of appropriate training programs, and the treatment of returned trainees. From the standpoint of the country's interests, it is important that a systematic method be established for the placement of such returned trainees in positions where their talents can be utilized most effectively.

The entire process of selection, programming, and placement of scholars may be much advanced by designating a specially trained educator as counsellor for this purpose and providing him with a small staff. The advanced studies counsellor would assist those presently responsible for the advanced training program abroad by canvassing promising graduates and other individuals to assure that the best qualified become candidates, by making a careful study of the qualifications of candidates, by advising on the most appropriate institutions and curricula for various courses of study, by arranging to keep in contact with the progress being made by students abroad, by obtaining full references on their achievements and ability on the conclusion of their training, and by assisting in channeling the trainees on their return into the positions for which they are best qualified. With the aid of such a permanent staff, the over-all planning of the foreign training program also could be improved. This would include systematic determination of the needs and priorities for types of personnel who require foreign training, full exploration of the many foreign and international scholarship opportunities available, and investigation of possibilities for on-the-job training to supplement and in some cases replace academic study.

c. Hiring Professionals Abroad

For some years to come, it will be necessary to engage a number of professional personnel from abroad to overcome domestic shortages and to help

train Burmese nationals. Some of these will continue to be provided through the United Nations and other technical assistance programs. Some will undoubtedly be brought in by firms to whom management contracts will be awarded, particularly in the industrial sector, while many other professionals may be engaged as individuals. Whereas until now a number of foreign experts have been engaged to study and evaluate particular problems and situations and to develop plans and programs for dealing with them, the foreign experts who will be required in the future will be needed increasingly for operating purposes, namely, to execute plans and to implement development programs. Such personnel will be required for substantial periods of time and will have to work closely with Burmese nationals on a day-to-day basis somewhere below the top policy level. In engaging these personnel, it should be kept in mind that the qualities needed involve more than high standards of professional competence and experience. These individuals should also have sufficient flexibility to adapt themselves to working conditions in Burma, and attitudes which are basically in sympathy with the aspirations of the Burmese people. Individual assignments and responsibilities should be closely designated, and organized plans should be made for the prompt orientation of such personnel upon their arrival in Burma, including the provision of necessary information, staff and facilities, so that they can make their maximum contribution during their period of service. Their use to train Burmese nationals in the process of their work in Burma is important.

2. SUB-PROFESSIONAL WORKERS

Table VII-3 shows that 3,166 additional sub-professional workers will be needed during the next seven years. In this group are included sub-engineers, surveyors, draftsmen, supervising mechanics and supervising electricians, who require a fairly considerable formal training, though not of the extended and costly university type. The fact that under proper supervision they can do a great deal of supervisory work which would otherwise need to be done by graduate engineers and other professionals lends a special importance to this group.

Existing training facilities for such personnel are concentrated in the Technical Institute at Insein. The prewar Government Technical Institute at Insein was re-established on a permanent basis in 1951 for the training of sub-professional personnel. It offers three-year courses in civil, mechanical, electrical and communications engineering and in civil engineering drafting. Because the Government Technical Institute is the only existing institution for the formal training of sub-professional workers, and because of the

extremely important role it must play in preparing such workers for the development program, a rather detailed discussion of the situation with respect to the Institute and its problems is appropriate.

The Technical Institute occupies several acres of land off the main road at Insein. It has a number of excellent buildings among which the main building, designed for lectures and laboratories, is outstanding. It has living accommodations in a separate building for some 130 students. With a slight degree of crowding, 150 second- and third-year students are presently accommodated. It is anticipated that the entering first-year class will add 110 to 120 new students. In addition to the buildings mentioned, there are also several workshops, three faculty houses and a number of storage and service buildings.

Instructional equipment and aids, both in the laboratories and in the workshops, are seriously lacking. The library is also seriously deficient. TCA had allotted \$190,000 for basic equipment requirements. However, since this program had not reached the stage of procurement at the time TCA aid was terminated, other means will have to be found to procure this and other needed equipment.

At the present time the instructional staff consists of two lecturers, four instructors and a number of workshop demonstrators. A minimum of 11 additional lecturers and instructors is stated to be required to serve the present student body plus the entering class. Sanctions exist for additional staff, but it is reported that competent teachers cannot be hired at existing salary rates. One of the present staff will soon transfer to another government position which is more remunerative. The Director of Technical Education has recommended that the monthly salary scales be increased to K600-40-800 plus CLA for lecturers (nationals and non-nationals), K350-25-700 plus CLA for assistant lecturers (*ad hoc* K500 for non-nationals), and K330-15-450 plus CLA for instructors (*ad hoc* K400 for non-nationals). It is reported that at the salary scales recommended it will be possible to engage the necessary staff either within Burma or by recruiting in India. At the present time some scheduled classes for second- and third-year students are not meeting because staff is lacking. The morale of the student body and of the staff is seriously threatened by this situation, which will be aggravated when the first-year class enters.

Students who have completed high school or passed matriculation examinations may sit for entrance examinations to the Institute. Beginning with this year entrance examinations are to be held in major cities throughout Burma, rather than in Rangoon alone. No tuition fees are charged for attendance at the Institute. Stipends are awarded to half the present

students, on the basis of scholarship rather than need. Living accommodations are provided free of charge. Students themselves supervise the provision of food for which each student contributes K40 per month. The students seem to be reasonably well prepared for, and interested in, their courses of study. Over 40% of the students are enrolled in the civil engineering course.

It seems clear that the Technical Institute at Insein represents a magnificent potential for technical training. In view of the acute need for technicians, plans for getting the Technical Institute functioning properly should be aimed at the largest possible student body. Existing classroom and laboratory space can accommodate a much larger student body than is now enrolled. However, expansion will entail a larger faculty than the 17 lecturers and instructors contemplated, more equipment than would be provided by the \$190,000 program previously envisaged, and additional workshop space. It would require also the provision of student living and dining accommodations over and above those presently planned, which would increase hostel capacity only to about 350. In this connection, however, it may be noted that approximately 40% of the students at the Institute come from the Rangoon area, and pending solution of the hostel problem these might be required to become day students only, with provision made for their daily transport to and from the Institute.

It will not be difficult to solve these problems if procedural administrative log-jams can be broken. It would be unfortunate if remedial action were delayed further. Vigorous efforts should be made to obtain the necessary finances from available contingency funds as soon as possible, and to press forward with the necessary program. It is understood that the problem of appropriate pay scales for lecturers and instructors presents an unusual difficulty because it is related to comparable problems throughout the various government departments. In view of the crucial role of the Institute in providing trained personnel for the economic development program, it is urged that every effort be made to solve this difficulty apart from the more general problem of government wage scales. The service which the Institute can perform is so important that reluctance to exceed pay scales for what are regarded as comparable personnel elsewhere should not stand in the way of salary increases.

It seems plain that the Government Institute at Insein, even when operating at full capacity basis, will not be able to provide all the trained technical workers needed. At least one or two additional institutions for technical training will be required

elsewhere. Under the circumstances, however, it is considered expedient to recommend that all available energies be concentrated on realizing the potential at Insein before attempting to develop additional formal training facilities in other cities. It will be desirable, however, to supplement the formal training of sub-professional workers at Insein to the greatest possible extent by in-service training courses, conducted by the various government departments and agencies, as recommended in Chapter VI, and by the larger private employers. In many cases, both formal and in-service training should be augmented by advanced training abroad.

3. SKILLED WORKERS

Table VII-3 shows an estimated need for some 26,112 additional skilled workers during the period of the development program. Among this group are included such workers as carpenters, electricians, masons, machinists and mechanics. Some types of skilled workers can be trained on the job, provided that competent foremen are available to supervise their work and provided that a nucleus of such workers exists alongside whom the novices can work and learn. However, some of these workers will require formal training. This will be especially true of those who will need to qualify as master mechanics, tool makers and group or crew supervisors.

Existing facilities for the training of skilled workers are represented chiefly by the Artisan Training Center, established in Rangoon in 1948, and by the training project of the Rehabilitation Brigade at Insein. Some equipment and staff have been mobilized for a projected artisan training center at Mandalay, which now awaits the construction of workshop buildings. Centers for Moulmein, Akyab, Myitkyina and other cities are intended.

a. The Artisan Training Center

The Artisan Training Center in Rangoon offers courses of two years duration in nine basic trades: carpentry, electricity, radio, motor vehicles, machine shop, foundry, diesel engines, fitting and welding, and blacksmithing. The instruction is essentially practical in nature, but includes rudimentary theoretical training as well. Stipends of K30 and K40 per month are granted to first- and second-year students respectively. Approximately 20 students per course, or a total of about 180 students, can be accommodated. At the present time 106 first-year trainees and 37 second-year trainees, or a total of 143 students, are enrolled. The relatively small number of students in the second year of training is typical of past enrollments and reflects the fact that a very high proportion of entrants do not complete their course. The

number of admissions, graduations and drop-outs in each of the past classes is shown in Table VII-6.

TABLE VII - 6
ADMISSIONS, GRADUATIONS AND DROP-OUTS
AT THE ARTISAN TRAINING CENTER

<i>Class entering in</i>	<i>No. of Trainees Admitted</i>	<i>No. Completing Course</i>	<i>No. Not Completing Course</i>
February, 1948	55	15	40
June, 1948	116	55	61
January, 1950	93	24	69
July, 1950	57	19	38
September, 1951	170	42	128
Total	491	155	336

Only 155 trainees have graduated from the Artisan Training Center in Rangoon in its five years of operation. More than twice this number of trainees have dropped out of the school before completing their training courses. This high drop-out rate is due to a number of causes. In some measure student registrations are exploratory and students soon drop out because they discover either that they have no real interest in the craft or because they are dissatisfied with the instruction and equipment, both of which are of varied quality. In some cases students drop out of school because they find jobs which are more attractive or because they find the stipends inadequate. Vigorous efforts should be made to improve the quality of instruction and equipment, to interest more youths in vocational training instruction, to select and guide students into training for which they have aptitude and interest, and to place students in good jobs upon completion of their studies. The inadequate staffing of the Directorate of Technical Education, plus the more obvious and pressing needs for sub-professional workers, has led the Directorate of Technical Education to concentrate its energies on the Technical Institute at Insein. It is necessary, however difficult the problems posed, to move forward also with the Artisan Training program both in Rangoon and elsewhere.

b. The Rehabilitation Brigade

A program of training in skills is being carried out by the Rehabilitation Brigade at Aung San village, 13 miles from Rangoon. Some 3,000 members of the Brigade are located there at present. They are provided with free housing and a stipend of K80 per month. All members of the Brigade, and many of their wives as well, receive training in technical and

vocational subjects. A number of large, well-planned and well-equipped training shops have been installed, with a heavy emphasis on woodworking and metal-working skills and the construction occupations. The scope of training is gradually being expanded towards the goal of some 25 subjects to be offered to about 4,000 trainees per year. The investment in plant and equipment is very substantial. Approximately K2.5 million worth of equipment alone has been procured to date. The instructional staff comprises some 72 personnel, including workshop demonstrators. The facilities are intensively used, with half of the Brigade members at Aung San village receiving instruction in the morning and the other half in the afternoon. The instructional plan calls for six months of such training during each of the two years of minimum enrollment. The remaining time is spent acquiring on-the-job experience in organized production work outside the camp.

This project is inspiring. It is well organized and dynamically directed. Efforts have been made to organize courses of study systematically and to develop training manuals and instructional aids. Its scale of operations is such as to suggest quite strongly that the major contribution to formalized training of skilled workers in Burma in the coming years will be made by the Rehabilitation Brigade.

Membership in the Brigade is open, not only to ex-insurgents, but also to unemployed and displaced youth. The disposition of trainees, once they have completed their courses of training—employment on organized production or release to private or other public employment—has not been finally determined. In either event, of course, the contribution being made is of great significance to the economic future of Burma. It is suggested, however, that to the extent feasible the excellent facilities for training at Aung San village be made available to non-Brigade members who upon completion of their training could flow into whatever areas need their acquired skills most acutely.

c. Other Training Programs

Training in handicrafts and small-scale industrial processes is primarily the responsibility of the Office of the Superintendent of Cottage Industries. In 1952-53, about 30 students were enrolled in a three-year course at the Lacquer School at Pagan and some 50 students in a two-year course at the Saunders Weaving Institute at Amarapura. Twelve recently obtained power looms are now being installed at the latter school, and a three-year course in power-loom weaving will be started by a United Nations technical assistant for selected graduates of the hand-loom course. In 17 different districts one-year courses are

given in District Weaving Schools, selected graduates of which make up the trainees at the more advanced Saunders Institute. Traveling demonstrators give advice and training in spinning, weaving and dyeing to operating establishments throughout Burma.

The Superintendent of Cottage Industries is responsible for initiating training and advisory programs in other special branches of small-scale industry and for coordinating the work in this field of 11 United Nations technical assistants, most of whom arrived in the past year. A training program in textile printing at Rangoon aimed at improving the quality and design of work by introducing new techniques is firmly established. Two eight-month classes have already been graduated, the last one consisting of 18 students. Twelve students have almost completed a course in sericulture at the new mulberry farm at Maymyo.

Detailed plans have been made and equipment has been ordered and some received for training centers—in some cases complete pilot plants in the silk-reeling, pottery, handmade paper, sugar refining and condensed milk industries. On-the-job advice to existing enterprises is already being given in some of these fields. A United Nations and a Burmese expert are also advising silk weavers on patterns and dyes, and two additional United Nations technical assistants will arrive soon to extend this program to the woodworking and electroplating and anodizing industries. The importance of these brief orientation classes for limited numbers of trainees and of on-the-job advisory programs is enhanced by the fact that they are oriented to the immediate practical needs of the industries and to persons already working or about to be working in them. Thus, for example, some 15 printers who attended the textile printing classes already have introduced the new screen-printing process in their establishments, and the sericulture trainees will be used for instruction and other work in implementing the three-year program for self-sufficiency in silk production.

Two small vocational handicraft schools are under the administration of the Director of Technical Education. The Polytechnic School occupying two rooms at the Government Technical Institute teaches leather-tanning and leather-working to about 25 students from the Rehabilitation Brigade. Another 25 youngsters receive training in bookbinding, toy-making, and cane and bamboo work at the Handicraft School located in the compound of the Rangoon Artisan Training Center.

The Adult Education University provides a learning opportunity for some 400 working adults. Engineering Technology evening classes, which have been suspended for lack of classroom space, will be resumed at the Artisan Training Center when additional

buildings now under construction are completed. The two-year course of training, meeting three nights a week, had been attended by some 250 students.

4. ORGANIZING AND ADMINISTERING THE TRAINING PROGRAM

Training of professional personnel is sufficiently distant to warrant its own organization structure. In so far as such training is performed in Burma, it of course falls under the separate administration of the University of Rangoon. The responsibility for administering the major foreign training program, state scholarships, is shared by the Ministry of Education and a special selection board. Comments on the organization and administration of professional training were included in Section B-1. As concerns training of sub-professional and of skilled workers, two special problems which are common to both of these programs are discussed in this section.

a. Central Responsibility

Responsibility for organizing, administering and executing the technical training program is vested in the Directorate of Technical Education within the Ministry of Education, to which it was transferred from the Ministry of Industry in 1952. Responsibilities for technical training have also been vested in the Industrial Development Corporation and the Mineral Resources Development Corporation. As of the present time, arrangements for cooperation between and coordination of the efforts of these bodies do not seem to have been developed. Similarly, such coordination and cooperation do not seem to have been developed *vis-à-vis* the Rehabilitation Brigade. It is recommended that such arrangements be made by means of an advisory board on which all interested agencies would be represented.

In the Preliminary Report it was noted that "an organizational problem which merits serious consideration is whether the Directorate of Technical Education should reside within the Ministry of Industry or within the Ministry of Education." It now appears that important practical grounds exist for moving the Directorate of Technical Education from the Ministry of Education, where perhaps on strict grounds of organizational theory it should find its home. The responsibilities of the Ministry of Education are both comprehensive and varied, and it is unreasonable to expect that harried officials confronted with a multitude of problems on every educational front can devote to the specialized program of technical education the full measure of attention and energy it requires. Moreover, these other broad commitments of the Ministry of Education in their very nature frequently act as obstacles to

the special efforts required for promoting technical education. For example, the disinclination to award higher pay scales to technical teachers results from a concern with comparative salaries throughout the educational system. Yet only a relatively few technical teaching positions are involved, and the importance of filling these positions is so critical to the whole development that special consideration is essential.

The problems of technical education will be solved more expeditiously if ultimate responsibility is placed either in a ministry more immediately concerned with this problem, or in an agency concerned exclusively with this problem. The responsibilities of the Ministry of Industry tend to make it acutely sensitive to the needs for technical and skilled workers, and it is anticipated that this awareness would result in treatment of the problem on a top priority basis. It is suggested, therefore, either that the Directorate of Technical Education be moved back to the Ministry of Industry or that an autonomous board for technical education and training be constituted and assigned responsibility for developing and executing the necessary programs.

b. Developing Teachers of Vocational Training

The number of qualified instructors available for training sub-professional and skilled workers is highly inadequate to present needs, and will be even more seriously deficient as training programs are expanded. In the long run, the situation will tend to correct itself. For the short run, however, it will be necessary to employ a number of expedients.

To augment the personnel available as lecturers and instructors in the training of more advanced technicians, it will be necessary in many cases to engage staff from abroad. Efforts should be made to enlist the services of engineers who have retired from gainful employment, and to enlist the part-time services of engineers presently employed in the various government departments and in private employment as well. Encouragement should be given to the further development of and increased participation by national professional societies (especially engineering and educational) in solving these problems. Such private bodies could be of real assistance both in mobilizing aid and in providing valuable advisory services to all agencies engaged in training.

Teachers of skilled workers must be drawn in the main from two sources—from the sub-professional technician group and from the artisan class itself. The number of technicians who will be available to serve as teachers of vocational training will be limited by competitive demands from the various government departments and from industry. Such persons might

be readily available for part-time service as instructors in courses conducted in the evening. There is no reason, moreover, why the skilled worker class itself should not be able to yield a considerable number of instructors and workshop demonstrators for artisan training classes. It will be exceedingly important, however, that some in-service training be provided for such artisan instructors to convey to them the basic pedagogic principles and practices which will enable them to impart their artisan skills more effectively.

5. IN-SERVICE TRAINING: A CENTER FOR TRAINING AIDS

The discussion above has dealt almost entirely with training before the worker enters upon his job. Another important aspect of training is training while in service. For many lower-level workers, in-service training is more effective than formal pre-job training, and completely takes its place. It is also important for all of the levels of workers discussed above. No employee at any level is completely prepared for a new position when he enters upon it; an important part of his training is what he learns on the job. His learning on the job may be haphazard and accidental or planned and organized. Organized in-service training can greatly accelerate both the approach to peak effectiveness by a worker and his preparation for moving to higher-level positions.

Many of the larger business organizations in Burma, both governmental and private, have had their own training programs for many years. Not enough study has been given to the individual programs to make specific comment useful. Organized in-service training should be introduced not only into the new productive enterprises to be established, but into virtually all existing government agencies which do not now have it. It is as important in government administrative agencies as in business-type enterprises.

While the specific type of training will vary greatly from agency to agency, there will be many elements in common. Many devices learned by the governments and business enterprises of belligerent nations during World War II, in their attempts to accelerate their greatly expanded needs for specialized manpower, can be applied in Burma. It is recommended that a Center for Training Aids, attached to the Ministry of Home Affairs, be established, one of whose main functions should be to advise every agency of Government concerning means of expediting effective worker orientation and in-service training. This advice should relate to training pamphlets, audio-visual aids, orientation courses, refresher or improvement courses, accelerated apprenticeship

schemes, teacher-learner squads, and a variety of other methods and aspects.

The Center will be of little use without the right head. In-service training, done by rote because it is said to be good practice, can be a waste of time and in fact a means of dulling enthusiasm. Only under a leader who has seen accelerated training at work in offices and shops and has the imagination to appreciate its possible applications in varied circumstances in Burma will the work of such a Center be fully fruitful.

6. PREPARING A COMPREHENSIVE PROGRAM FOR TECHNICAL TRAINING

While an attempt has been made to present a useful statement of the situation and problems with respect to training of sub-professional and skilled workers in Burma, and to make helpful recommendations concerning them, it has not been possible to explore fully all the considerations and data involved in the preparation of a comprehensive training program. It is urged that further and continuous study and consideration be given to the preparation of a comprehensive program in this most significant area. The Government might establish a commission or engage experts for this purpose. It could also invite foreign technical assistance, whether international or privately endowed in nature, for advice in this field.

C. MEETING THE GENERAL PROBLEMS OF INCREASING LABOR PRODUCTIVITY ON THE JOB

The many broad factors which influence labor productivity in general are outlined in Section C of Chapter II. In a real sense, this entire Report is concerned with bringing these influences to bear in the Burmese economy. Within the field of manpower considerations, the special problems of developing the necessary professional, sub-professional and skilled personnel have been defined and measures for their solution have been recommended. There remain certain aspects of labor productivity which have to do with workers as such, as distinguished from more comprehensive factors such as health, which affect all citizens but which are equally applicable to all workers, specialized or non-specialized. An analysis is required of the factors making for increased productivity and output on the job—what may be called, in short, management-labor relations.

Those aspects of management-labor relations which bear most significantly on labor productivity and output are the earnings and hours of work; such related conditions as holidays, vacations, sick leave, pensions and similar benefits having monetary value; non-monetary conditions of work such as tenure,

seniority and physical comfort on the job (cleanliness, light, heat, sanitation, protection against hazards, etc.); the arrangements which exist for management-labor cooperation and bargaining (such as union contracts, grievance machinery and the like); and finally the very "atmosphere" of work itself, which is a sensitive complex of a number of factors both tangible and intangible affecting the worker's morale and discipline, and which can make him either a sullen and resentful cog in a machine or an eager and cooperative worker in a purposeful group.

1. EARNINGS AND HOURS OF WORK

Earnings and living standards throughout the Burmese economy are low, not only in relation to the standards of more highly developed countries, but also in relation to the wage levels which can be achieved in Burma. They vary considerably between industry and agriculture, between one geographic region and another, between large and small establishments, and between higher and lower skills.

Adequate data do not as yet exist for the precise measurement of incomes throughout the economy. These can be more accurately measured for the relatively small groups of workers who are employed by the larger trading and industrial enterprises and on major government projects. A brief study made by this survey group indicates that the average value of wages and cost-of-living allowances received by production workers in such enterprises, on the basis of a 44-hour week, is approximately 110 kyats per month. This finding is supported in a general way by the calculations of the Directorate of Labour which indicate that the average incomes of permanent workers for all industries listed in the latest tabulations (except banking and air transport, which are special cases) is 117 kyats per month. Typical rates of pay for ten major occupational groups based on information received from 14 large employers of labor are presented in Table VII-7. These show that unskilled laborers in such selected enterprises, which must be presumed to be relatively better paying than others, averaged about 80 kyats per month; semi-skilled workers averaged about 110 kyats per month; and skilled workers averaged about 180 kyats per month.

The need for higher incomes for Burmese workers with which they could better provide for the basic requirements of living such as health-maintaining food consumption, decent and sanitary housing, and necessary clothing and for education, recreation, transportation, vacations, insurance and other essentials of everyday life is universally recognized.

It has been repeatedly emphasized throughout this Report that in the long run the standard of living and the welfare of the Burmese people will depend on the

TABLE VII - 7

TYPICAL MONTHLY RATES OF PAY IN LARGE INDUSTRIES, BY TEN MAJOR OCCUPATIONAL GROUPS (44-HOUR WORK WEEK)

<i>Occupational Group</i>	<i>Wages Plus Cost-of-Living Allowance (Kyats)</i>
Engineers	880
Assistant Engineers	500
Senior Foremen	380
Lower-level Foremen	270
Administrative Workers; highest level	470
Administrative Workers; intermediate level	270
Administrative Workers; low level	180
Skilled Laborers	180
Semi-skilled Laborers	110
Unskilled Laborers	80

total output of goods and services which can be achieved, which in turn depends on the amount of work which is performed and on the efficiency or productivity of that labor.

Individuals and organized economic groups frequently have a disposition to think that their standard of living can best be raised by striking a better bargain with their employer. This, of course, may at any given time be the case, although very often when a group of workers succeed in obtaining an increase in pay, this increase is paid in reality not by their employer but by the rest of the population, in the form of higher prices for the goods or services produced. The effect of the pay increase in such case is for the standard of living of the small group immediately involved to be increased, at the expense of a decrease in the standard of living of the much larger group who consume their product, many of whom, although they may be especially needy or deserving, are not in a position to press for pay increases.

The intention of this analysis is not to dissuade workers, whether individually or in groups, from seeking to improve their living standards through bargaining with their employers; indeed, such bargaining is one of the ways in which the benefits of increased productivity are allocated in a democratic society. The objective of this analysis rather is to emphasize that in the long run real and substantial increases in the living standards of all the Burmese people can be achieved only through substantial increases in the total production of goods and services.

With special reference to the so-called industrial "wage workers," who constitute most of the non-self-employed workers in industry, it would not be practicable in general to increase wage levels in Burma at this time. The effect of such increases at

current levels of production could only be to increase costs and selling prices and achieve gains in the living standards of the favored groups at the expense of the living standards of other working groups and perhaps of the cultivators. It would be more practicable to provide monetary incentives to increased productivity and output. There are in general two ways in which this can be done. One is by associating current levels of workers' output with the current wage, and of providing extra wage bonuses for units of output in excess of the current level. The other method is by providing a share in the profits of the enterprise for the workers. Both methods have been practiced in advanced economic societies, and both have been productive of extremely worthwhile results. It is suggested that these methods have real possibilities for increasing productivity and living standards concurrently.

With respect to the hours of employment, at least so far as the larger industrial and trading enterprises are concerned, the comparison with other countries is quite different. The standard week has been established at 44 hours on a five-and-a-half-day basis. This compares quite favorably with the hourly conditions of work in other advanced countries. In fact such countries did not reduce working hours to this level until they achieved standards of productivity much higher than now exist in Burma. Because of cultural factors and the general advance in conceptions of workers' welfare, it would be a mistake to attempt to lengthen working hours beyond 44 hours per week. However, the elementary facts of the economic situation in Burma indicate that it would be equally a mistake to attempt to reduce the work week below this level until a very substantial increase has been effected in productivity and total output by the economy. Wherever feasible, work weeks which are now far below this level as in the government service should be increased at least to about 40 hours. Such a reform is most expeditiously initiated when a corresponding pay increase is also justified. The special justification for pay increases in the important government sector of the economy is discussed in Section E of Chapter VI.

2. MONETARY FRINGE BENEFITS

In some respects prevailing benefits of this category are quite advanced in Burma. It is reported, for example, that in the larger establishments referred to above, typical arrangements include 17 paid holidays per year, two to four weeks of paid annual leave, 60 days or more of paid sick leave, and occasionally ten days of additional paid "casual" leave per year. The liberality of these standards (however limited in application they may be) may be judged by the fact

that in the highly developed United States economy, powerful labor unions have achieved, for their members who work in industry, no more than seven to nine paid holidays per year and two weeks vacation with pay (although in some cases three and even four weeks of paid vacations are granted to workers who have been on the job five or ten years). In further sharp contrast, allowance for sick leave with pay to industrial workers is virtually non-existent in the United States, and additional paid leave for such workers on grounds other than those already mentioned is non-existent. On the other hand, old age pension schemes and protection against unemployment have developed remarkably in the United States in recent years, both through legislation (which embraces widows' and orphans' pensions as well) and on a private basis through collective bargaining. Desirable as these forms of protection for workers and dependents are, their introduction on a major scale in Burma will become feasible only when substantial increases in productivity and output have been realized.

3. NON-MONETARY CONDITIONS OF WORK

With comparatively few exceptions, the physical conditions of work in Burma are far below minimum levels of acceptability. Improvements must be made in terms of cleanliness, sanitation and elementary creature comforts if real gains of labor productivity are to be achieved.

The introduction of machinery and industrial occupation in other countries in the past has been attended by a high accident rate due to failure to provide adequate safeguards against occupational hazards. Such safeguards are absent in the great majority of establishments in Burma. Burma should not wait to experience first a large number of industrial accidents, but should take timely measures to prevent them at the very outset of her industrialization, by means of rigorous standards for safety devices and a thorough system of governmental inspection.

Other non-monetary conditions of work which promote workers' productivity are security of tenure on the job and fair treatment in the granting of promotions. These assurances must be provided by a system of seniority rules which will protect the interests of ordinary workers, promote incentives to better performance, permit the more qualified to advance more rapidly, and at the same time prevent the creation of sinecures for the idle and incompetent. Because the requirements of different working situations vary so much, the difficult task of devising an appropriate system is best accomplished by agreement between the management and the workers' organization in individual establishments or enterprises. The Government, in addition to its

responsibilities for public workers in this connection, may properly also lay down broad basic rules providing minimum protection to all workers. Its general function, however, should be to provide advisory, conciliation and arbitration services and in other ways to promote private agreements.

4. ORGANIZED RELATIONS BETWEEN LABOR AND MANAGEMENT

A continually functioning system of organized relation between management and a workers' organization is, in general, the most effective method for attacking most of the issues discussed above. Labor organization in Burma has until recently been in the "growing pains" stage. Now, with 70,000 workers in trade unions, the point has been reached when labor organizations can make an important contribution to the welfare of the country at large, while at the same time protecting and advancing the interests of their members to a greater extent than before. The many and varied functions which trade unions can perform in the social and cultural fields as well as in the economic area are too well known to warrant their enumeration and discussion here. The greatest single obstacle to the fuller performance of these functions by the Burmese labor movement of today is the absence of permanent and systematic working relations with management cooperatively arrived at and resulting in formal and binding agreements. Unilateral offers and demands by employers and trade unions, often arbitrated by governmental decrees, generally take the place of collective bargaining in the true sense of the word. Frequently there is a total absence of discussion and negotiation before a matter is carried to the point of arbitration or the calling of a strike. Not only are the final outcomes of such proceedings apt to be unsatisfactory to all concerned but the very technique of arriving at them breeds distrust and suspicion. These in turn lead to open violation of agreement or more subtle disruption which is equally fatal to efficient production.

In some areas, especially in the railway, water transportation and timber industries, progress toward collective bargaining in a spirit of goodwill and confidence is being made. Certain legal provisions may encourage its extension to other sectors. These include modification of the Trade Union Act to provide that appropriate unions be recognized by managements as bargaining agents for workers, that real collective bargaining take place before arbitration by Government is resorted to, and that agreements once reached through collective bargaining are honored by all parties to them. Ultimately, however, law can only point the way, and good labor relations and their

counterpart, efficient production, are dependent on understanding and cooperative attitudes on the side of, and especially by the leadership of, both labor and management.

This is especially true in connection with the special problem of grievances, day-to-day complaints in connection with the conduct and conditions of work. Workers have an unquestioned right to make known their displeasures and to expect prompt consideration of them. However, grievances must not become, as they frequently do now, agents of continual disruption of the work process. The long history of collective bargaining in other countries shows that it is essential to set up a permanent "grievance machinery" for prompt processing of these small complaints jointly by representatives of both workers and management. That history also shows, with equal force, that the machinery must be manned by men of restraint and goodwill.

5. THE ATMOSPHERE OF WORK

It is perfectly possible that collective bargaining may be practiced sincerely and intelligently; that wages, hours, physical conditions of work, pensions, vacations and other work arrangements may all be highly satisfactory; and yet that the general attitude of workers in a large modern enterprise toward their jobs is one of dissatisfaction and discontent, inimical to their own happiness and to the efficiency of their work. Such a situation reflects the problem of psychological adjustment to a new technology. The transformation from peasant cultivation or handicraft production to modern industrial production involves a transformation of work from an act of independent creativeness, performed largely under self-determined conditions, to operations, many of them routine, guided by a common discipline. This radical change in the nature of work requires a changed set of attitudes as well as aptitudes. Unless these attitudes are acquired, labor under the new conditions loses its meaning, and anti-social work practices arise canceling the potential productive advantages of the new technology. Machines are poorly tended and run idle; pieces are spoiled; maintenance suffers. A modern factory, which at 95% efficiency would turn out needed products cheaply and help raise the living standards of the people, at 60% efficiency turns out goods at greater cost than the "inferior" hand process and is a burden to the economy.

The end result runs deeper than reduced living standards. When the worker derives no satisfaction from his work, minor frictions between him and his supervisors give rise to suspicion and distrust of management, and swell into a lingering bitterness, a bitterness containing the seeds of social revolt. The

employer, even if the employer is the State, becomes an enemy, not a leader.

Higher wages and other benefits are not alone sufficient for solving this problem. The worker whose work itself is not satisfying will not feel contented, and will not apply himself merely because he is well paid and can perform what he conceives of as his drudgery under good conditions. A congenial atmosphere must be created which will elicit a new set of attitudes conducive to effective work in modern industry. The development of these attitudes is a problem in human engineering which must be solved specifically in terms of the prevailing habits and values in the Burmese culture. Its successful solution will depend primarily upon the imagination, resourcefulness, and dedication of managers of individual enterprises, trade union leaders, and government officials responsible for labor policy. However, general avenues of approaches for improving human relations in industry are the same in Burma as elsewhere. These can be summarized under three major headings.

Firstly, if his work is to be satisfying the worker must feel that the project of which he is a part is serving a worthwhile end. Workers in new Burmese industries will be taking part in the advance to a better Burma. That they are doing so must be dramatized to them in various ways. This can be done at the State Spinning and Weaving Factory, for example. It is the first factory of the new Burma, and its tasks, such as providing cheap yarn to the many handloom weavers, are important ones affecting the welfare of many people. By driving this fact home to workers, a sense of responsibility and importance can be created.

Secondly, the worker must be aware, as he does his individual job, of its importance in relation to the whole. The worker in every department must be given a simple understanding of the role of his department and of his individual work. For example, placards describing in simple language the relationship of the department or machine to the final product, its weekly achievement, and similar informational devices will stimulate morale. Human beings do not devote themselves enthusiastically to meaningless tasks. They can become enthusiastic participants in a meaningful one.

Thirdly, it is necessary to make every worker feel that he is individually valued as a person, not merely as the slave of a machine. While some of the techniques mentioned elsewhere can be fruitful in this direction, ultimately this is a matter of "personal," not "personnel" relations. The personal attitudes of supervisory personnel should reflect a regard of the worker as a person of integrity and dignity in his own right.

It is not sufficient that persons responsible for labor relations simply understand that each individual worker is an important individual, that his work is important in the whole project, that the entire project is a worthwhile part of raising the nation's level of living. These facts are not self-evident to workers and must be impressed upon them forcefully. Orientation discussions with new workers; small illustrated pamphlets; family visiting days, on each of which a well-organized effort is made to bring the families of the workers in one department to the plant, and to tell them of the achievements of the plant and of the department; contact with groups of workers by the managerial staff; athletic leagues among employees, these and numerous other devices can be used to give the worker a feeling of participation in an act of creation and of companionship in a group, which he gains in simple and direct ways in agriculture and handicraft work.

The attitudes and measures suggested involve no relaxation in discipline and efficiency. On the contrary the discipline necessary for efficient production is the more readily obtained if a worker is proud of his job and gains satisfaction from it. He must be made to realize that the job to be done is challenging, not easy.

As one employer who had learned the lesson of human relations stated, "You can buy a man's time, you can buy a man's physical presence at a given place, you can even buy a measured number of skilled muscular motions per hour or day, but you cannot buy enthusiasm; you cannot buy initiative; you cannot buy loyalty . . . You have to earn those things." Understanding how to earn them is one of the most challenging problems facing the economic leaders of Burma.

D. THE NEED FOR ABLE MANAGEMENT—A SPECIAL PROBLEM

1. THE SPECIAL IMPORTANCE OF MANAGEMENT

Although the remarks made in an earlier section with regard to providing other types of specialized manpower for the development program are entirely pertinent to managerial personnel, the problem of management in the development program has both special complexity and special importance which warrant its separate treatment. Since the problem of obtaining effective management is in part a problem of establishing the proper administrative organization, it is also commented on in Chapter VI.

Management is that factor in the productive process which organizes, coordinates, and directs the three other basic factors in production—natural resources, labor and capital. Able management will make decisions which result in the optimum utilization of these basic factors of production, thus

providing maximum benefits for society at the least possible cost. Poor and inefficient management will wastefully employ these productive resources, with the result that less goods and services will be produced and produced at higher costs. These considerations have special significance in the modern enterprise, whether public or private, both because the problems requiring solution are far more complex than is the case where smaller and less mechanized enterprises are concerned, and because the cost of inefficiency or failure in the larger or more modern enterprise is vastly greater.

The importance of managers in the Burmese economy is centered in three main areas. As the Government plays an increasingly important role in the development of the Burmese economy, and strives to achieve this development in major degree through development corporations in the industrial, mining and other fields, successful management within the development corporations becomes a critical factor. As autonomous or semi-autonomous corporations or boards are constituted to establish and operate new industrial, mining and other projects, competent management again plays a major role. Finally, since the successful accomplishment of the development program requires continual growth and increased efficiency in the private sector of the economy, the problem of management must be solved in this sector as well.

2. THE NATURE OF MANAGEMENT

It is a common mistake to think of management in the narrow sense of being concerned primarily with the production of goods within a plant. The compass of management is much broader. It embraces a broad area of decision-making responsibility which requires estimates of the market, domestic and international, present and future; judgements as to quality and pricing of goods which will stimulate sales; decisions as to merits of alternative raw materials and raw material sources; choices between various types of production equipment and production methods; decisions concerning working capital and credit requirements, sales and distribution methods, dividend policy, capital accumulation and re-investment; the conduct of management-labor relations; and a host of other responsibilities and judgements of which these are but illustrative and typical.

In mature industrial economies, the executive in charge of operating the enterprise is aided in the discharge of these duties by a staff of highly competent specialists. Generally speaking, this management team submits for approval and action by the board of directors its recommendation as to broad policies for conduct of the enterprise and is responsible for the

execution of approved policies. The problem of management in Burma is particularly acute because Burma lacks, as of now, not only able operational management but also personnel qualified by their experience and ability to serve on boards of directors, and who could bolster operating management by formulating broad policies within which operational management personnel could function satisfactorily. This means that an especially large burden of responsibility must be shouldered by those placed in executive control of enterprises.

In this connection it may be observed that the experience of colonial Burma with respect to management could easily be misleading. In colonial Burma large-scale mining and trading enterprises were managed by resident staff who were primarily operational in character. Policy management, while invisible, was provided by the home office and by directorates of these corporations. In contrast to these arrangements, management in Burma will now be required to assume much broader responsibilities.

Before proceeding to an examination of the ways in which a solution of the managerial problem in Burma may be found, it will be useful to study briefly the experience of other countries in their attempts to solve problems similar to those confronted here.

3. SELECTED EXPERIENCE IN OTHER COUNTRIES

In recent years the Philippines, Ceylon, and Turkey have been among the countries which have sought through economic development schemes and projects to develop their economies more fully and raise the living standards of their people. In this process they have encountered problems of management analagous to those presently faced by Burma. In each case an analysis of the experience of those countries has been made by a highly competent and objective group. Pertinent selections from the reports made by these authorities are listed below.

a. Management: Philippines

The program of the Philippine Government sets a broad framework from which to formulate further plans and to select individual projects after thorough and complete engineering and economic study. It contains no provisions for measures to increase production from existing facilities. The magnitude of the program that should be undertaken at this time is limited by a variety of factors. It is not only a question of finance, but more important is the rate at which engineering, planning and construction can proceed, the availability of raw materials, and the need for power and fuel which must be met. Of special importance is the need for engineering and management personnel to assure the planning, scheduling and efficient operation of the investment that is undertaken.

The available technical and management skills in the

Philippines will not be sufficient for extensive development of industry for some time. That does not mean that industrial development must be postponed. It does indicate that rapid progress must be made in the training of engineers and business managers. This deficiency must be overcome by providing engineering education and by providing experience in actual operation. In the meantime, use should be made of competent and experienced planning, managing and technical personnel from abroad.

It is clear that the Government will have to take an active part in stimulating economic development in the Philippines. It will have to provide much of the planning and some of the construction for major enterprises. It will have to give financial assistance to stimulate private investment in the industrial fields of special importance to the economy. Precisely because of the large part that will have to be undertaken by the Government, it is important that its functions in this field be clear, and that it be prepared to perform these functions with honesty and efficiency.

The Philippine Government has for many years been operating various agricultural and industrial enterprises through government corporations. The National Development Company was originally organized in 1919. Existing government corporations were reorganized and certain new ones created between 1938 and 1941. In the postwar period, new corporations were organized for a multitude of purposes. The common experience was that a corporation once started, grew and took on new functions.

There are now 24 government corporations, not including subsidiary enterprises. They have come a long way from their original objective of creating industries to stimulate domestic production for export and for home needs. Their management has become cumbersome and burdensome. The directors of the government corporations commonly include cabinet officers, many of whom serve on a number of government boards, for which special remuneration is given. This involves more or less haphazard direction, so that the efficiency of the corporations and the government service is adversely affected. By the most generous evaluation, the larger number of the government corporations are inefficient, wastefully operated, and in some instances they have been misused.

Before the Government undertakes the responsibilities of the development program it should clean house in the existing corporations. What is of primary concern is that the development in the Philippines should be well and economically managed . . .

The extensive report of the Committee on Reorganization of Government Corporations submitted to the President of the Philippines on August 18, 1950, recognizes the defects in the operation of the government-controlled corporations and proposes to bring down their number to 16. It recommends that in the development of Philippine resources preference should be given to private industry (if necessary, with Government financing in the form of preference shares), and that the Government withdraw from trading activities in export products, from agriculture, and from other activities that are now in competition with private industry. The report proposes the

abolition of PRATRA—a recommendation that the Mission strongly endorses. If the recommendations of the Philippine Government Committee on Reorganization are promptly implemented, a good start will be made toward more efficient development of the Philippine economy.

All government corporations should be placed under consolidated full-time management, free from any other obligation than to manage these corporations in the public interest. This could be done by establishing a Philippine Development Corporation as the responsible holding company for all government corporations. Its common stock would be wholly owned by the Government and would be issued in exchange for the Government's equity in the various organizations. Whenever necessary, the Government would also subscribe to additional shares to provide capital for the operations of the corporation. The directors of the Philippine Development Corporation would be government appointees, barred from holding any other government or private position.

Report to the President of the United States by the Economic Survey Mission to the Philippines, Washington, D.C., October 9, 1950, pp. 66-68.

b. Management: Ceylon

Lacking a broad industrial background which is only now being built, it is only natural that for the moment Ceylon has few persons of general industrial management experience.

Among private plants, distinction between the functions of ownership and management is less frequent in Ceylonese-owned enterprises than in the others. As larger units are built, however, it is becoming clearer to the investors that ownership does not automatically confer management ability. In some cases trained foreign managers are being hired, at least until local personnel can gain experience. This is more common in technical positions, for Ceylonization pressure has made it extremely difficult to import skilled administrative personnel.

Where management and ownership are distinct, it is noted that maintenance and replacement of capital equipment are often better. But as a rule Ceylonese factory owners tend to take out large profits at the expense of maintenance, reinvesting these (if at all) in other ventures or in land. Efficiency then suffers through deterioration, and so does the psychological incentive for good performance.

Reports from different factories show a wide variation in the output of workers, even with the same equipment. Similar variations are noted in the history of individual plants. All evidence indicates that such differences are largely attributable to the choice of managers and supervisors, their qualities of administration, initiative and leadership, and their understanding of the worker as a fellow individual.

Ceylon's cement plant, located atop the Kankesanturai limestone deposits on the Jaffna peninsula, has been the first of the Government's modern factory projects to go into operation. Started in August, 1950, the plant uses the dry process and a single kiln equipped with a

pre-heater. Its rated capacity is supposedly about 300 long tons per 24-hour day.

Although frequent press references give the present output at 250 tons per day, the records of the factory indicate that on very few days has the production exceeded 225 tons. These records also show that from January to October, 1951, the plant was shut down for a total of some 50 days, in periods ranging from a day to several weeks, because of various troubles. Hence an actual output approaching rated capacity is still far from being achieved. Reasons for this are, in the main, inherent in the administrative structure. At the time of the Mission's visit new orders were arriving at the rate of 700 to 800 tons daily. Outstanding orders in mid-November totaled 7,000 tons, and buyers were asked to limit new individual orders to 26 tons each—representing two railroad carloads. Meanwhile, not only was the effective plant capacity limited to a third of the demand, but the shortage of railroad cars prevented movement of more than 60-70% of the output. Thus, until the transport difficulty is removed, installation of a second kiln will not solve the problem.

Mechanically, the plant is a fairly good one. Initially a poorly constructed roof collapsed; since then the pre-heating system has given some trouble; the limestone crane is overworked through unnecessarily repetitious handling of material; and the sacking and carloading operations could be improved to reduce losses through breakage of bags. But these defects will soon be corrected.

Most of the shutdowns and troubles can be attributed, directly or indirectly, to the difficulties of outright government operation of the plant, and are so recognized. Replacement parts have been slow in arriving because of lengthy government purchase methods; and constant official intervention in management has made it difficult for the plant to retain competent technical help for more than short periods. As for operating costs, it appears that the factory employs from two to three times the number of workers that it needs.

The Mission believes that removal of the management functions from government offices will alleviate at least 90% of the cement plant's troubles, and will permit it to make a real contribution to the island's development as a soundly based industry. The management problem in government-owned industries is a very acute one. It is now acknowledged by all that their present administrative structure is hopelessly unsatisfactory.

To their credit, it must be said that officials have been quick to recognize the need for experienced industrial managers and have imported them. But these managers are unable to give their best performance while virtually all administrative authority is retained by the Ministry. Inevitably, the very decisions for which their skill and judgement were sought are made for them by government officials instead. Hiring, firing, production planning, accounting, purchasing, distribution and sale are all handled through the inherently cumbersome mechanisms of government, and a resulting large overhead is charged against production cost.

Some very competent managers have been obtained; but delays, veto and frustration have caused a number to

resign. This, and the fact that governmental salary limitations have not kept pace with the industrial world, now makes it difficult to replace them with the best men.

A solution probably lies in conversion of these enterprises to ordinary corporations where responsibility for efficient management can be left to competent managers chosen by a board of directors, and where the Government can limit itself primarily to the role of stockholder and recipient of dividends.

Some progress is being made in discussions toward this goal. However, it is felt that current local thinking has not yet fully evaluated the real essentials of the problem. One proposal, disclosed in a memorandum released to the press in February, 1952, would create government-owned corporations but would actually leave all final operating authority in the hands of the Ministry of Industries, where it is now. We fear that this would merely continue the present system under a new name, and would solve nothing. Further consideration will show that the key to good management and protection of investment is to delegate authority to competent personnel with a minimum of restriction, and to hold them responsible for performance.

"The Economic Development of Ceylon," report of a mission organized by the International Bank for Reconstruction and Development at the request of the Government of Ceylon, the Johns Hopkins Press, 1953, pp. 519-520 and 535-537.

c. Management: Turkey

The State's enterprises are bureaucratic and top-heavy. Authority is heavily concentrated at the top and is not sufficiently delegated to lesser officials and employees. We referred in Chapter VII to these characteristics in the transport agencies. They are equally typical of the industrial enterprises. Channels of communication are unnecessarily complicated and routine activities are hampered by restrictions and paper work to such an extent that productive efficiency is seriously impaired. Factory employees, as far down as minor clerical staff, are hired and dismissed by the central office of the holding company, not by the factory management. The Sumerbank's head office also intervenes in the purchase of raw materials and supplies as well as in the marketing of products of individual factories. As a result, plant managers can exercise little initiative and tend merely to carry out orders from above. Top Sumerbank management, on the other hand, is hampered by lack of information on operations and overburdened with paper work. In the accounting systems of public enterprises, terminology is not uniform, so that financial statements can rarely be read and interpreted correctly without consulting the responsible accounting department. Heavy administrative charges add to costs of production and unnecessarily raise the prices of finished goods.

Operation of public enterprises has in general been hampered by the fact that they do not have sufficient independence to operate as business entities. A substantial amount of authority should be delegated to managers of individual undertakings. This would increase

their efficiency as well as give wider experience to the managers. Only through such a delegation of responsibility can good managers be developed and incompetent ones weeded out.

The managers of individual enterprises should have the authority to operate on the basis of a business budget as approved by the responsible minister. This means that each plant or agency should pay its current operating expenses out of current revenues. Other powers which should be delegated to individual factory managements are freedom to buy raw materials, to hire or dismiss personnel, to set wage rates on the basis of local labor market conditions and to market their goods and services under general price policies approved by the responsible minister.

Based on information received from official Turkish sources.

4. LESSONS FROM THE EXPERIENCE OF OTHER COUNTRIES

Among the points which emerge clearly from the experience of these countries, and which seem pertinent to comparable problems in Burma, are the following.

(a) Deficiencies in indigenous management and technical skills do not mean that industrial development should be postponed, but indicate rather that for the short run, use should be made of competent personnel from abroad, while indigenous personnel are simultaneously trained.

(b) Participation on boards of directors by government personnel on a part-time basis tends toward haphazard direction, and adversely affects the efficiency of the corporations concerned as well as the government service. This applies to the directors of government development corporations in particular.

(c) All government corporations should be placed under broadly empowered, full-time management which is free from any obligation other than to manage these corporations in the public interest. Managers are unable to give their best performance while virtually all administrative authority is retained by the ministry concerned. Such administrative interference makes it difficult to retain competent managers once they have been engaged. The key to good management and the protection of investment is to delegate authority to capable personnel with a minimum of restriction, and to hold them responsible for performance.

(d) An important function of the government development corporation should be to provide trained personnel who would be available for all government enterprises.

(e) Another important service of the development corporations should be the provision of engineering, industrial research, and other advisory services to small and medium-sized industrial enterprises, both public and private. Foreign advisers and technicians

should be employed for this purpose as required. One of the most important functions of such personnel should be the training of indigenous personnel.

(f) To the maximum possible extent, the Government should attempt to foster and encourage economic development by private enterprise so as to minimize as far as possible its own responsibility for management.

(g) Preferences granted by Government to government enterprises conceal inefficiency and prevent the weeding out of incompetent managers.

E. POSSIBLE SOLUTIONS TO THE MANAGEMENT PROBLEM

1. DELEGATION OF AUTHORITY

There is no easy solution, no single solution, and no basic short-range solution to the problem of providing competent management. Short-range expedients, however, can be found. The most certain principle which can be laid down is that action should be guided by the lessons of recent experience elsewhere to avoid making in Burma the mistakes which other nations have made, even if this involves, as it must, abrupt departures from established ways of doing things. Perhaps the most important of the lessons which this experience has provided is that adequate authority must be granted to personnel charged with managerial responsibilities.

Even an individual who possesses managerial talents, training and experience in a high degree will not be able to administer a venture effectively unless he is adequately empowered to exercise this function. This does not imply that *carte blanche* should be given to the manager. The board of directors must be responsible for the basic policies. At the same time, however, they must delegate to the general manager full authority to make the operational decisions necessary to execute these policies. The manager must, for example, have authority, under general policies laid down by the board of directors, to employ, discharge and promote personnel; to purchase material and equipment; to supervise production; and to make sales decisions. All important decisions in these fields must of course be subject to review after the fact by the directors for compliance with the overall policy, but to require approval for each separate decision before action can be taken paralyzes the decision-making function and inevitably destroys efficiency. Delegating adequate authority to the manager, and holding him responsible for results under the authority granted him are the pillars of effective administrative organization.

The danger that these practices will not be followed is the greater because of the fact that managing boards without industrial experience as in Burma may not understand the importance of the delegation of

responsibilities referred to above, and may therefore insist upon a degree of control of operating details which will make successful administration impossible.

Similar administrative arrangements should exist between any two related levels of responsibility. Individual project boards must be adequately empowered by the Development Corporation, and these in turn should be subject only to the requirement that they conform with broad government policies. To delegate authority which has customarily been retained in the past is a difficult thing, as difficult, perhaps, as it is for a mother to part from her child. But excessive mothering will prevent the normal development toward maturity of the child, if indeed it does not smother the child to death. In the same way, if Government embraces the budding development and project corporations too closely, they will be unable to achieve maturity and responsibility.

With the need for delegation of authority firmly established, the Government can turn its full attention to the provision of competent personnel to exercise this authority.

2. PRIORITIES IN ATTACKING THE PROBLEM OF MANAGEMENT

Attempts to solve the problem of management must focus initially on the public sector. While, as has been pointed out, the problem is important in the private sector as well, the advances made in the public sector will permeate in time throughout the economy. Further, the Industrial Development Corporation can make a significant contribution to the improvement of the quality and operation of management in the private sector of the economy by making available the results of its research activities, by the advice and assistance of its technical staff, and by the policy guidance which can be given by its loan and investment personnel.

Within the public sector, the level at which the management problem must first be solved is at the level of the major development corporations themselves, in industry, mining, agriculture, and in other fields in which they may be constituted. The development corporations are the key to successful development in these broad areas of economic activity. Unless they are properly organized, staffed, and ably and dynamically conducted, the development program will have little chance for success. The chief problem at this level is to assure selection of the most able persons available for the executive staff and for membership on the board of directors, and to promote effective operation by appropriate grant of authority to the board, including adequate working capital; by the necessary delegation of authority as well as responsibility by the board of directors to the

chief executive officer of the corporation; and by attaching to the board and the chief executive officer technical advisers of outstanding competence in the various fields in which technical assistance is required. For the short run at least, it will be necessary to engage a large number of foreign technicians for this latter purpose.

So far as the project corporations which will be set up by the development corporation are concerned, the chief problem is that of supplying able operational management. Because it will be difficult to find people of the necessary experience and ability, who are not already overburdened with other tasks, to serve on the boards of directors of these corporations, the operational management of these corporations will need also the experience and ability to formulate and recommend broad policies covering the entire range of operations of the enterprise.

Short-run solutions to these high-priority management problems require a consideration of the qualifications which must be possessed by competent managers; of the availability of such personnel within Burma; and of the arrangement which may be made to procure foreign managerial talent. For the longer run, consideration is required of the ways in which Burma can develop able managers of her own.

3. SPECIAL QUALIFICATIONS FOR EFFECTIVE MANAGERS

The technical knowledge and the business judgement which is required for efficient administration cannot be obtained merely by academic training, no matter how comprehensive and advanced. A high degree of native talent is essential and even if this is possessed, considerable experience is needed to apply academic knowledge to practical operations, before reliable judgement can be expected. To give an engineer or other technician responsibility for important operating decisions before he has had some years of experience in subordinate positions and demonstrated his ability in them is to run a grave risk of administrative failure.

Knowledge of personnel management is as essential to administrative success as is technical knowledge. The manager must understand how to treat labor fairly, how to stimulate labor's interest in the work and how to make labor eager for the success of the enterprise. The importance of this aspect of effective production, which is inherent in industrialization itself, was stressed earlier. Establishing the personnel relationships which are necessary to create favorable work attitudes requires personal qualities and talents on the part of managers which are possessed by relatively few persons, and requires in addition a special knowledge of industrial psychology and of

techniques for successful handling of labor union relations and workers' grievances. Neither the special personal ability nor the knowledge of personnel-relations methods is acquired solely by training; both depend in part on experience.

A third personal characteristic which is important for efficient management is coordinating ability, the ability to keep in mind many details and relationships and to organize the necessary administrative procedures and records for keeping production flowing smoothly and at a maximum pace. Such judgement, foresight, and organization ability are in part inherited. But even the most skillful manager will not possess them before he has had experience in a venture similar in nature, though not necessarily identical, to that which is placed in his charge.

4. LACK OF QUALIFIED MANAGERS IN BURMA

It is an unfortunate fact that very few Burmese nationals now possess the necessary combination of talent, training and experience to assume management responsibility for sizable industrial ventures. This is an inevitable consequence of the economic history of Burma. When the British occupied Burma and introduced some industries, the Burmese were untrained and inexperienced in modern productive methods, and disinclined by their culture and by their independence of spirit to enter upon them. There was, furthermore, a language barrier. On the other hand, there were considerable numbers of Indian and Chinese nationals with varying degrees of industrial experience and training and with whom the British had had previous economic contact. These were probably the major reasons why administrative and managerial posts which were not occupied by Europeans came to be filled by non-Burmans.

These statements are true of every major industry. The large rice mills were owned and operated by foreigners. Teak extraction and milling was largely in the hands of Europeans, and there were no Burmans in high administrative positions in the industry. Neither the Burma Corporation nor the Mawchi Mines placed Burmans in the more responsible positions. The Burmah Oil Company was administered by Europeans. No Burmans had managerial responsibility in any large bank, and few, if any, in any large import or export business.

These conditions persisted. It was the course of least resistance to continue to employ personnel with the greatest industrial and commercial training and experience for key administrative posts. As a result very few Burmese at present have acquired the necessary training for industrial management, and even fewer have experience in upper-level administrative positions.

Because experienced managers are essential in initiating new ventures, it will be necessary in most cases to employ non-Burmans for the present. But to prevent the perpetuation of this situation, vigorous measures must be taken to accelerate the training of Burmans in technical and managerial skills, and to give them the necessary experience.

5. OBTAINING FOREIGN MANAGERIAL AID FOR NEW ENTERPRISES

Effective management is a demanding task. It requires continuous vigilance, and exacts at times a heavy toll in nervous tension. The inducement to the continuous exertion of nervous energy must be great. That inducement is provided only in part by financial rewards and by the satisfaction of creative achievement. To a manager operating in his own country, inducement is also provided by the esteem which he achieves and the positions of higher rank to which success may lead. But to a man operating for a limited term in a foreign land, that inducement is less powerful. The arrangements under which foreign managerial aid is obtained are therefore of the first importance.

A wide variety of such arrangements is possible.

(a) A Burmese national may be designated as manager, under government ownership, and foreign technicians may be employed to advise him.

(b) A general manager and the necessary technicians may be employed from abroad, on an individual contract basis.

(c) A joint venture may be entered into between the Government and a foreign firm experienced in the industry, either on a fifty-fifty basis, or with one party holding predominant ownership, but in either case with the foreign firm supplying the management personnel.

(d) Management may be provided by an experienced foreign firm operating under a management contract, with a profit-sharing or similar provision as an inducement to efficiency.

(e) A management contract may be let to an experienced foreign firm on a straight fee rather than a profit-sharing basis.

(f) A foreign firm might supply the equity capital in such a venture with the Government providing loan capital but not participating in ownership.

(g) The entire venture might be financed by foreign capital operating under certain guarantees extended by the Government as to raw materials, markets, security of capital and returns, etc.

(h) Ownership of the enterprise might be domestic in character, assisted by Government loans and with management assistance provided by foreign technicians.

Undoubtedly some of the eight possibilities outlined above are more promising than others. An elaborate analysis could be made of the relative advantages and disadvantages of each. Before attempting even a brief analysis, however, it should be emphasized that these alternative arrangements cannot be adequately evaluated in the abstract. Flexibility must be retained, and the choice of arrangements must be conditioned by the practical possibilities existing in the case of each venture for which management must be found. The person or firm available to supply the needed management will be in the long run just as important, or perhaps even more important, than the type of arrangement selected for engaging that person or firm. For example, it is quite clear that the employment of a foreign firm on a fee basis is not likely to be as satisfactory as a management contract in which provision is made for profit-sharing, or bonuses, to provide real incentive to the management firm. On the other hand it is perfectly possible that management firm "X" will perform more satisfactorily on a fee arrangement than would management firm "Y" operating on a profit-sharing basis. With this word of caution as to the importance of flexibility in the selection of arrangements, a brief discussion of the relative merits of these various possibilities for foreign managerial aid is offered below.

(a) The designation of a Burmese national as manager of an enterprise with foreign technicians to advise him might work out quite well, provided that the venture is not a very large one, provided that the manager has had some experience in a related field, and provided that the range of problems that would be encountered would be largely technical and on the production side. The greater the degree to which these conditions are departed from, the more weighty are the reasons for selecting some arrangement which will place more experienced management in charge.

The selection of the individual is extremely important. Administrative talent is rare. The assumption that a man can manage a plant effectively because he has the necessary technical knowledge is false and dangerous.

(b) The employment of a general manager and other technicians from abroad under individual contracts involves serious hazards. The chances of finding the right kind of individuals are problematic, particularly where the manager is concerned. The broad range of talent, training, experience and policy-making ability necessary is everywhere in short supply and the probabilities of finding persons of this caliber by individual recruitment seem rather remote. The person must be one who not only has been technically and administratively successful in his industrial

field, but also one who understands problems of personnel management in relation to workers of a different race who have no industrial experience, and who understands the problems of governmental relationship which will be involved. The experience at the government Cotton Spinning and Weaving Factory is an evidence of the possible weaknesses which attend this approach.

(c) A joint venture may be entered into with a foreign firm experienced in the industry. Under such a venture the foreign firm would share in the capital investment, and would share correspondingly in the profits. The joint venture with the former Burma Corporation seems to be working well, and is an illustration of the possible success of this form of organization. Other joint ventures for the operation of existing enterprises are now being negotiated.

Arranging joint participation in a new industrial venture, on terms which will attract the necessary foreign capital and at the same time be equitable to the Government and the people of Burma, is a more difficult undertaking than is arranging a joint venture with an enterprise long established in Burma.

In establishing a joint venture, mutually acceptable provisions are far from enough. Some operating policies may cause frictions. Provisions concerning them must be clearly spelled out in the contract. For example, principles on which prices and wages are to be determined must be clearly indicated, to avoid later dispute caused by the Government's desire for low prices or high wages, while the foreign company may wish to maximize profits by contrary policies.

Over-all control of a joint venture will of course be by a board of directors on which the Government and the foreign company are represented. Equal representation on the board is probably the most advantageous arrangement. Domination of policies by either the Government or the foreign company will hardly be successful. Unless the conditions of the joint venture are so clearly and fairly spelled out in the contract that reasonable men can subsequently agree upon policies without deadlock, chances of success of the venture will be small.

One of the aims of the management of the venture must be the training of Burmese nationals as rapidly as possible to take over the administrative positions. Preparing them to do so will be an important part of the function of the foreign managerial and technical staff. One of the most important sections of the contract will be that dealing with this matter, for it will not be easy to arrange provisions which stimulate the foreign company to most efficient management at the same time that it is working vigorously to create conditions in which its participation will no longer be necessary. Yet it is entirely feasible to

establish such provisions. A minimum period of years within which the foreign company is guaranteed against compulsory sale of its interest to the Government is a requisite.

Joint ventures may be entered into with the Government taking either more or less than a half share. At first glance, an arrangement of this type would seem to obviate some of the difficulties or complexities which attend the joint venture on a fifty-fifty basis, because the partner undertaking more than a 50% share would have the major voice in the making of basic policy decisions. In practice, however, such an arrangement might be exceedingly difficult to design. In cases where the Government held a minor share, it still could hardly afford to permit its partner to operate out of harmony with the Government's views, a fact that would be well known to a prospective partner. On the other hand, the private partner would probably be reluctant to enter into a relationship where he would hold a minor share and therefore have little or no voice in the making of critical decisions. The probability of such arrangements therefore may be considered remote.

(d) The fourth possibility is complete ownership of the venture by the Government, with development and management provided by an experienced foreign firm under a management contract which contains profit-sharing or similar provisions. These provisions may simply take the form of a share in the profits over a specified period of years without any capital investment by the foreign firm. Alternatively, the firm may be given an option to purchase stock at a specified price, so that it will have an inducement to create profits which will make such a purchase advantageous. In general, the comments above concerning the conditions and provisions necessary for the success of a joint venture apply, though in somewhat lesser degree, to such a management contract.

(e) The fifth possible arrangement is complete ownership by the Government, with initial management of the venture provided for by a management contract with a foreign company on a straight fee, rather than profit-sharing or other basis. Such a contract will provide for management by the foreign concern for a period of say three to ten years, depending on the nature of the venture. The company would agree to provide competent staff and professional judgement for construction of the plant, initiation and conduct of operations, and training of Burmese nationals at all levels of production and administration. It is entirely possible to obtain the services of a company to do this effectively without a profit inducement. But for such an arrangement to be effective, the company employed must be one

which depends for its reputation and success upon the efficient conduct of such management operations, either because it is primarily a management company or because in some other way the success of such operations is interwoven with its business standing. If these conditions do not exist, the inducement to efficient operation provided by a fixed fee only can scarcely be compared to that provided by a share in profits.

(f) Ventures might be organized with foreign equity capital, i.e., capital representing ownership, with Government providing loan capital, especially if government long-term loan assistance comprised a large share of the total capital required. Such an arrangement would absolve the Government from any responsibility with respect to management other than the safeguards usually exercised by lenders to protect their capital. It seems quite likely that foreign firms might be interested in undertaking ventures in Burma on such a basis, particularly if the prospect of earning substantial returns on a modest capital investment seemed bright and if convertibility of the earnings to other currencies could be assured. Such an arrangement, however, could yield to the foreign owners a return quite disproportionate to the investment made, and would scarcely be in harmony with the economic views of the Government.

(g) Ventures could be financed entirely by foreign capital, with the Government providing the necessary guarantees concerning convertibility and freedom from nationalization. The possibilities of such arrangements do not seem very great. The profit-making opportunities which exist in advanced economies where such capital is available are so large these days that investment abroad in an under-developed country like Burma would not seem very attractive unless the prospective profits were very great. By the same token, however, the Government would hardly wish to encourage investment of this kind if the profits to be made by such concerns would be so large as to be embarrassing.

(h) Domestic ownership and management of enterprise, assisted by government loans and by foreign technicians, might be quite feasible where Burmans have had some experience in the particular industry or in a related field, where the size of the venture is not very great, and where no especially difficult or unique problems are likely to be encountered. Such an arrangement should be considered in the case of contemplated ventures in fields where a domestic private industry already exists, and where there already exists some nucleus of capital investment and managerial know-how.

It would appear then, from the point of view of the possible arrangements themselves, that the most

likely methods of providing initially the management necessary for proposed industrial ventures are methods (a), (c), (d), and (h). While it is recommended that in each case thorough consideration and weight should be given to the persons and firms likely to be involved in an arrangement, as well as to the type of arrangement itself, it would seem that, for the short run and for the more important ventures in which the Government is interested, the management contract with an experienced firm containing an incentive feature such as profit-sharing is likely to be the most effective and satisfactory method for providing the management ability and experience necessary. It needs scarcely to be emphasized that an essential concomitant of any such arrangement must be provision for the training of Burmans in positions of responsibility so that they can in time assume the full burden of management themselves.

6. DEVELOPMENT OF INDIGENOUS MANAGEMENT IN THE LONG RUN

Concurrent with the short-run solutions which have been discussed above, steps must be taken to assure the preparation of Burmans in increasing numbers for responsible management positions. While the major steps in this process must be the placement of Burmans for on-the-job training with the foreign managements engaged, additional measures can and should be taken.

Promising young men should be encouraged by scholarships, stipends, and similar inducements to undertake studies which will prepare them for managerial positions. These studies should then be followed carefully by planned programs to give trainees on-the-job experience in the productive processes with which they are to deal as well as in administrative work. The training arrangements involve problems similar to those involved in the training of other professional personnel. These have been discussed in Section D above.

An organized program is also needed for providing assistance to Burmans presently engaged in businesses of their own. Such a program would include the availability of research, technical, and advisory services of the Industrial Development Corporation. It might also include the services of an office of small business development which could be set up in the Ministry of Industry. Such an office, working in close cooperation with the Industrial Development Corporation, could make a substantial contribution to the advancement of managerial know-how and ability in the private sector of the Burmese economy.

On a somewhat broader scale, every reasonable encouragement and aid should be given to the development of industry and commerce in the private

sector of the economy. This is indeed the best training school for managers, where experience serves as teacher, and survival is the stern criterion of economic performance.

F. SUMMARY OF RECOMMENDATIONS

(1) University facilities for the training of professional workers must be greatly expanded. Intermediate colleges should be established, permitting the Rangoon facilities of the University to be used mainly for upper division work.

(2) The desire to increase the number of students in professional courses must not prevent improvement in quality. Financial assistance for students of promise should be combined with rigorous standards for all students.

(3) The present highly desirable program of advanced training abroad should be expanded; methods of selection of trainees should be improved.

(4) Employment of foreign professional personnel should be continued for some years.

(5) The Government Technical Institute at Insein should be expanded and given improved equipment at once. Salaries must be increased to attract sufficient staff.

(6) The Artisan Training Center at Rangoon should be expanded and centers opened promptly in other cities.

(7) The excellent work of the Rehabilitation Brigade should be encouraged. At least a large share of graduates should be released for public employment outside the Brigade or for private employment.

(8) The training of sub-professional and skilled workers, referred to in recommendations (5), (6), and (7), should be placed under the administration of the Ministry of Industry, or under an autonomous board.

(9) A center for Training Aids should be established to provide aid in in-service training throughout the Government.

(10) A comprehensive program for technical training should be prepared.

(11) Where applicable, bonuses for output above a norm or profit-sharing should be adopted as a work incentive. In general, straight wage increases should wait upon increases in productivity.

(12) Industrial safety devices should be required.

(13) Collective bargaining and the establishment of grievance machinery should be encouraged.

(14) An industrial revolution in Burma as in any country will create problems of worker attitudes which must be met, by measures to make workers aware of the worthwhile ends the enterprises are serving, the importance of their individual parts in the production process, and the recognition granted to

their value as individuals and members of a cooperating group.

(15) The experience of other countries should be studied to avoid their errors in operating public enterprises.

(16) Key attention must be paid to obtaining efficient managers and to establishing conditions conducive to effective management.

(17) Management boards must delegate wide authority.

(18) In seeking managers, technical knowledge and successful experience, ability in personnel relations, and broad administrative and coordinating ability must all be sought.

(19) The success of any arrangement for

management of a new enterprise depends in large degree upon the quality of the individual manager or firm involved. With this qualification, the most promising arrangements probably are as follows: For smaller and less complex enterprises, in which Burmese nationals have had some experience, employment by the Government of a Burmese national with foreign technical advisers as needed, or domestic private ownership and operation assisted by government loans may be most advantageous. For larger and more complex enterprises, a joint venture where feasible and where one is not a management contract with a foreign company, may be most effective.

(20) Any type of arrangement must make careful provision for the speedy training of Burmese personnel.

PART III

AGRICULTURE AND IRRIGATION

CHAPTER VIII

AGRICULTURE

A. OBJECTIVES

Agriculture is probably the most important factor of the Burmese economy for two primary reasons. First, it produces 38% of the national income, and is the greatest single source of foreign exchange. Second, agriculture employs approximately two thirds of the labor population and therefore supports the greater part of that population the raising of whose living standard is the objective of the development program. To the extent that increased foreign exchange will be required, and particularly in the early stages of the development program, agriculture must provide the major share of the increased output. Even though industrial development progresses rapidly, industry will remain a small sector of the economy for a long time. Increases in agricultural income must accrue to the farmer in order to increase the market for industrial products, and to the Government in order to support the capital investments required to expand industry and to mechanize productive operations of all kinds throughout the economy. Progress in agriculture must therefore be included with progress in other industries to prevent destructive unbalance between production, marketing and foreign exchange.

The agricultural development program shares with the general development program the basic objective of providing all the people of Burma with a greater share of the world's goods and opportunities for intellectual and cultural advancement through increased productivity of the individual and fuller and more efficient exploitation of physical resources. If, because of its key position, agriculture is relied upon as the principal initial resource of the federal development program to attain the established goal of increasing the per capita income by 1960 to 5% greater than its prewar value, agricultural output must be increased by 77% of its 1951-52 production. Its present production is only 81% of its prewar value. Of the required increase, 61% can be obtained by the restoration of prewar acreages and by the addition of new acreage, 11% from increased efficiency of production and 28% from state marketing.

B. PRESENT AGRICULTURAL DEVELOPMENT

1. BASIC AGRICULTURAL RESOURCES

a. Climate

The principal agricultural areas of Burma lie between the 16th and 24th parallels of latitude. The climate is characterized by high temperatures, varying approximately from 60° to 95° F. throughout the year, and heavy rainfall. The country is rather sharply divided by rainfall variations into Lower Burma with precipitation from 80 to 250 inches per year, the Dry Zone having 25-50 inches annually, and Upper Burma with rainfall approximating 100 inches annually. Each of these divisions occupies approximately one third of Burma, the central portion constituting the Dry Zone while the north and south extremes form the Wet Zones.

b. Soils

Soils of the agricultural areas consist principally of alluvium and deposits of the Peguan and Irrawaddian series. The Shan States are separated from the rest of Burma by a fault line extending the length of the country, and forming the boundary line of a large limestone plateau that stretches east into China. The principal agricultural soils are characteristically heavy-textured clay at subsoil depths, often overlain with lighter surface soils. The soil reaction is extremely acid in the Delta, gradually changing northward to a neutral or slightly alkaline reaction in the Dry Zone.

c. Topography

The topography of the country is characterized by north-south Yomas of uplifted, broken terrain that pass between wide, flat valleys. In lower Burma the topography is typically flat. The Shan States have a rolling topography with occasional wide valleys having moderate slopes.

The conditions of warm temperature throughout the year, ample rainfall, and flat land of relatively fertile soil are ideal for excellent agricultural production, and typical of the major rice production areas of Burma.

d. Human Resources

Compared to most countries in Asia Burma is fortunate in having land resources that are large in proportion to the population (see Plate 1). However, there are large areas of formerly cultivated land which remain idle as a result of insecurity, and there has been a 10% increase in population since 1941. The result is a surplus of agricultural labor in relation to currently cultivated crop area. As prewar acreage is restored this surplus labor force will be reduced but there will be ample labor for more intensive cultivation and for expansion of cultivated acreage.

The 1931 census indicated about two thirds of the labor force to be engaged in agriculture. About 27% of the labor force were classified as agricultural laborers, 15% as tenant cultivators and 25% as cultivating owners. Subsequent increase in the amount of tenancy and postwar reduction in the size of farms have probably reduced the relative number of cultivating owners and agricultural laborers and increased the number of tenant cultivators.

e. Standard of Living and Income

An agricultural laborer receives from 100 to 150 baskets of paddy plus board for working seven months. This amounts to about K40 to K50 per month if he is able to wait until harvest time to collect his wages. Actually he usually draws cash advances at the rate of K1.50 to K2 per basket for at least part of his wages so that his actual wage may be as low as K20 per month. His wife and other members of the family must also work, and during the remaining five months of the year the laborer must find other employment in rice mills, carting, petty trades, handicrafts or other unskilled work. Income from such pursuits run from about K0.50 to K3 per day. Wages in rural areas are usually paid in terms of paddy. The monetary wages are about two to three times the prewar level but the prices of cooking oil, longyis, and other items which must be purchased have risen much more.

The differences between the incomes of laborers, tenants and the average owner cultivators are not great. The income derived from agricultural operations is insufficient and subsidiary occupations help to make up the deficiency. Such work includes forest work, carting, boating, fishing, thatch making, weaving and processing of products. The cultivator is in a somewhat better position than the laborer but his income is still substantially below that in other sectors of the economy. This disparity is clearly indicated by the fact that agriculture with two thirds of the labor force receives only 38% of the national income.

2. LAND USE

a. Cultivated Areas

A breakdown of prewar land use in divisional Burma, covering a five-year period ending in June, 1940, appears in Table I-2 of Chapter I. The 170.4 million acres of total area are listed by districts according to use, with the exception of approximately 66.8 million acres lying principally in the Chin Hills, Shan States, Kayah State, Naga Hills and Myitkyina for which no record of use is available. The over-all breakdown shows approximately 12% of the total area in reserve forests, 24% suitable for agriculture, 25% not suitable for agriculture, and 39% unknown. The 40.4 million acres of land suitable for agriculture is further divided to show average annual use with net acres sown comprising 43% of the total, 9% left in fallow, and the remaining 48% not cultivated. The areas listed as potentially cultivable, and a portion of the 66.8 million acres with no use record, can be expected to provide ample room for future expansion of agriculture in the country. The map titled "Land Topographically Suited for Agriculture" (Plate 2) gives some indication of the extent of the potentially cultivable acreage in Upper Burma. Further areas of potential development occupy the Shan Plateau where the climate is favorable for such products as wheat, fruit and potatoes, and particularly for livestock production.

The most highly productive areas are those of the Delta and along the valleys of the Irrawaddy and Sittang Rivers. The Dry Zone is less productive, principally because of the lack of water. Upper Burma and the Shan Plateau are least productive because of their remoteness, their traditional pattern of hillside cultivation, and the topographic conditions of that part of the country.

Burma is unique among Asian countries in having a large acreage of cultivated or cultivable land per capita. It is estimated that approximately 2.2 acres of cultivable land are available per capita. Unusual too are the characteristics of much of the cultivable land in being essentially flat and receiving sufficient moisture for annual, single crop cultivation without irrigation.

b. Areas Abandoned because of Insurgency

Some of the cultivated acreage is under insurgent control. Approximately 2 million acres, or 10% of all formerly cultivated land, is now out of cultivation and degenerating into shrub and forest growth. These areas are not well defined, but occur generally in sections of the country not under government control. As these areas are made secure, they can be expected to return to cultivation rather quickly.

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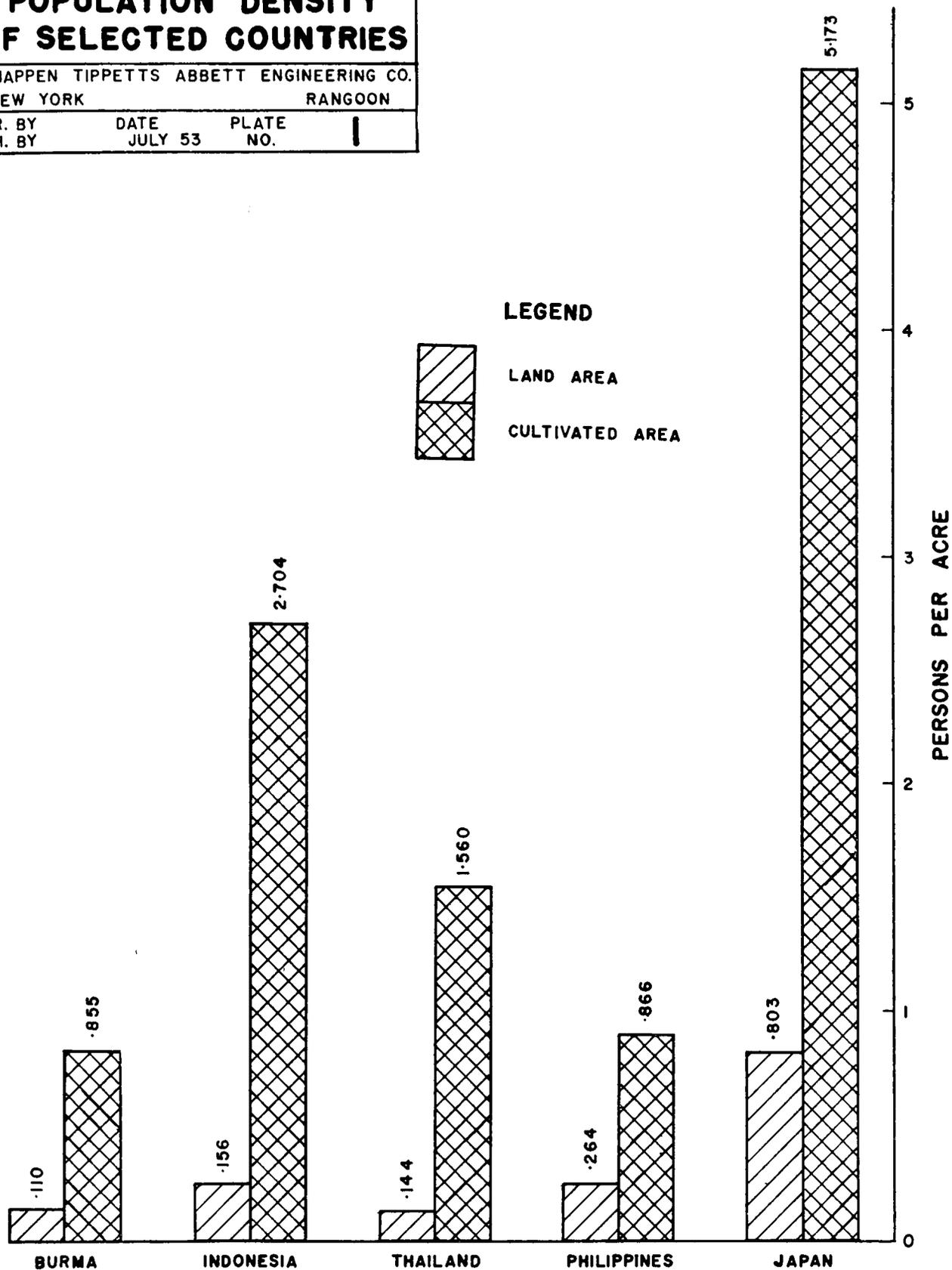
I

LEGEND



LAND AREA

CULTIVATED AREA



c. Crops

Agricultural production centers around rice. Two thirds of all cultivated acreage is devoted to that crop. The lack of a practicable alternative to rice production on heavy flat lands, and a monsoon rainfall, have encouraged the high proportion of rice. Serving the dual function of providing staple food in the country and supplying the major source of national income for Government, the predominant production of rice is unquestionably far better suited to requirements of the economy than any other combination of agricultural crops that could be grown under the present farming system. Growing conditions for rice are best in the Delta, and that area produces the export fraction of the rice crop. The favorable rice-producing area extends beyond the limits of the Delta proper, notably along the Irrawaddy and Sittang River valleys, but its adaptability to rice production declines northward. The demand for rice as the single staple food of the Burmese people results in its production in some areas not well suited to the growing requirements of the plant. The lack of good communications has, on several occasions, left upper Burma in a condition of serious rice shortage while rice glutted the market in the Delta.

After rice, the production of vegetable oils is most important as a result of the dietary demand for oil products within the country. Oleaginous production is practically restricted to the Dry Zone where suitable growing conditions for sesamum and groundnut are found. There, too, is the major production of pulse and fiber crops. The bulk of all food crops, other than

rice, is produced in the Dry Zone and along the periphery of the Dry Zone and the Delta. Table VIII-1 shows the approximate acreage devoted to different agricultural crops in Burma.

A few agricultural commodities are imported into Burma, and the increased production of some of these is of considerable importance to the national economy. Principal among these are edible oils and sugar. Among fibers, long staple cotton is produced in insufficient quantities to supply local demands, while short staple cotton is exported for lack of milling facilities. Jute importation has been costly. An analysis of that situation is discussed in detail in the Project Report which indicates that jute bags can be manufactured in Burma from native jute for K67/ton less than they can be imported, but that the net revenue to the cultivator for jute fiber may not exceed that for paddy since man-hours of labor required per acre are at least twice those for paddy production. In addition, the advantage gained in the reduction of jute imports is counterbalanced by the loss due to the reduction of exports of rice previously grown on the land allocated to jute production.

d. Grazing

The importation of dairy products is large and will probably continue to be so for a long time. In spite of apparently good conditions for livestock production, as evidenced by reasonably abundant grazing lands on the Shan Plateau, the industry never developed in relation to other agricultural progress. Major reasons probably lie in the dominating interest of cultivators

TABLE VIII - 1
ESTIMATED CROP ACREAGE BY DIVISIONS

<i>Division</i>	<i>Rice</i>	<i>Groundnut</i>	<i>Pulses</i>	<i>Sesamum</i>	<i>Millet</i>	<i>Maize</i>	<i>Cotton</i>	<i>Tobacco</i>	<i>Fruit and Other</i>	<i>Sugar Cane</i>	<i>Not Listed</i>	<i>Total</i>
1	978,400	—	1,000	1,800	100	400	800	7,900	30,700	—	46,100	1,067,200
2	3,760,000	1,600	29,300	14,300	—	5,300	2,700	24,100	159,200	11,900	151,400	4,159,800
3	3,549,500	8,700	50,900	3,000	—	26,400	—	18,000	147,500	—	174,500	3,978,500
4	1,394,100	—	3,300	7,400	—	300	—	4,800	219,900	11,400	73,300	1,714,500
5	384,600	362,600	101,100	350,800	134,400	81,400	55,100	20,700	12,100	—	294,100	1,796,900
6	630,500	282,500	340,200	387,500	151,300	49,200	133,300	12,900	58,800	20,800	77,900	2,144,900
7	1,097,800	101,700	431,400	287,900	141,200	10,400	185,000	12,400	25,600	7,900	223,300	2,524,600
												17,386,400

1. Akyab, Arakan Hills, Kyaukpyu, Sandoway.
2. Pegu, Tharrawaddy, Rangoon, Hanthawaddy, Insein, Prome, Toungoo.
3. Bassein, Henzada, Myaungmya, Maubin, Pyapon.
4. Salween, Thaton, Amherst, Tavoy, Mergui.
5. Thayetmyo, Minbu, Magwe, Pakokku, Chin Hills.
6. Mandalay, Kyaukse, Meiktila, Myingyan, Yamethin.
7. Bhamo, Myitkyina, Shwebo, Sagaing, Katha, Upper Chindwin, Lower Chindwin.

BURMA

Scale 1 inch to 60 miles

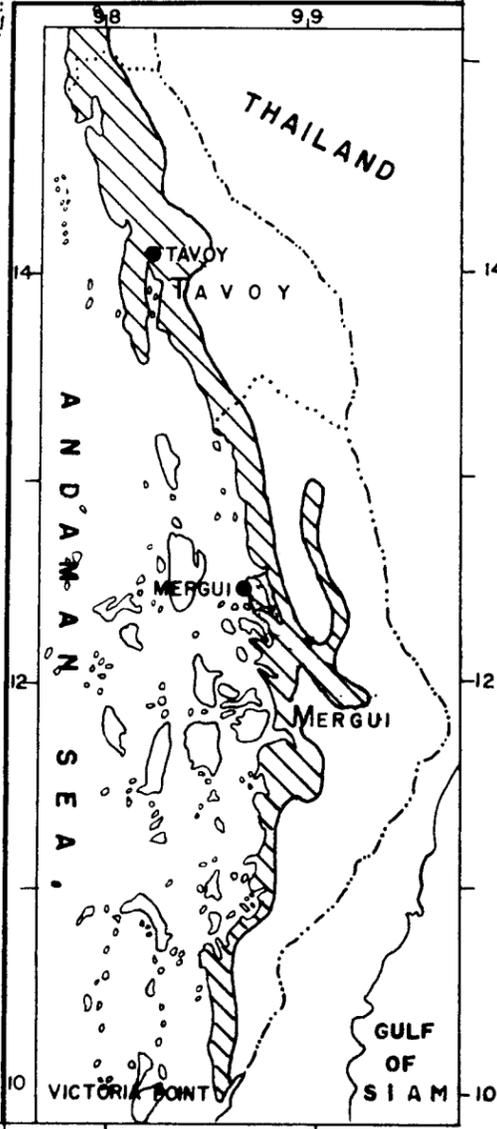
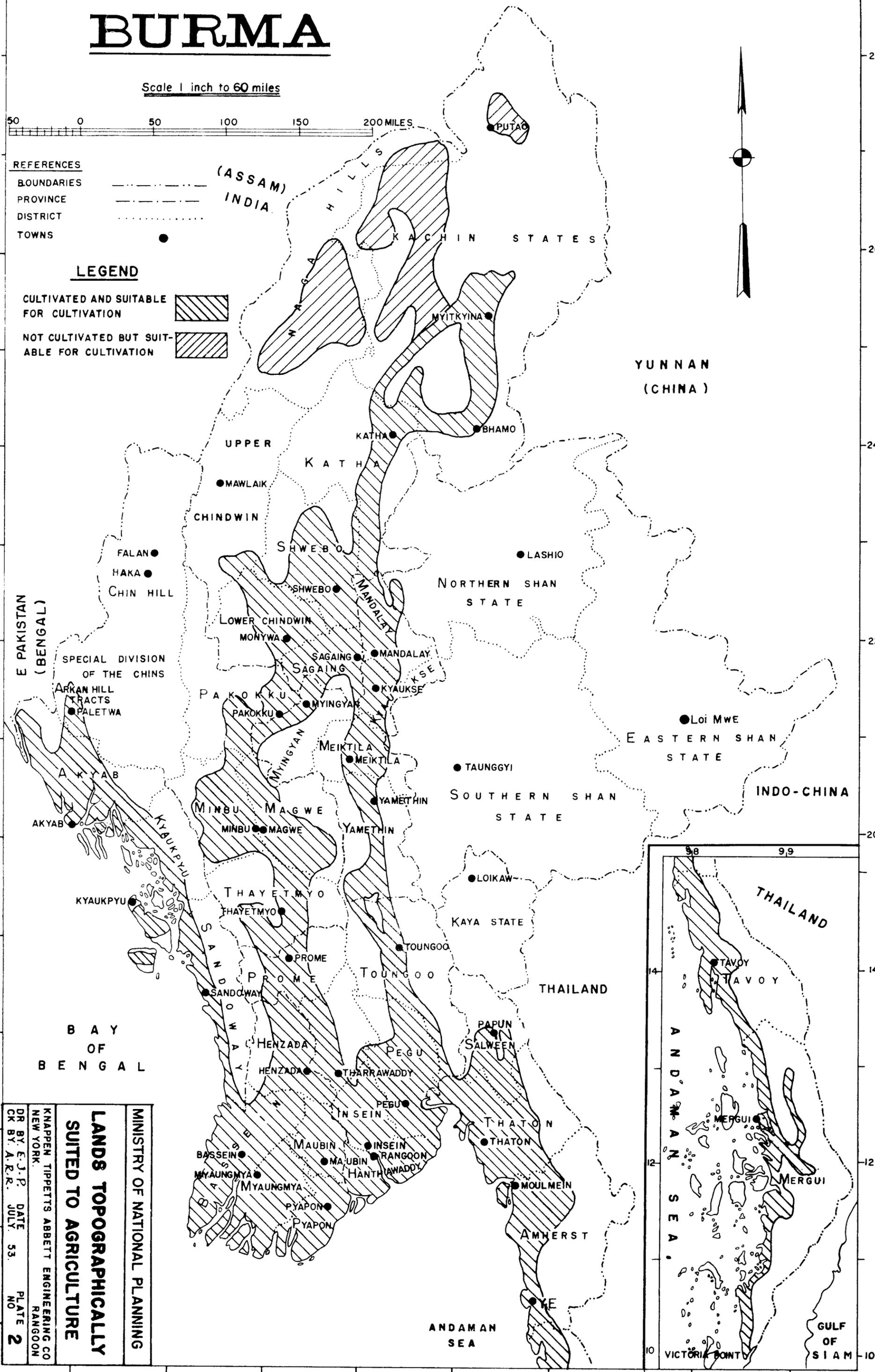


REFERENCES

- BOUNDARIES
- PROVINCE
- DISTRICT
- TOWNS

LEGEND

- CULTIVATED AND SUITABLE FOR CULTIVATION
- NOT CULTIVATED BUT SUITABLE FOR CULTIVATION



MINISTRY OF NATIONAL PLANNING

LANDS TOPOGRAPHICALLY SUITED TO AGRICULTURE

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in cattle as draft animals instead of for meat or milk production and, more important, the difficulty of producing and maintaining livestock in the humid hot Delta country where agricultural production is concentrated. If livestock and dairy production are properly confined to the areas most suitable for their development, principally on the Shan Plateau, increased production of these commodities may be slow in developing because of the remoteness of that part of the country from the population centers.

e. Farming Methods

The very considerable exports of rice from Burma have been produced exclusively under primitive farming methods little changed from times of antiquity. The methods are characterized by the use of animal power, hand labor, and primitive tools. A description of rice cultivation throughout the year will explain farming methods in current use, and emphasize the possibilities for more efficient production and fuller land use.

Rice production is normally a two-stage operation consisting of nursery preparation followed by main paddy-field planting. Field nurseries comprise about 10% of the area to be planted, and they are the first to be prepared. Preparation begins after four to six inches of rain has softened the soil sufficiently to permit plowing with a steel-pointed wood plow. Plowing is completed toward the end of May or early June. The land is then harrowed using a timber crossbar equipped with teeth that stir up the soil in the manner of a pegtooth harrow. After the area has been harrowed eight or ten times, a simple rotary hoe is passed over it. Most of the soil preparation is carried out when there is one or more inches of water covering the surface. The inefficiency of the tools is partially responsible for the numerous repetitions required for each operation. One reason for repetitive plowing and harrowing is to "puddle" the soil into a thick mud that tends to seal the surface inches by destruction of the soil structure, thereby decreasing its permeability. The result is less leaching, or percolation, and a consequent reduction in the amount of irrigation water required.

Before field nurseries are planted, the water is drained, and seed, previously sprouted, is broadcast by hand. Sprouted seed establishes itself more readily than dry seed and is therefore less likely to be washed out by torrential monsoon rains. Water is gradually flooded into the nursery field plot, increasing in depth as the seedlings grow. After a period of four to six weeks the seedlings are ready to be transplanted.

While the nursery plot is growing, the main field is prepared for transplanting. Soil preparation on the main area is usually inferior to that on the nursery plot. Early rains encourage a fairly rank, hydrophytic

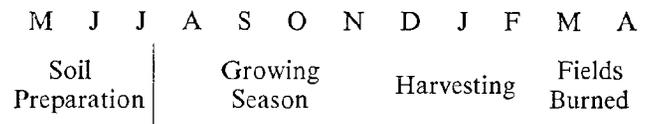
weed growth of sedges and grasses that make soil preparation difficult.

When the soil is a thick mud in the upper four or five inches, and with three inches of water on the surface, the transplanting operation begins. Seedlings are pulled and tied into bundles, five or six hundred of which are required for one acre. After pruning, the seedlings are placed into the mud in bunches of two to four at six-inch intervals. Rarely, when labor or weather conditions dictate, sprouted seed is broadcast on the entire field in quantities of 60 or 80 pounds per acre, instead of transplanting.

After transplanting has been completed, no care is required for the crop other than regulation of water. About ten days before harvesting, the water is drained off the fields. The removal of surface water causes the rice plants to undergo a physiologic change that hastens ripening of the grain and discourages lodging.

Harvesting is sometimes preceded by laying the crop over in a single direction to prevent haphazard blowing over by the wind and to facilitate cutting. The crop is reaped with hand sickles by removing the panicle together with the top foot or so of culm. A long stubble is left in the field and usually later burned. Bundles of panicles are left on the threshing floor for a week or longer for drying. Bullocks tread the grain out of the plants and it is afterwards winnowed to separate the grain and chaff.

The production of a single rice crop occupies most of the year. Nursery preparation usually extends from the middle of May until the first of July. Transplanted in July, the crop matures in November or December. Harvesting takes place in January or February, the fields are burned in March or April, and in the following month soil preparation begins again. The graph below shows the normal rice cultivation pattern during the period of a year. With primitive equipment, plowing is possible only during the months of May and June. Hand harvesting occupies the month of January and often February.



In the absence of ample water at all seasons of the year, and unless there can be a reduction in the time required for plowing and harvesting, single cropping cannot be avoided.

3. PRESENT LAND TENURE

The development of commercialized paddy agriculture in lower Burma started with the British occupation and brought with it western institutions of land ownership, rule by law, and a money economy

based on prevailing *laissez faire* notions. Production for the market required larger holdings than subsistence production and larger holdings required more labor and equipment. These in turn became cash costs to the cultivator. So long as rice prices increased and new rice lands were available, money for further rice area development was readily available and cultivators found it profitable to borrow. However, by 1908 and 1909, special inquiry into the conditions of the agricultural population in lower Burma concluded that small landholders were losing their lands to money-lenders, traders and large landlords. The land boom resulting from the sustained rise in the price of paddy and the availability of credit from the Chettyars collapsed as a result of the worldwide collapse of credit in 1907. The small cultivator unable to meet the sudden demand for repayment of his debts was forced to surrender his land. Since then there has been a steady decline in the area owned by cultivators. This trend was accelerated substantially during the depression of the early 'thirties and by 1939 in lower Burma 48% of the occupied area was occupied by non-agriculturists and 59% was under tenancy. In the worst districts 70% of the area was in the hands of non-agriculturists.

The commercialization of agriculture in upper Burma started much later than in lower Burma with the rapid expansion of groundnut production from about 1905. The result is that traditional patterns of village life have been better preserved. Farms are smaller in size, and, because of varied climatic conditions, agriculture is more diversified. Landlords usually live in the village or close by, and are often fellow farmers renting out surplus land. Problems of tenancy, indebtedness, and alienation of land did not reach the proportions that they did in lower Burma. Tenancy litigations were more infrequent than in lower Burma and apparently tenants were relatively satisfied with their lot. However, while the increase in tenanted area and in the area of land held by non-agriculturists started much later in upper Burma than in lower Burma the rate of increase has been roughly as indicated in the graph (see Plate 3). Most studies quote data on area held by non-agriculturists to indicate the seriousness of the tenancy problem, but the area under tenancy is much greater in upper Burma than indicated by the area held by non-agriculturists because of the large proportion of tenant land held by agriculturists. By 1939 only 14.2% of the land in upper Burma was owned by non-agriculturists but 32.5% of the land was tenanted. Plate 4 indicates the proportion of land in the various tenure categories. Tables VIII 2, 3 and 4 show occupancy of land in lower Burma, upper Burma and in the whole of Burma respectively.

TABLE VIII - 2

OCCUPANCY OF LAND IN LOWER BURMA

(in acres)

Year	Total Occupied Area	Tenanted Area	Total Non-agriculturist	Resident Non-agriculturist
1925-26	10,339,589	4,482,835	2,784,959	700,163
1926-27	10,456,422	4,583,092	2,893,219	735,723
1927-28	10,607,514	4,626,601	2,955,433	767,131
1928-29	10,654,025	4,701,952	3,052,816	778,345
1929-30	10,745,121	4,932,361	3,231,561	803,617
1930-31	10,805,961	5,264,090	3,513,936	821,585
1931-32	10,733,754	5,290,692	4,093,594	857,232
1932-33	10,768,444	5,773,249	4,473,817	834,843
1933-34	10,846,462	5,981,012	4,816,071	860,493
1934-35	10,926,303	6,225,308	5,061,753	890,052
1935-36	11,056,018	6,372,425	5,253,082	968,161
1936-37	11,201,766	6,579,507	5,306,017	989,419
1937-38	11,300,110	6,683,797	5,359,823	981,684
1938-39	11,293,092	6,682,233	5,385,150	966,968
1945-46	11,330,885	3,383,460	5,435,285	1,017,813
1946-47	11,330,243	4,684,726	5,400,483	974,716
1947-48	11,391,237	5,366,836	5,492,666	949,560
1948-49	7,647,288	3,699,942	3,784,276	655,134
1949-50	10,402,581	4,645,683	5,095,891	891,598

Source: Report of the Land and Agricultural Committee. Report on the Land Revenue Administration of Burma (Statement XI).

TABLE VIII - 3

OCCUPANCY OF LAND IN UPPER BURMA

(in acres)

Year	Total Occupied Area	Tenanted Area	Total Non-agriculturist	Resident Non-agriculturist
1925-26	7,932,229	1,924,299	686,909	312,347
1926-27	7,928,498	2,014,173	686,411	310,758
1927-28	7,912,922	1,915,007	720,497	327,936
1928-29	7,892,047	2,010,208	731,073	324,552
1929-30	8,002,805	2,158,070	797,105	350,671
1930-31	8,007,426	2,160,320	842,700	368,866
1931-32	8,021,272	2,167,279	908,230	394,425
1932-33	8,049,372	2,387,997	982,473	424,273
1933-34	8,049,951	2,553,608	1,035,326	441,857
1934-35	8,066,490	2,623,823	1,076,780	454,298
1935-36	8,093,082	2,646,076	1,105,521	462,623
1936-37	8,103,141	2,698,094	1,136,016	475,745
1937-38	8,143,036	2,680,403	1,153,816	482,428
1938-39	8,167,666	2,654,033	1,157,944	481,350
1945-46	7,921,959	1,795,333	1,065,932	458,471
1946-47	7,830,976	1,770,093	1,003,849	428,710
1947-48	7,873,527	1,973,731	985,047	419,625
1948-49	5,189,216	1,269,899	644,361	285,451
1949-50	8,065,241	1,899,880	984,553	426,689

Source: Report of the Land and Agricultural Committee. Report on the Land Revenue Administration of Burma (Statement XI).

TABLE VIII - 4

OCCUPANCY OF LAND (TOTAL BURMA)

(in acres)

Year	Total Occupied Area	Tenanted Area	Total Non-agriculturist	Resident Non-agriculturist
1925-26	18,271,818	6,407,134	3,471,863	1,012,505
1926-27	18,384,920	6,597,265	3,579,630	1,046,481
1927-28	18,520,436	6,541,608	3,675,930	1,095,067
1928-29	18,546,072	6,712,160	3,783,889	1,102,897
1929-30	18,747,926	6,985,431	4,028,666	1,154,288
1930-31	18,813,387	7,424,410	4,356,636	1,190,451
1931-32	18,755,026	7,457,971	5,001,824	1,251,657
1932-33	18,817,816	8,161,246	5,456,298	1,259,116
1933-34	18,896,413	8,534,620	5,851,397	1,302,350
1934-35	18,922,793	8,849,131	6,138,538	1,344,356
1935-36	19,149,100	9,018,501	6,358,603	1,430,784
1936-37	19,304,907	9,277,601	6,442,033	1,465,164
1937-38	19,443,146	9,364,200	6,513,594	1,464,112
1938-39	19,460,758	9,336,236	6,543,094	1,448,318
1945-46	19,252,844	5,178,793	6,501,217	1,476,284
1946-47	19,161,219	6,454,819	6,404,332	1,403,426
1947-48	19,264,764	7,340,567	6,477,713	1,369,185
1948-49	12,836,504	4,969,831	4,428,637	940,385
1949-50	18,467,822	6,545,563	6,080,444	1,318,287

Source: Report of Land and Agricultural Committee. Report on the Land Revenue Administration of Burma (Statement XI).

The lot of the tenant farmer was not enviable. Rents ranged from about 25% to 60% of the crop. At the end of the season after paying his rent and his debts the tenant farmer normally did not have enough "wunza," the paddy to be used for food during the coming year. Particularly in lower Burma, where fixed rents prevail, a poor crop usually meant accumulation of debts and eviction from the land. Prewar studies in lower Burma show that only about half the tenants remained on a given piece of land for more than one year and that less than a quarter remained for more than four years.

The average size of a holding in lower Burma is now between 10 and 20 acres, or the area which can be plowed with one or two yokes of oxen. Some cultivators operate as much as 50 acres which is the maximum permissible under the Disposal of Tenancies Act, but the postwar tendency has been toward smaller holdings. In Upper Burma, holdings are much smaller, averaging between five and ten acres.

4. AGRICULTURAL PRODUCTION

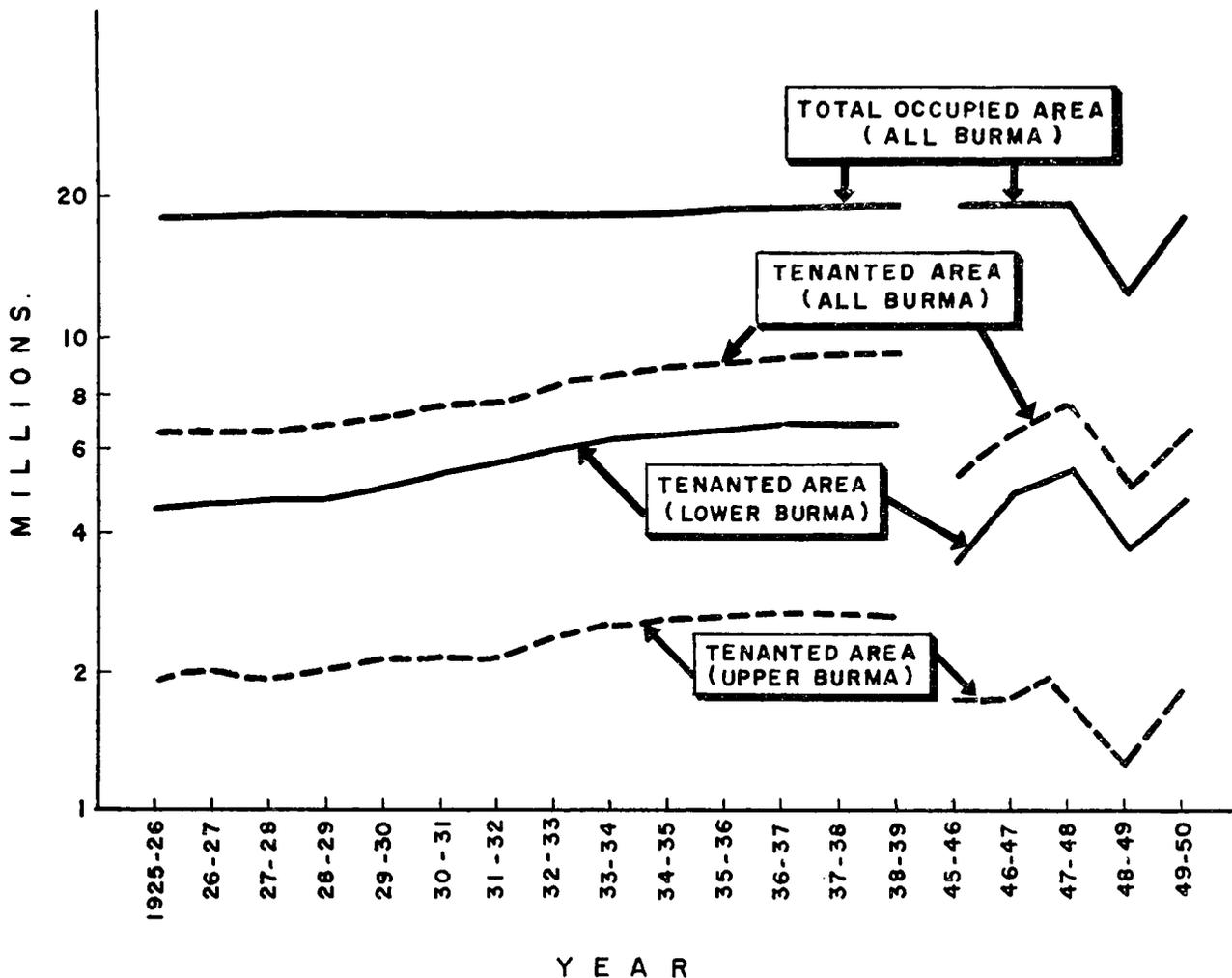
The total area under crops and output in the prewar and postwar periods are shown in Tables VIII-5 and 6. During the war, incentive to produce was low and many export crops in 1945-46 fell to

TABLE VIII - 5

SOWN ACREAGES, PREWAR AND POSTWAR

	Average 1936-37 to 1940-41	1938-39	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53
<i>A. In thousands of acres</i>									
Total Acreage Sown	19,117	18,990	13,456	15,305	15,783	15,031	15,120	15,366	16,270
1. Paddy	12,832	12,816	8,242	9,597	10,128	9,349	9,467	9,698	10,331
2. Groundnut	808	840	573	729	706	699	695	721	744
3. Sesamum	1,401	1,363	1,262	1,395	1,385	1,351	1,297	1,321	1,328
4. Cotton	453	408	171	222	219	216	221	255	294
5. Pulses	1,329	1,347	852	970	968	995	1,000	950	1,050
6. Sugar Cane	64	59	38	46	56	45	45	50	60
7. Millet	475	456	603	565	583	589	635	598	682
8. All Other Crops	1,755	1,701	1,715	1,781	1,738	1,787	1,760	1,773	1,781
<i>B. As per cent of prewar average</i>									
Total Sown	100	99	70	80	83	79	79	80	85
1. Paddy	100	99	64	75	79	73	74	76	81
2. Groundnut	100	104	71	90	87	87	86	89	92
3. Sesamum	100	97	90	100	99	96	93	94	95
4. Cotton	100	90	38	49	48	48	49	56	65
5. Pulses	100	101	64	73	73	75	75	71	79
6. Sugar Cane	100	92	59	72	88	70	70	78	94
7. Millet	100	96	127	119	123	124	134	126	144
8. All Other Crops	100	97	98	101	99	102	100	101	102

TENANTED AREA



Source :- Report of the Land and Agriculture Committee.
 Report on Land Revenue
 Administration of Burmo.

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TENANTED AREA			
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DR. BY. <i>E.J.P.</i>	DATE	PLATE	3
CK. BY. <i>J.L.</i>	JULY. 53.	NO.	

TABLE VIII - 6

AGRICULTURAL PRODUCTION, PREWAR AND POSTWAR

	<i>Average 1936-37 to 1940-41</i>	<i>1938-39</i>	<i>1946-47</i>	<i>1947-48</i>	<i>1948-49</i>	<i>1949-50</i>	<i>1950-51</i>	<i>1951-52</i>	<i>1952-53</i>
<i>A. In thousands of tons</i>									
1. Paddy	7,426	8,050	3,968	5,535	5,264	4,691	(4,979)	(5,250)	5,740
2. Groundnuts	181	180	103	153	144	115	145	176	176
3. Sesamum	45	53	32	44	42	32	39	48	54
4. Cotton	20.5	18.8	3.9	7.7	7.7	7.1	7.7	6.9	9.2
5. Pulses	217	198	153	188	187	175	183	177	181
6. Sugar Cane (1,000 canes)	560	520	356	344	355	300	304	360	384
7. Tobacco	38	31	36	46	43	40	47	45	46
8. Millet and Wheat	70	67	58	77	84	56	76	71	77
<i>B. As per cent of prewar average</i>									
Index of Total Agricultural Production	100	106	56	77	74	65	70	75	81
1. Paddy	100	109	54	75	71	63	67	71	77
2. Groundnuts	100	100	57	85	80	64	80	97	97
3. Sesamum	100	118	71	98	93	71	87	107	120
4. Cotton	100	92	19	38	38	35	38	34	45
5. Pulses	100	91	71	87	86	81	84	82	83
6. Sugar Cane	100	93	64	61	63	54	54	64	69
7. Tobacco	100	82	95	121	113	105	124	118	121
8. Millet and Wheat	100	96	83	110	120	80	109	101	110

subsistence levels. The biggest fall in production was in cotton. Paddy output fell to 54% of the prewar level. The index of total agricultural production was down to 56% of the prewar base. In spite of the insurrections, acreage and output in 1952-53 are now 85% and 81% respectively of the prewar level. Progress is registered by all major indicators: acreage, output and yields. The 10,331,000 acres of paddy sown in 1952-53 represent a postwar high. The production of 5.7 million tons of paddy in 1952-53 is also the highest in the postwar period.

On the other hand, although the average yield per acre of paddy over the last five years is 91% of the five-year prewar average, the yields remain far below what they should be with the employment of scientific agricultural practices, as will be discussed in succeeding paragraphs.

5. AGRICULTURE PROBLEMS

a. Low National Output

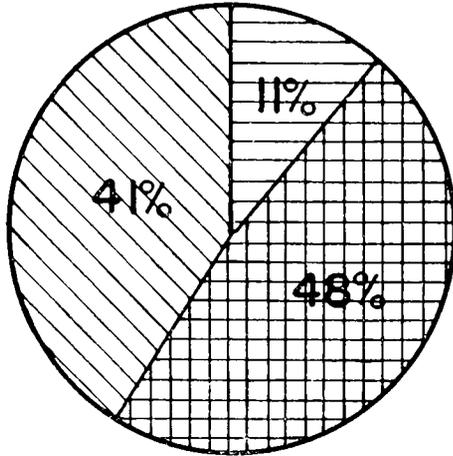
The collective ills of the nation's agriculture are reflected in the low national output. The most conspicuous index of low national output is the difference between prewar and postwar rice exports. The present export of rice is only 41% of the prewar quantity, and the efforts of Government are directed toward reaching the former rice export volume.

Insurgency is a factor profoundly affecting agricultural production by denying the normal cultivation of some areas.

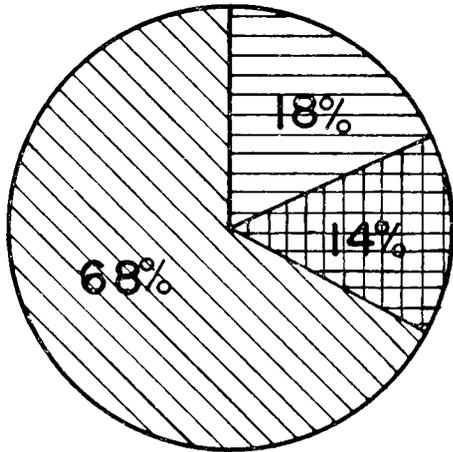
b. Low Per-unit Yields

Agricultural production is at a low level of per-unit yield in every crop grown. In most areas, the soil has reached its base level of productivity. Primitive cultivation has puddled the surface soil of the entire rice-producing area, creating conditions unfavorable for all crops other than rice. Paddy monoculture, with its deleterious effect of exhausting the nitrogen and phosphorus reserves in the soil, is the rule. Little or no fertilizers, organic or otherwise, are applied. The undesirable custom of burning paddy lands is probably made necessary by the absence of sufficient nitrogen in the soil to supply body-building material for the soil microorganisms required to reduce stubble to a humus condition. Under present farming methods, the soil is not managed but mined, with resulting continued degeneration and progressively declining yields.

In spite of present low yields, there are factors very favorable to increased production. Some of the possibilities that appear to be practical and financially feasible for application in Burma are discussed in this Report.



LOWER
BURMA

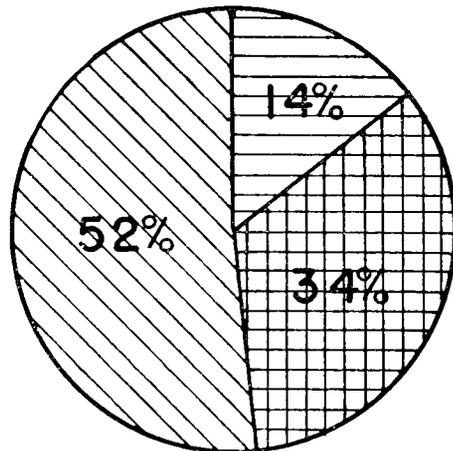


UPPER
BURMA

LEGEND

-  TENANTS ON AGRICULTURIST HELD LAND
-  TENANTS ON NON - AGRICULTURIST HELD LAND
-  OWNER CULTIVATORS

ALL
BURMA



MINISTRY OF NATIONAL PLANNING

**PERCENT OF CULTIVATED
LAND IN VARIOUS TENURE
CLASSES**

KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK RANGOON

DR. BY. DATE PLATE NO. **4**
CK. BY. JULY 53

Source = Report on Land Revenue Administration of Burma
(1938 - 39)

c. Studies, Development and Education

Much work is needed in this field. Surveys, detailed plans, estimates, research, and various educational measures are required. As first steps of the development of new land, the program of aerial mapping should be carried to conclusion, and a broad program of land classification surveys initiated. On the basis of information obtained from these sources, plans may be made for the clearing and preparation of new land and for the development of irrigation and drainage where required. Experimental and demonstration farms are needed for developing the practical adaptation of new methods of cultivation, application of fertilizer, new crop varieties, new methods of pest control, and related measures. Demonstration farms may be used to test the application of various mechanical farming aids, and, as an adjunct to the extension services, to provide a training and instruction ground with which to introduce these measures to the interested population.

d. Fiscal and Marketing Problems

An important reason for low incomes in agriculture has been the large share of total output which has gone to non-agriculturists in the form of rents, interest and trading profits. The Burmese Government has taken steps to correct this inequity through rent controls, land nationalization, government loans, formation of cooperatives, and establishment of state and cooperative marketing. Most of these measures have not yet been fully implemented and some are not consistent with the objectives of increasing output. Also, in the past, heavy rent and interest burdens have reduced the farmer's standard of living and denied him the incentive or opportunity to increase production. Insecure tenure conditions have tended to discourage land improvement practices. The lack of proper market information and the lack of uniform standards of weights and measures and grades have prevented farmers from obtaining full market prices for their produce. Tax measures have not been framed with adequate consideration for the tax burden of the cultivator and its relationship to production incentives.

C. NATIONAL AGRICULTURAL PROGRAMS

1. THE LAND NATIONALIZATION PROGRAM

The Burmese Government, in recognition of the need for basic institutional changes in Burma's land tenure system, passed a series of laws to provide some early relief from tenancy, and the Land Nationalization Law which will, when implemented, eliminate tenancy on all privately owned land. Steps to implement the Land Nationalization Act have, however, been delayed as a result of the insurgency.

To date only a small area in Syriam has been nationalized.

The Burmese Constitution provides that the State is the owner of all land. The Land Nationalization Act carries out this philosophy by providing for resumption by the State of land in excess of specified limits and distribution of the land to cultivators and laborers who would operate the land as state tenants. The Act provides that recipients of land must become members of cooperative societies which would be formed as part of the program. The stated long-term objective is to encourage either cooperative or collective farming. In the first phase it is planned to distribute about 9,900,000 acres of land in parcels which can be plowed with one yoke of oxen. To assure maintenance of adequate living standards, cottage industries, poultry farming, livestock, and cooperative farming or collective farming are to be introduced where necessary.

The short-term program to improve conditions of tenancy before implementation of the Land Nationalization Act consists of the Disposal of Tenancy Acts, the Rent Control Acts and the Land Alienation Act. The Land Alienation Act prohibits transfers of agricultural land to non-agriculturists, and has halted the prewar trend toward increased ownership of land by non-agriculturists. The Rent Control Acts limit gross rents to twice the land revenue tax on paddy land, 20% of out-turn on Ya (field crops other than rice) lands, and 10% of out-turn on sugar cane land. The Disposal of Tenancies Act guarantees the tenure of a tenant so long as he pays standard rents, has not defaulted in the repayment of agricultural loans, and cultivates the land. The Act also limits cultivators to cultivation of 50 acres of paddy or equivalent.

These laws have given tenants most of the advantages of land ownership in areas where they have been enforced. Rents are nominal and tenure is secure. The main problem is that a tenant has no land to mortgage and has difficulty in getting credit. These conditions would of course also be true after nationalization so that in areas where tenancy laws are enforced there is little interest in land nationalization. However, enforcement of tenancy laws is by no means thorough or widespread. In addition to insurgent-held areas there are many areas, particularly in upper Burma, where farmers know very little about the laws. In a number of villages tenants are still paying traditional rents in excess of legal maximums. Tenure was insecure and Tenancy Disposal Boards were inactive because tenants did not know their rights under the law.

However, even if the laws are more fully enforced, so long as tenancy exists on a large scale the

possibilities of reverting to the old system of rack renting and insecure tenure will remain. So long as the demand for land exceeds the supply at controlled rents there will be incentives for evasion of controls. Rental contracts can be changed to sales contracts. Evictions are legally possible under some circumstances, and Tenancy Disposal Boards are not infallible. Hence the objective of the Government to eliminate tenancy should be enforced. In the meantime every effort should be made to publicize and enforce the present temporary laws.

The present plan of the Government, as expressed in Resolutions adopted by the Welfare State Conference in August, 1952, and various speeches by the Minister of Land Nationalization, describe as the ultimate goal of the program the establishment of large-scale collective and cooperative farms. The nationalization of land and its distribution to State tenants as one-yoke plots is considered to be only a temporary phase of the program. Reduction in the size of tenant-managed farms to more or less equal units is expected to minimize opposition to later collectivization and at the same time to provide land for distribution to landless laborers. The problems involved in sub-dividing holdings and the adverse effects on production of disturbing present management units are considered by the officials concerned to be of relatively little consequence as compared to the long-range advantages to be gained through collective farming.

Plans for establishment of one collective in 1954, seven in 1955, and 66 more between 1956 and 1962 are included in the ten-year plan for land nationalization prepared by the Ministry of Land Nationalization. However, Burma has had no experience in collective farming and very little experience in mechanized farming. Substantial investment of equipment and technicians will be required and a number of collectives will have to be established before their success or failure can be fully determined. If the experimental collectives should prove successful the program can be accelerated. The recent experience of Yugoslavia and the earlier Russian experience indicate that many difficulties are encountered in the initial stages of collectivization. Yugoslavia is no longer encouraging collectives and has decided to carry through a program for cooperative farming based on smaller individual holdings. The USSR also has had to revert to individually operated farms until enough experience and technical skills in collective farming can be developed.

In the process of dividing resumed land into one-yoke plots, tenants operating more than one yoke will be adversely affected and may resist. Problems of providing cattle and equipment for the new cultivators

are created, and problems of surveying and distributing the land are increased substantially over those involved in simply continuing the tenant operator on the land he farms. In addition, disturbances of present management units will probably reduce output until cultivators get accustomed to their new holdings.

To achieve action without encountering these initial difficulties, it is recommended that the initial phase of the program should be limited to elimination of absentee ownership of tenant land and distribution to present tenant cultivators. This step can be taken without disturbing production, and can be carried out with much less administrative expense than a more ambitious program. This step will legalize the "de facto land reform" in lower Burma and establish a cutoff date on any claims which landlords may press on the tenant in the future for unpaid rents. It will greatly improve the economic status of tenant farmers in upper Burma. It will give concrete assurance to farmers that Government has abolished the old system of rack renting and insecure tenure, and make farmers more amenable to cooperation with the Government in other phases of the program to increase farm income.

The purchase of owner-operated land in excess of 50 acres should be carried through. The Disposal of Tenancies Act has already reduced the size of holdings to this level in areas where it has been enforced. Before its enactment, less than 2% of the holdings were in excess of 50 acres. The amount now is probably much less, and purchase of such lands should not create any special administrative problems.

In terms of long-range development of agriculture, mechanization can be expected to play an increasingly important role. The 50-acre limit on individual holdings is a real deterrent to the development of mechanized agriculture on a privately managed basis. This is one of the important reasons why the Burmese Government plans to establish collective or cooperative farms. If the formation of cooperative or collective farms progresses slowly, and if the Government desires to attract private capital for agricultural development, it is recommended that exceptions to the 50-acre limit be permitted where a cultivator has equipment necessary for mechanized farming and if there are surplus lands available, or that individual holders be encouraged to farm their holdings jointly under a cooperative arrangement. The Government should screen each application for oversized farms carefully to determine that the applicant has sufficient capital and a sound farm plan. Periodic checks should be made to insure that proper labor standards are being observed and that productive efficiency is being maintained. Private capital may be of value in opening

up new areas or in restoring abandoned land which cannot be cleared without mechanical equipment.

The Act provides for exemption of lands owned by "agriculturists" within the limits of 50 acres of paddy or caneland, 25 acres of Ya land or ten acres of Kyaing land from resumption by the State. The Act has very tight provisions for resumption of land held by non-agriculturists but will permit agriculturists to retain tenanted land within the authorized limits on condition that they cultivate the land themselves. This will mean that tenants on land held by agriculturists will be forced off the land and will become landless laborers. While this will not be a major problem in lower Burma where the bulk of the tenanted area is held by non-agriculturists it will result in a substantial change in upper Burma where there are at least 1½ million acres of tenanted land held by agriculturists.

To maximize production, and to speed the land nationalization program, it is recommended that efforts be made to minimize changes in the management unit and to concentrate on changes in land-holding rights. The importance of speedy implementation of a simplified land nationalization program cannot be overemphasized. Landlords have not yet fully re-established their controls over their tenant lands and are probably less likely to resist now than they would be at a future date when they have re-established control. Delays will also give landlords added opportunities to evade nationalization through sales to tenants. Also, the longer the delay the more difficult it will become to determine the status of landholders on January 4, 1948, which is the basis for determining which lands are to be resumed and who qualifies as an agriculturist.

The program for land nationalization as outlined in the ten-year plan is an ambitious program which attempts to carry through a thorough-going reform of the Burmese agrarian structure. It includes not only changes in land tenure, but also formation of producer cooperatives, improvement of agricultural production methods, settlement of new agricultural land, formation of mechanized collective farms, and machine and tractor stations, diversification of agriculture, establishment of village processing and institution of collective purchasing and marketing. The first phase of the program consists primarily of basic research and training of personnel. Part of this work has been done, but the major part of the work remains.

The idea that reforms in land tenure alone are only a partial solution to the problems of improving the economic status of the cultivators is sound. However, reforms in land tenure need not wait upon reforms in other fields. Development of agricultural cooperatives, use of improved production methods, large-scale

mechanization, and realization of other goals will require many years of intensive work. The Co-operative Department and the Department of Agriculture are currently engaged in programs aimed at some of these goals. The land nationalization program should be integrated with these programs.

2. THE FIVE-YEAR PLAN FOR AGRICULTURAL SELF-SUFFICIENCY AND DEVELOPMENT

In order to increase agricultural exports and to provide a greater degree of self-sufficiency the Burmese Government prepared a Five-year Plan for Agricultural Development in 1952. The plan contains projects for increasing the annual output of farm products by K1,15,00,00,000 by 1959-60. Implementation of the plan is expected to bring about fuller employment of resources, increased incomes, a higher level of consumption and increased foreign exchange. Specific targets are shown in Table VIII-7 (*see p. 138*).

To carry out the projects the Agricultural and Water Resources Development Corporation was established with an initial grant of K1 crore. The Corporation is responsible for coordinating the operations of various agencies involved in implementing projects under the plan and for disbursement of funds required to finance the projects.

Nine projects were selected for immediate implementation. The program for the restoration of prewar levels of rice exports was given the highest priority. Programs for increased production of groundnuts, long stapled cotton, jute, coconuts and onions were also given high priority. Establishment of an experimental state dairy farm and a cattle breeding farm was also planned. Immediate steps for establishment of a State Agricultural Bank were also approved.

During 1952-53 the Corporation distributed subsidies of K43,78,000 to farmers for bringing new paddy acreage into cultivation. In 1952 the target acreage of 505,000 acres was exceeded by 128,000 acres. K14,73,000 was also distributed for extension of groundnut crop acreage.

Two thousand acres of land have been cleared in the Thapan Cotton Seed Farm site at Meiktila. Cattle purchase and cultivation loans have been distributed to tenants in that farm. They will grow long stapled cotton for the Government Spinning and Weaving Factory. An additional 2,000 acres will be brought into cultivation next year.

The Corporation has loaned K15,000 to jute seed growers in 1952. The 1953 jute acreage goal was reduced from 10,000 acres to 7,200 acres as the 1952 output of seed fell short of expectations. K3,25,000 has been allocated for loans to growers for planting the main jute crop.

ECONOMIC AND ENGINEERING DEVELOPMENT OF BURMA

TABLE VIII - 7

TARGETS OF INCREASE IN AGRICULTURAL INCOME BY 1959

(value expressed in 1951-52 prices)

Projects	Total Increase over 1952		Agricultural Income Increase from			
	Production (Tons)	Agricultural Income (K)	Extension		Improvement of Conditions for Growing or Living (K)	Improvement of Productive Efficiency of Plants or Animals (K)
			(Acres)	(K)		
A. AGRICULTURE AND FISHERIES						
1. Rice (74% of paddy)	1,750	3,50,000	*2,500 †500	3,00,000	40,000	10,000
2. Groundnut	150	75,000	*200	69,000	5,000	1,000
3. Cotton	10	10,000	*200	8,000	500	1,500
4. Pulse Crops (excluding soya beans)	100	15,000	*350	15,000	—	—
5. Soya Beans	25	4,000	†75	3,000	—	1,000
6. Sugar Cane	350	17,500	*†20	15,000	1,000	1,500
7. Onions	50	10,000	10	8,000	2,000	—
8. Spices (Chillies)	10	700	15	700	—	—
9. Wheat and Barley	50	15,000	250	14,000	500	500
10. Jute	—	4,000	70	4,000	—	—
11. Maize	12	3,500	*50	3,500	—	—
12. Tobacco	—	4,000	—	—	—	4,000
13. Tea	1	2,000	—	1,500	250	250
14. Coffee	0.2	1,250	—	1,000	100	150
15. Coconut	—	—	‡10	—	—	—
16. Vegetables	100	30,000	—	25,000	5,000	—
17. Livestock	750 (no.)	1,50,000	—	1,25,000	10,000	15,000
18. Dairy Products	10	10,000	—	5,000	1,000	4,000
19. Fish and Fish Products	20	25,000	—	20,000	5,000	—
20. Miscellaneous (Fruit, Tung oil, etc.)	—	1,00,000	—	80,000	10,000	10,000
Total		8,26,950		6,97,700	80,350	48,900
B. STATE MARKETING		3,20,000				
Grand Total		11,46,950				

*Rehabilitation and reclamation of land previously cultivated.

†Opening up of new land.

‡Full bearing only after 12 years.

Sindhi cows from Pakistan were imported for the dairy farm at Insein. This farm has now started production. Construction of buildings on the Taung-dwinyi site for the cattle breeding farm has been started. The Corporation has also procured coconut seedlings from Penang and from domestic sources for planting 300,000 trees. Work was started on pump installations required for expansion of onion acreage.

A Directorate of State Agricultural Credit has been established to coordinate all government loans made

to cultivators. The Directorate made arrangements necessary for the establishment of the State Agricultural Bank with branches in four districts. The Bank will issue loans to cultivators in these districts. In other districts the Bank will provide farmers with K3.77 crores in direct loans and K1.55 crores in cooperative loans. The total of government loans to agriculturists through various agencies will amount to K10.12 crores. This is more than double the amount issued in 1951-52. In addition to these loans special

subsidies of K65,00,000 will be issued for acreage extension.

The results of the first year's operation of the Agricultural and Water Resources Development Corporation have been encouraging. With its small staff the Corporation has managed to expedite the flow of funds required for financing the priority projects in the Five-year Agricultural Development Plan and to meet most of the goals for the initial year. The Agriculture Department was responsible for execution of most of the projects in the field. Its excellent cooperation was an important factor in this success. The task was made relatively easy by the availability of large areas of abandoned land which were freed from insurgent disturbances.

3. FINANCING THE FARMER

A sound credit system for agriculture must be based on a prosperous and stable agricultural population. Sound loans can be made only where there is a basis for credit, a reasonable assurance that the borrower can repay the loan. This will in large measure depend on the borrower's capacity to earn. The shortage of credit on reasonable terms has forced farmers to borrow at interest rates ranging as high as 400% per annum. Farmers are prevented from adopting improved practices requiring cash outlays because funds are not available at more reasonable rates. It is therefore recommended that in addition to general measures recommended for raising the level of incomes in agriculture, a sound system of increased agricultural credit be made available to farmers.

a. Short-term Credit

The Committee on the State Agricultural Bank made a thorough study of the agricultural credit problem in 1948, and presented a report with detailed recommendations for meeting the seasonal agricultural credit problem. Subsequently, a Directorate of State Agricultural Credit has been established. A State Agricultural Bank with four district branches was established in 1953 with a capital of K5 crores.

Under the State Agricultural Bank plan, village banks will be established. Each village will elect a village bank committee of four to be headed by the village headman. The committee will be responsible for disbursing and collecting seasonal agricultural loans. The State Agricultural Bank will provide seasonal crop loans through the district branches to village banks at 6% interest. The village bank will lend to the cultivator at 12%, the difference being used to build up the capital of the village bank. Loans will be issued to cultivators on a flat per-acre basis until such time that village banks become sufficiently well established to balance loans with needs.

During the year 1952-53, the Bank expects to lend K5 crores in the four districts where branches will be opened. The loans will amount to K28 per acre in contrast to an average of about K7 per acre issued previously through direct government loans and cooperative loans. In addition in the districts with no banks, direct government loans amounting to K3.75 crores and cooperative loans amounting to K1.55 crores will be issued by the State Agricultural Bank. In addition K65 lakhs will be distributed as acreage increase subsidies in connection with the Five-year Plan. This will amount to a total of K10.7 crores as compared to estimates by Binns of seasonal loan requirements of K10 crores on the basis of paddy prices of about one third of the present level. In the areas where the Bank will operate it should be in a position to provide most of the required short-term financing, and free cultivators from the usurious rates charged on sabape loans. In other areas farmers would receive only a slight increase in per-acre loans. However, the increase in money in circulation in the economy resulting from increasing rice exports and from increasing development plan expenditures will provide considerably increased private credit available for agricultural loans.

In view of the present shortage of administrators and of the cultivators' inadequate understanding of the proper use of credit, it is desirable to start the Bank on a modest scale and to minimize red tape and the need for supervision. On the basis of the experience gained in the first years it will be possible to improve procedures and to open up additional district branches. Too ambitious a program in the first year could result in inefficient administration and failure to collect loans when due.

The principal obstacle to establishment of a sound farm credit system is the failure of farmers to understand the proper use of credit and the absence of responsible village organizations through which to channel credit. In the past, farmers have tended to look upon indebtedness as a normal condition of life. Money was borrowed not with the idea of putting it to productive use to increase incomes, but in order to meet personal expenses as well as productive costs. Little thought was given to the necessity of repayment with interest until the loans matured. The introduction of cooperatives was an attempt to build up responsible village organizations, but few members understood cooperative principles. Over-expansion of credit and failure to build up adequate capital resulted in widespread liquidations of cooperatives during the depression.

The Bank Committee Report recognizes these difficulties and emphasizes the need for insistence on prompt repayment of all loans in order to develop

greater consciousness of the responsibilities of the borrower. However, this is not enough. An intensive program of information and education on the proper use of credit, on the need for savings, and on how and when to borrow should be instituted immediately. Likewise establishment of District Banks should be preceded by intensive programs to explain to cultivators the purposes of the banks, the benefits to be gained, the responsibilities to be assumed by cultivators, and detailed procedures for organization and operation of the Bank. When extension services have been established, this program should be re-oriented to incorporate conditions and features relating to production methods, use of equipment and other factors affecting improved output.

The village bank should be promoted not only as a place to get loans but as an institution belonging to the villagers and which will provide benefits to just that extent to which villagers contribute to its success by prompt repayments and by contributions to capital. A financial stake in an organization stimulates interest. The present plan calls for a very gradual accumulation of capital by retention of profits in the village banks. In addition a program to compel cultivators to subscribe to capital at harvest in order to qualify for loans in the succeeding years should be considered. The amounts should be small enough not to be burdensome. Subscriptions of 5% or 10% of the amount borrowed would keep the total payments collected from the cultivator well below the prevailing interest rates.

Certain minimum financial standards should be established for village banks to insure sound operations. Some of the points which should be covered are establishment of minimum ratios of capitalization to volume of loans, and to fixed assets, accumulation of minimum reserves, maximum loans to individual members, and standards for loan security. Some of these standards cannot be enforced initially but village banks should be required to establish a program for meeting certain minimum goals each year. Unless some such steps are taken many of the village banks may be tempted to continue to rely solely on district banks without building up their local organization.

The suggestion of the Committee that provisions be worked out for repayment of loans in kind wherever possible should also be followed. Such practices are familiar to cultivators who are accustomed to repayment of sabape loans in kind. Some cooperatives are already collecting in kind and report good results not only in repayment of loans but in better prices.

In addition to flat per-acre loans, cultivators should be allowed to obtain on credit improved seed, fertilizer, implements, machines and other supplies

distributed by the Agriculture Department. It should be relatively easy to devise procedures for consolidating these loans with the per-acre loans for purposes of collection. This would assist the Department in obtaining more widespread use of improved methods. The increased output which can be expected from use of better methods should enable the cultivator to assume the added loan.

The following measures to meet the problem of short-term credit are therefore recommended:

(1) An intensive information program to educate farmers in the proper use of credit.

(2) Building up responsibility at the village level by insisting on adherence to certain minimum financial standards including contributions to share capital.

(3) Continuation of the program gradually to establish district branches of the State Agricultural Bank in all districts.

(4) Encouraging repayment of loans in kind wherever possible.

(5) Establishment of procedures to enable the Agriculture Department to issue improved seed, fertilizer, implements, etc., on credit in conjunction with the system of state agricultural credit, and the farm extension and demonstration services.

b. Intermediate and Long-term Credit Requirements

The principal need for loans of more than one year (intermediate term) at present is for the purchase of cattle. Other requirements are for small land development projects, and for equipment and improvements of all kinds. An increasing amount of the land improvement work can be handled through Pyidawtha grants. There are very few types of farm equipment in current use which cannot be paid out of the proceeds from one year's production.

A yoke of oxen costs from about K400 to about K500. The average working life is about five years. Under normal conditions a cultivator can repay such a loan over a period of three or four years. Death of cattle is probably the chief cause of unavoidable indebtedness among farmers. Suggestions for taking care of this problem have varied from government cattle insurance and voluntary savings plans to direct government loans. Measures for reducing cattle diseases and prolonging the working life of the animals are also important in reducing the size of the financing problem. The greatest improvement can be expected to arise from the development, demonstration, and training which will be provided by the demonstration farms and extension services.

Government loans for cattle purchases in the past have been wholly inadequate in amount and the complicated red tape involved has prevented cultivators from making much use of such loans.

Security for the loans had to be more substantial than for seasonal crop loans since the amounts involved were greater and there was no guarantee that the borrower would continue to cultivate land. With more stable tenure conditions today, there appears to be less risk than before in that crop liens can be taken in addition to the security provided by the cattle. Binns, in his "Agricultural Economy in Burma," suggests a plan for repayment of cattle loans in equal installments secured by crop mortgages. District branches of the State Agricultural Bank might advantageously start insurance of cattle loans on this basis in a few selected areas to determine whether such a plan is workable.

Voluntary cattle-replacement savings programs have been started on a small scale by some of the agricultural cooperatives to encourage farmers to finance cattle purchase partially from their own savings, but generally there are no facilities for such savings. As soon as village banks become well established, consideration should be given to expanding their functions to receive savings deposits as well as to make loans.

Cattle insurance offers probably the best solution in the long run since it would spread the cost of cattle replacement over the average working life of the animal and would protect cultivators against unexpected losses through epidemics. However, before instituting any system of cattle insurance a thorough study should be made. Accurate statistics on number and causes of deaths by district will be needed to determine risk and premium rates. The question of the basis for participation will have to be decided. Compulsory participation may be required in order to avoid problems of adverse selectivity, i.e., greater participation in high risk areas with consequent higher premium rates. On the other hand in view of the Government's policy of keeping down the price of paddy, it may be desirable to keep insurance on a voluntary basis with partial government subsidization of premium charges.

With land nationalization, the need for funds to purchase land, which elsewhere is the principal need for really long-term credit in agriculture, will be eliminated. At the same time the principal security for long-term agricultural loans and mortgages on land will also be eliminated. Other requirements for long-term loans have been consolidation of accumulated shorter-term borrowings, sickness, ceremonies and "failure of agricultural income." Improvements in short-term financing will do much to take care of the problem of debt consolidation and "failure of agricultural income" since heavy interest charges were probably the principal cause of accumulated indebtedness. The problem of long-term credit is not therefore now a pressing one.

4. AGRICULTURAL TAXATION

The land revenue tax is the principal direct tax on agriculture. It has declined in relative importance as a revenue measure from 1938-39, the immediate prewar year, when it accounted for more than one quarter of total tax revenues until it now provides less than 5% of tax revenues. This drop is attributable to the facts that land revenue rates have not been adjusted upward with the general increase in price level and that land revenue is now being collected from only about half of the prewar area.

Persons engaged in other occupations pay no direct taxes unless incomes are in excess of K2,000. Most farmers have incomes of less than K2,000 per year but pay land revenue either directly or indirectly. Hence, in terms of ability to pay, farmers bear a higher proportion of direct taxes than non-farmers. In addition, the internal price control on paddy can be considered to be a form of indirect taxation which the farmer is bearing. Though the unbalance is minor, it is a form of discrimination which is not in keeping with the principles of democratic government.

The land revenue tax is a fixed tax per acre based on the theoretical net return from the land. In prewar days these rates were determined on the basis of detailed land settlement surveys conducted about every 20 years in each district. Rates of assessment varied considerably from district to district since settlements were not carried out simultaneously and the rate varied with the level of prices and the need for revenue at the time of the settlement. Although effort was made to keep rates somewhat consistent with neighboring districts there was no systematic effort toward uniformity of assessments for all Burma.

Present land revenue rates are based on settlement surveys extending from 1913 to 1940. During this time the price of rice varied from a low of K52 per 100 baskets to K262 per 100 baskets as compared to the present price of K300 per 100 baskets in Rangoon. As a result land revenue rates no longer reflect differences in actual net returns from the land. So long as the rates are at present levels this inequity in distribution of tax burden is not serious. When land is distributed under the land nationalization program it will be possible to adjust revenue rates to correct major discrepancies without carrying through a complete new series of settlement surveys.

The land revenue tax with its infrequent rate adjustments is very inelastic in its revenue yields. Before the war this resulted in heavy burdens on the farmer during periods of low prices and provided Government with inadequate revenues in periods of high prices. Tax revenues which fall or rise faster than prices are fiscally desirable. However, as long as

land revenue rates are low and land revenue is a minor source of tax revenue it will not create any serious pressures for the farmer or interfere with the Government's fiscal policy. Land revenues should be increased only when persons in income brackets comparable to that of the cultivator are also subject to direct taxes.

The complex method of establishing land revenue through land settlement operations has been quite costly in terms of the revenues derived from the tax. Prewar the costs of administration amounted to about 10% of land revenue. Postwar the percentage has ranged from 59 to 174. With less emphasis on the land-revenue tax the complicated settlement operations of the past will no longer be necessary. Once initial adjustments are made at the time of land nationalization, rates need not be changed except as major changes in land use or land productivity occur or as discrepancies are reported.

The job of maintaining land records should be taken over by the agency managing state-owned lands under the land nationalization program. The records should be primarily for the purpose of distributing tenancies and maintaining title records on owner-cultivator land.

Collection of crop statistics should be separated from the tax collection function and established under an independent agency. Statistics collected for tax purposes usually show a downward bias since the farmer is anxious to conceal production in order to pay lower taxes. For crop estimating purposes it is not necessary to have detailed data at the Kwin level. With modern statistical sampling methods it will be possible to get accurate estimates of crop production with a relatively small staff and at relatively low cost.

As functions of local government are expanded under the Pyidawtha plan consideration should be given to making the land-revenue tax a source of local government revenue.

5. MARKETING THE CROP

a. Farmers' Handicaps

The position of the farmer as a small producer engaged primarily in the production of crops and only intermittently concerned with selling his product places him at a disadvantage in his dealings with traders who are engaged full time in buying and selling. This has led in other countries to government efforts to assist farmers in getting better prices for their crops. These include formation of farmers' cooperatives, standardization of grades, adoption of uniform weights and measures, provisions for furnishing market information to farmers and price stabilization policies.

Studies made by the prewar Marketing Section of the Department of Agriculture disclosed that the cultivator was not getting the full share of the price of his products in the central market because of his poor bargaining position, the lack of organized local markets, and the lack of uniform standards of weights, measures and grades. Even in the case of paddy where the market mechanism is most developed, the discrepancies in prices paid in different markets were in excess of the freight and handling charges involved in linking various markets. For other crops there were much greater discrepancies, and for many crops there was no semblance of organized marketing, even on a local scale.

The postwar situation is similar. Activities of the SAMB and cooperative organizations have improved marketing practices to some extent in areas where they are operating. However, disruption of communication and transportation and the general insecurity in rural areas have made marketing conditions worse than before the war in many parts of the country. Much of the crop is still transferred to shopkeepers, money-lenders, brokers and landlords at the threshing-floor in settlement of existing debts. Farmers sell the remainder of their crop to jungle brokers or in some instances to cooperatives which take the produce from the village to primary assembly points, whence it is shipped by boat or rail to the mills in Rangoon and other port cities.

b. Marketing Standards

The system of grading is very rough. Different qualities are often mixed together at the primary assembly stage. Even in lower Burma where paddy is an export crop, consignments of pure varieties can only be obtained from special areas devoted to particular types. Most paddy is purchased as fair average quality of a certain type, and buyers often make weight adjustments for inferior paddy but not for better grades. These adjustments are often arbitrary, and the cultivator is tempted to adulterate his products as much as possible. This of course leads to further weight cuts on the part of the buyer. These factors add to the cost of marketing by necessitating more rigid inspection at each level. They also force buyers to try to protect themselves against adulteration by paying as low a price as possible. The cultivator, who is in a poor bargaining position, generally has no recourse, even if the quality reduction is unfair, and he receives a low price.

There are no uniform standards of weights and measures. The standard basket of paddy has a capacity of 9 gallons and a standard weight of 46 pounds. Variations from this standard are the rule for almost all transactions outside Rangoon. The standard

basket for groundnuts which is 25 pounds in Rangoon ranges as high as 44 pounds in some districts. Buyers, particularly at the primary collection centers, tend to use large-size baskets or faulty scales. A check of 154 beam balances by the Marketing Section of the Agricultural Department in 1940 showed that farmers were being short-weighted from 3% to 11%. Even where standard-sized baskets are used, the method of measuring can result in more or less paddy per basket. This lack of standards tends to make the operation of normal market forces weak, and transactions tend to become personal.

Paddy, groundnuts, sesamum, some of the pulses, cotton and sugar can have relatively well-developed markets in the producing centers, but these are not effectively linked with central markets as a result of the differences in standards. Other crops are generally sold by the farmer in small quantities to brokers at the village or at local bazaars which are held about once every five days. Local merchants and itinerant traders gather at these bazaars to purchase farm products. The lack of standard qualities and the use of inaccurate weights and measures are even more pronounced for these other crops, and the markets more poorly organized. The higher trading risks which result are usually borne by the farmer in lower prices for his crops.

Uniform standards of weights, measures and grades will provide the basis for more accurate price quotations, facilitate trading between distant markets, and enable the farmer to get the full market price for his crops. The prewar Marketing Section of the Department of Agriculture started some very useful work toward standardization in distributing standard baskets, inspecting weights and measures and establishing regulated markets. The work has been discontinued since the war, however, and steps should be taken to reinstitute this work. The local Pyidawtha committees and agricultural cooperatives can serve a very useful function in assisting the Government in carrying through such a program. However, as the establishment and maintenance of proper standards of weights and measures affect the entire productive and scientific economy, and as they require scientific laboratory and research facilities, it is recommended that responsibility for the broad development, testing, and regulation of standards be legislatively assigned to a central scientific organization, with enforcement vested in various interested agencies such as the Ministry of Agriculture and the Ministry of Industry.

Another consequence of the present marketing situation is that differences in prices between different markets or even within the same local market are often greater than for different crops. At present, local traders and brokers keep in touch with other

markets and know by experience the prices they can afford to pay to the farmer in relation to prevailing prices in other markets. The farmer is, however, ignorant of conditions outside his village. For this reason, substantial changes in prices are necessary to effect changes in production. As market standards improve, prices in different markets will become more uniform, and differences in prices between crops will assume increasing importance as a factor in determining which crops are to be planted.

For the future, the Government should consider the establishment of a market outlook service to provide farmers with accurate information on current and expected prices, timely forecasts of crop acreage and yield, and implications of these trends on the farmer's production plans. The prewar Marketing Section started some basic work in its surveys which dealt primarily with current and past trends and descriptions of the marketing mechanism. This work should be resumed and eventually, as competent personnel become available, increasing emphasis should be placed on outlook analysis. The Department of Agriculture even now collects prices of principal agricultural crops from various district headquarters. These could be used to prepare periodic bulletins to extension workers. This information, as well as the results of any marketing studies which may be undertaken, should be widely disseminated to farmers through the extension and information services. Market information will be useful to the farmer not only in getting the full market value for his crops but also in planting crops which will bring him the best returns.

c. Price Policy

In a normal free marketing situation, production is responsive to prices. Where it controls prices the Government can fix them at levels consistent with economic objectives, but effectiveness is limited by ability to control the market. The Government has been able to carry out its paddy price policy because it buys and sells sufficient quantities of paddy and rice to dominate the market. Where the Government purchases do not dominate the market, price policy cannot be enforced effectively without resorting to direct distribution controls.

Pricing programs should therefore be limited to those crops for which the Government is prepared to enter the market. For certain new crops which the Government is trying to establish it may be desirable to offer incentive prices above the market. For example, the production of long stapled cotton is at present very limited, and the Government could afford to purchase total production at a premium in order to persuade more farmers to substitute the improved

varieties for the short stapled cotton which they are now growing. Likewise the Government could pay a premium for jute. The premium prices should not be allowed to become a permanent subsidy program but rather a temporary program to get enough production to judge whether the crops can be economically grown.

d. Cooperatives

Farm cooperatives can play a significant role in improving the marketing of agricultural crops. Through cooperative effort farmers who individually have a poor basis for credit can collectively obtain loans. Many of the functions now performed by the middleman and others can be taken over by farmers' cooperatives. For example, where it would not pay an individual farmer to take his own produce to the primary assembling point a number of farmers joined together in a cooperative could hire a boat to take the produce to the market. Cooperatives can keep in closer touch with various markets; can build cooperative facilities for storage, threshing and simple processing; and, by dealing in larger quantities, can insist on adherence to standards of grades, weights and measures.

Multi-purpose cooperatives are fairly complex business organizations requiring skilled management for successful operation. The postwar experience of many Japanese cooperatives indicates that the fewer the functions of a cooperative the greater the likelihood of success. Too ambitious a program in the initial phases tends to overburden the management and results in inefficiency. Cooperatives can serve a useful function by providing a channel for government loans, for farmer savings, and group purchase of essential production supplies as well as for marketing of crops. As the cooperative grows and its financial position improves, steps can be taken to add new functions as demanded by the membership.

Cooperative storage facilities can add to the income of farmers by enabling them to hold stocks in periods of low prices for sale later at higher prices. With proper storage facilities the State Agricultural Bank or other credit institutions could extend credit on the security of the stored crop and relieve farmers of the necessity for immediate sales. Bulk handling and storage also will permit larger-scale sales direct to processors. Joint storage would reduce storage losses since better buildings and conservation methods could be used.

Establishment of cooperative processing facilities at the village level would permit more efficient processing of crops now processed by individual farmers using primitive methods, increase or stabilize income from crops which require nearby processing facilities,

and create seasonal employment opportunities. For example, small oil expellers have about 40 times the capacity of a single Hsizon (bullock-powered crusher), and extract a much higher percentage of the oil. Small sugar factories requiring relatively little investment can greatly increase the income from sugar cane as compared to the primitive methods of making kyanthagar. Small cooperative flue curing barns have substantially increased returns from Virginia tobacco to growers in the Mandalay area. Cooperative ginning of cotton and milling of rice are other possibilities.

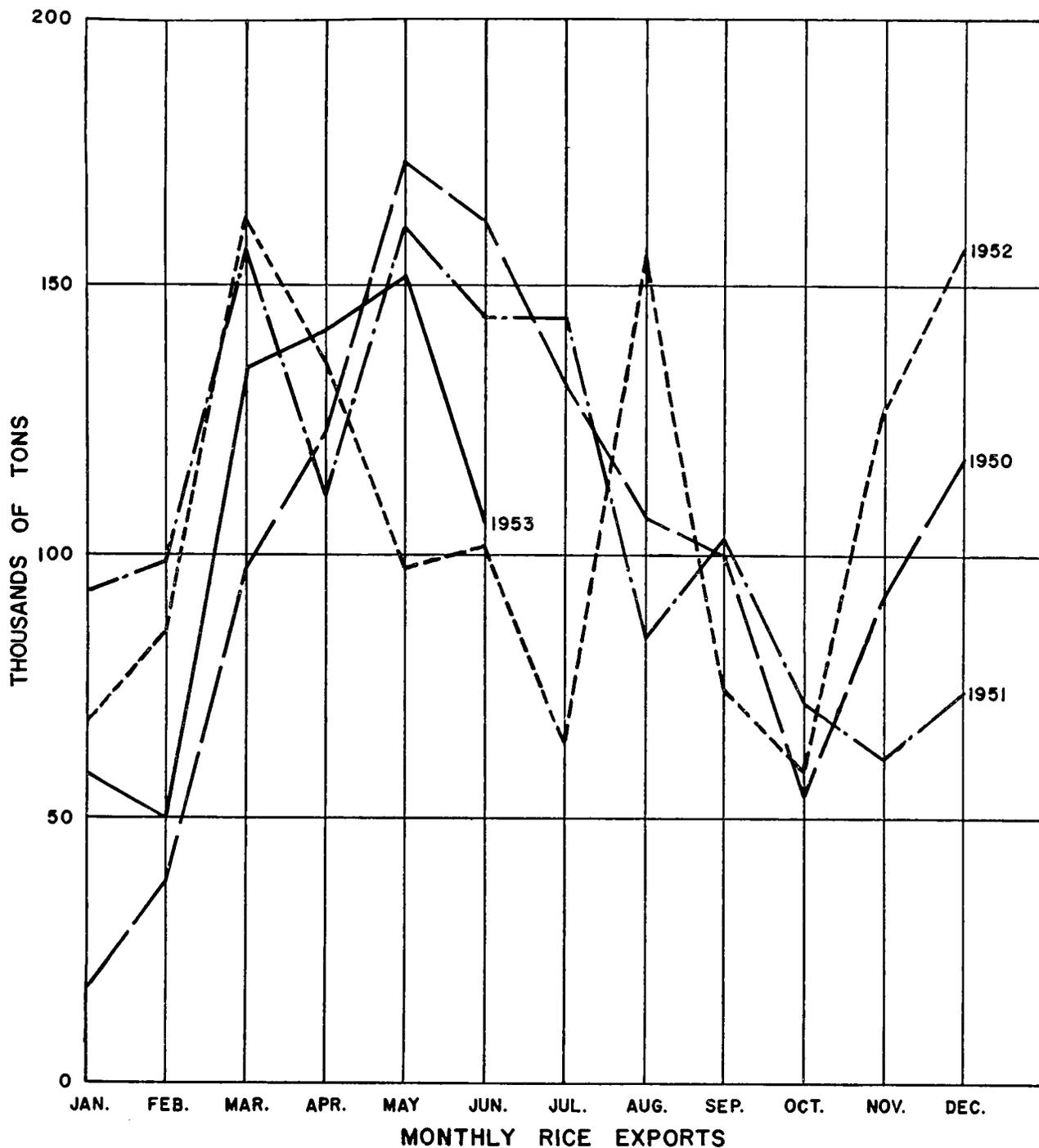
Many cooperatives have already been established in Burma. The total in 1952 was over 12,000. That their success has been limited is attributed to lack of technical and management skills and to lack of coordinated effort to develop the needed skills and understanding.

The problem of establishing independent cooperatives is largely one of mass education of farmers in these matters. Sound cooperatives cannot be established through fiat. The basic groundwork must be there, and work must be started immediately to provide it. An expanded agricultural education and information program should be carried through to provide the means for a determined effort to educate the farmers in the principles of cooperatives.

6. THE STATE AGRICULTURAL MARKETING BOARD

The State Agricultural Marketing Board was established in 1946 as a public monopoly to control all exports of rice. The original purpose was to eliminate the monopolistic position which large foreign-owned mills held in the prewar rice export market, and to keep rice export profits within Burma. The subsequent rise in the world price of rice together with the policy of holding domestic paddy prices constant has since made the SAMB the principal source of government revenues. Although cultivators have not received direct benefits from the favorable export prices of rice, they have been guaranteed a minimum price for paddy. The profits from rice exports permit the Government to make current and capital expenditures which will increase incomes and living standards and provide the people with services which would otherwise not be available.

The Government makes export allocations by country of destination. About two thirds of each government's allocation has been sold directly to the buying government by the State Agricultural Marketing Board. For the remaining third, SAMB has received tenders from private domestic concerns for rice for export to specific countries. The domestic concern usually operates as an agent for a foreign importing concern or for the foreign government itself.



MINISTRY OF NATIONAL PLANNING			
MONTHLY RICE EXPORTS			
KNAPPEN TIPPETTS ABBETT ENGINEERING CO. NEW YORK		RANGOON	
DR. BY	DATE	PLATE	5
CK. BY	JULY 53	NO.	

Government-to-government prices were £50 per ton during the first half of 1952 and £55 during the last half, and have been £60 so far in 1953. Quantities offered for private tender during the autumn and winter of 1952 were accepted at prices running as high as £85 per ton for Small Mills Special. Prices offered in 1953 are markedly lower. During January–May, the Government had invited private tenders on about 275,000 tons but had accepted the tenders on only about one third of this amount. The prices paid, however, were still well above the government-to-government price, and £10 to £15 above the prices during the same period last year.

Price prospects are of great importance to the Government.

Increases in world rice production since before the war have been much less than increased needs resulting from population increases in rice-consuming areas, and are not likely to overtake them in the foreseeable future, according to studies by the Food Agricultural Organization of the United Nations and by the United States Department of Agriculture. Increases in productivity in rice production in Asia can bring great increases in output, but they will come only very gradually, and are likely to be offset by increased consumption of rice. It is safe to assume that during the remainder of this decade export prices for Burma's rice will remain well above their prewar relationship to prices of Burma's imports. However, a level or falling price trend seems more probable than a return to 1952 peaks, and price and marketing policies of the State Agricultural Marketing Board should be adjusted—and indeed have already been adjusted—to this expectation.

During the period of sharply rising prices in 1951 and 1952, the Government followed a policy of holding off export allocations. (Plate 5 shows the monthly pattern of shipments during the period 1950–53.) The motivation was not necessarily anticipation of rising prices; in part at least it was required because of the uncertainty of supplies of rice. In any case, the policy resulted in maximizing foreign exchange earnings. However, now that the period of rapidly increasing export prices has ended, and the probability seems strong of no further rise (except possibly temporarily as the result of an unusually short world rice crop), SAMB should sell rice more expeditiously in order to maximize sales at current favorable prices and hold existing markets.

Earlier shipment would relieve the problem of rice storage at port cities, which is especially acute this year. However, earlier sale need not mean return to the seasonal shipping peak which was typical before the war. The prewar pattern of concentrating rice shipments in the months before the monsoons

required port facilities which remained idle during the rest of the year. As also recommended in Chapter XII, storage facilities secure against insects, rodents and other spoilage should be constructed and bulk handling facilities installed so that the Government will be able to store sufficient rice to spread its shipments over a longer period and to take advantage of short-term fluctuations in the rice market. While there was no reason for private shippers before the war to adjust their shipping dates to lessen peak port requirements, it is advantageous for the Government to do so. The need for improved storage facilities if this policy is to be followed must be emphasized. Otherwise, quality deterioration in storage could cause an increasingly serious sales problem in future years.

It is recommended that the Government explore the possibility of arranging for trade agreements for the sale of rice. These agreements, if they are to be advantageous, should extend over a relatively long period. Such agreements would specify minimum amounts which would be exported by Burma at an agreed price (if world prices should rise above this level) and minimum amounts which the importing country would accept at an agreed price (if world prices fall below this level).

Continued effort should be made to improve the quality of Burma rice. With improved availabilities of rice Burma will have more and more difficulty in disposing of poor-quality rice. Measures for encouraging use of improved seed and for establishing uniform standards of grading should be adopted. Improvements in rice milling and storage facilities are also important.

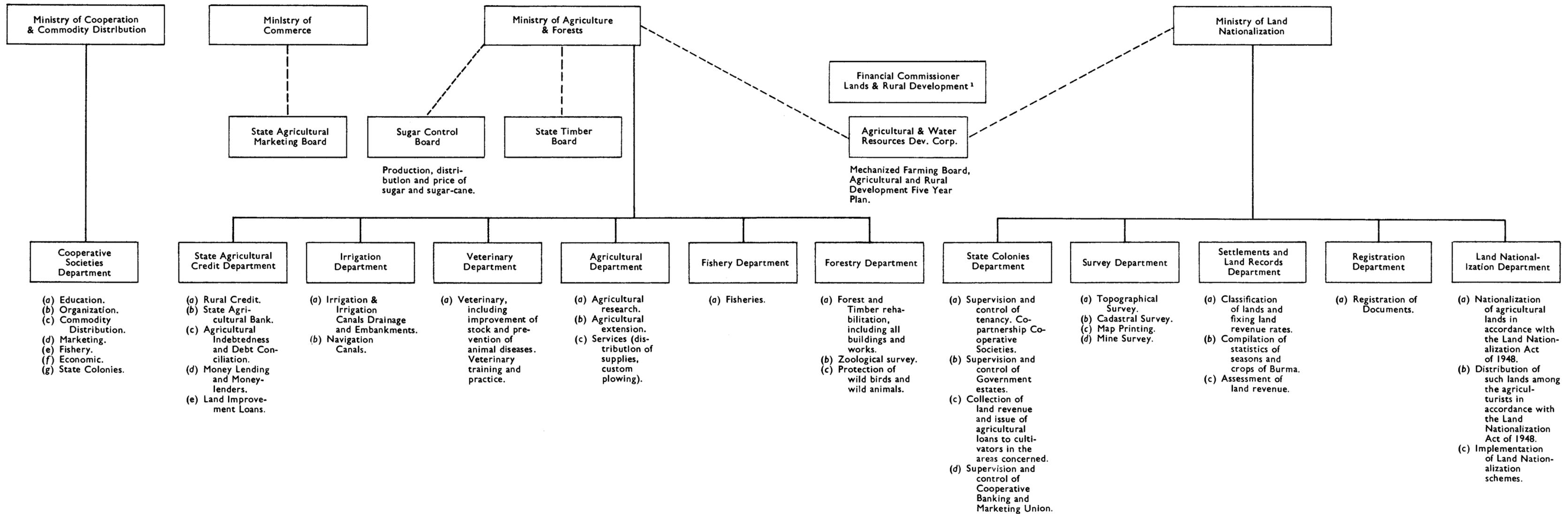
7. GOVERNMENT ORGANIZATION FOR AGRICULTURE

a. The Ministries

At present, governmental functions relating to agriculture are performed by four different ministries (see Plate 6). The Ministry of Land Nationalization and that of Agriculture and Forests are the two principal ones involved. The Ministry of Land Nationalization was created in 1952 to bring together functions which relate to the Land Nationalization Program in an effort to expedite implementation of the Government's policies. Its functions include, in addition to planning and execution of the land nationalization program, establishment and supervision of State colonies, surveys (topographical, cadastral, map printing and mine surveys), "settlement" (determination of land-revenue tax rates) and land records and crop reporting.

The Ministry of Agriculture and Forests is responsible for agricultural extension and research, veterinary affairs, State credit, irrigation, tenancy

GOVERNMENT AGENCIES CONCERNED WITH AGRICULTURE



¹ The Financial Commissioner (Lands & Rural Development) is responsible for all fiscal and financial matters relating to land and rural development. Department heads report to him on matters relating to taxes.

controls, farm labor, and fisheries and forests. The Cooperative Societies Department of the Ministry of Cooperation and Commodity Distribution is responsible for registration, audit and development of cooperatives, rural as well as urban. The Financial Commissioner (Land and Rural Development), who has a number of responsibilities relating to government revenues from agriculture, usually acts with the approval of the Ministry of Agriculture and Forests. The recently established Agriculture and Water Resources Development Corporation, which is responsible for planning and financing of agricultural projects under the Pyidawtha Plan, is under a Board of Directors including representatives of all of the principal agricultural agencies. The State Agricultural Marketing Board is an autonomous board which is under the Ministry of Commerce.

Below the cabinet level, coordination of the policies of these agencies depends primarily on the initiative and imagination of persons in responsible positions. While a number of inter-ministerial boards and committees exist, they meet infrequently and have no permanent staff to provide continuing attention to the problems of coordination. Furthermore the individual members of these bodies are typically overburdened with responsibilities relating to their own programs and are members of so many committees that they cannot devote the time or the energy required for effective integration. Consequently there is substantial duplication and overlapping of functions. For example, farm cooperatives are being planned separately in two ministries, as are means for increasing the use of machinery in agriculture. Field staffs are now maintained separately by the Agriculture Department, the Irrigation Department, the Ministry of Land Nationalization, the Commissioner of Settlements and Land Records, the Cooperative Department, and the State Agricultural Marketing Board.

There is also failure to achieve a consistent coherent program for meeting over-all goals. Integrated planning in agriculture will make it possible to schedule specific measures to achieve over-all goals and maximum benefits. Individual measures carried out in isolation seldom yield as much benefit as an integrated program in which various measures reinforce and sustain each other. Provision of farm credit on reasonable terms will increase production but will be even more effective if accompanied by technical advice on improved methods. Benefits from tenancy reforms will similarly be less likely to be dissipated if credit on reasonable terms is available and farmers are taught proper methods.

In order to achieve proper integration of agricultural policies it is recommended that the principal

agricultural functions be brought together under one Ministry. In bringing them together, it will be desirable to reallocate functions in order to eliminate duplication and overlapping in so far as it is possible. It should also be possible to consolidate field staffs to some extent and to reduce overhead costs involved in maintaining separate establishments. A tentative plan for reorganization of agricultural agencies is presented in the succeeding paragraphs (see Plate 7).

b. Minister's Staff

The staff of the Secretariat of the Ministry should be greatly strengthened to provide a small group of experienced agriculturists of administrative caliber to plan and expedite an integrated program. The Secretary should be assisted by a joint secretary for planning, who would head up the planning staff and the Agriculture and Water Resources Development Corporation. The Ministry would also have deputy secretaries for administration, land nationalization, and Pyidawtha, and assistant secretaries for information, forestry and fisheries who will work with the planning staff on problems relating to their respective fields (see Plate 8).

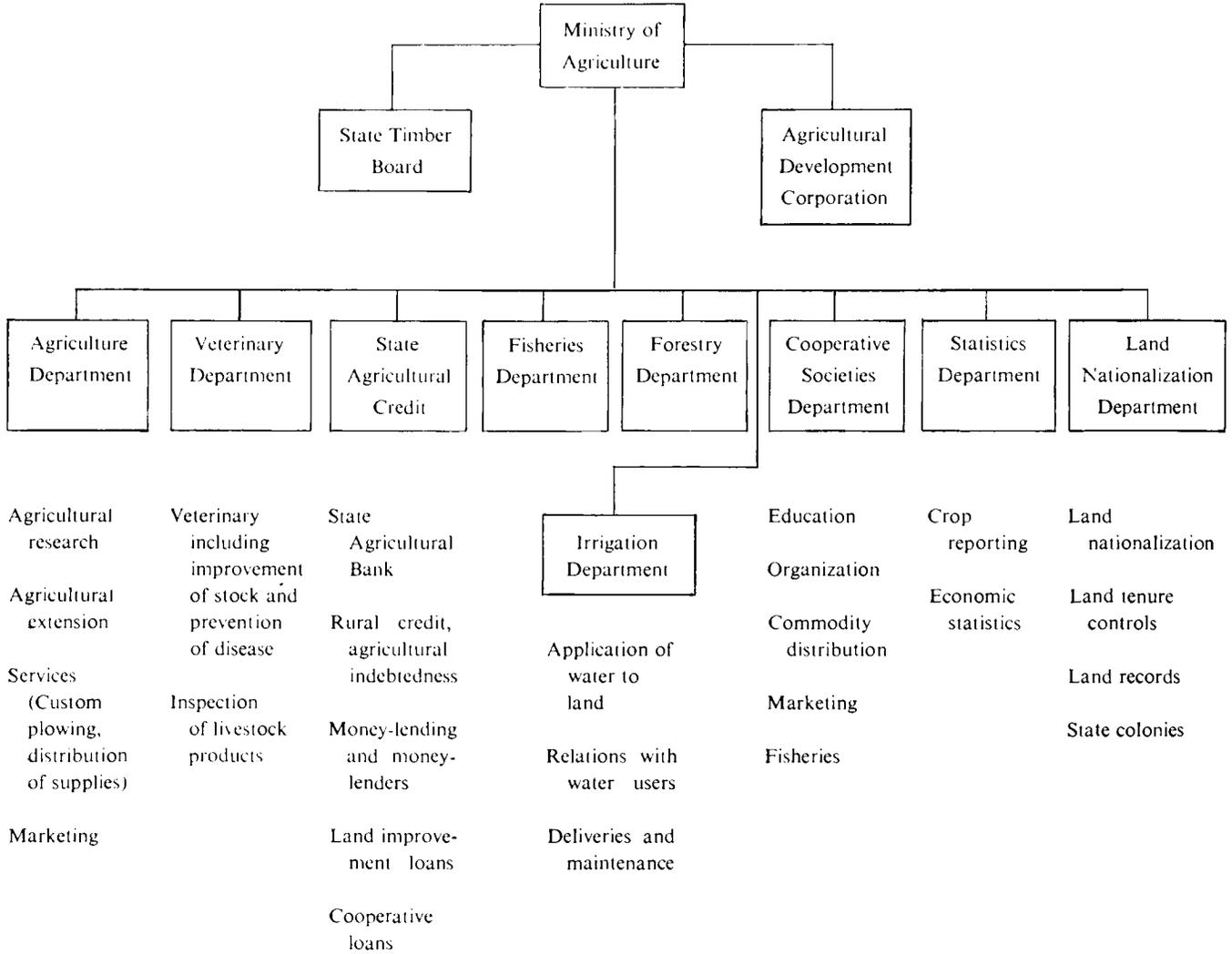
The planning staff would keep in close touch with the progress of all agricultural programs and advise the Minister on the formulation and execution of broad agricultural policies. It would see that the various measures are consistent with over-all policies and would assist the minister in allocating responsibilities to specific agencies. It would be expected to provide a continuing appraisal of the programs in the light of changing conditions. It would play a key role in determining priorities in the formulation of the budget.

The planning unit would also coordinate the work of the departments so that they keep to the planning body's program. It will take projects from various departments and boards and fit them together into a consistent and well-balanced program. There must be close cooperation between this small unit of very capable personnel and the entire ministry.

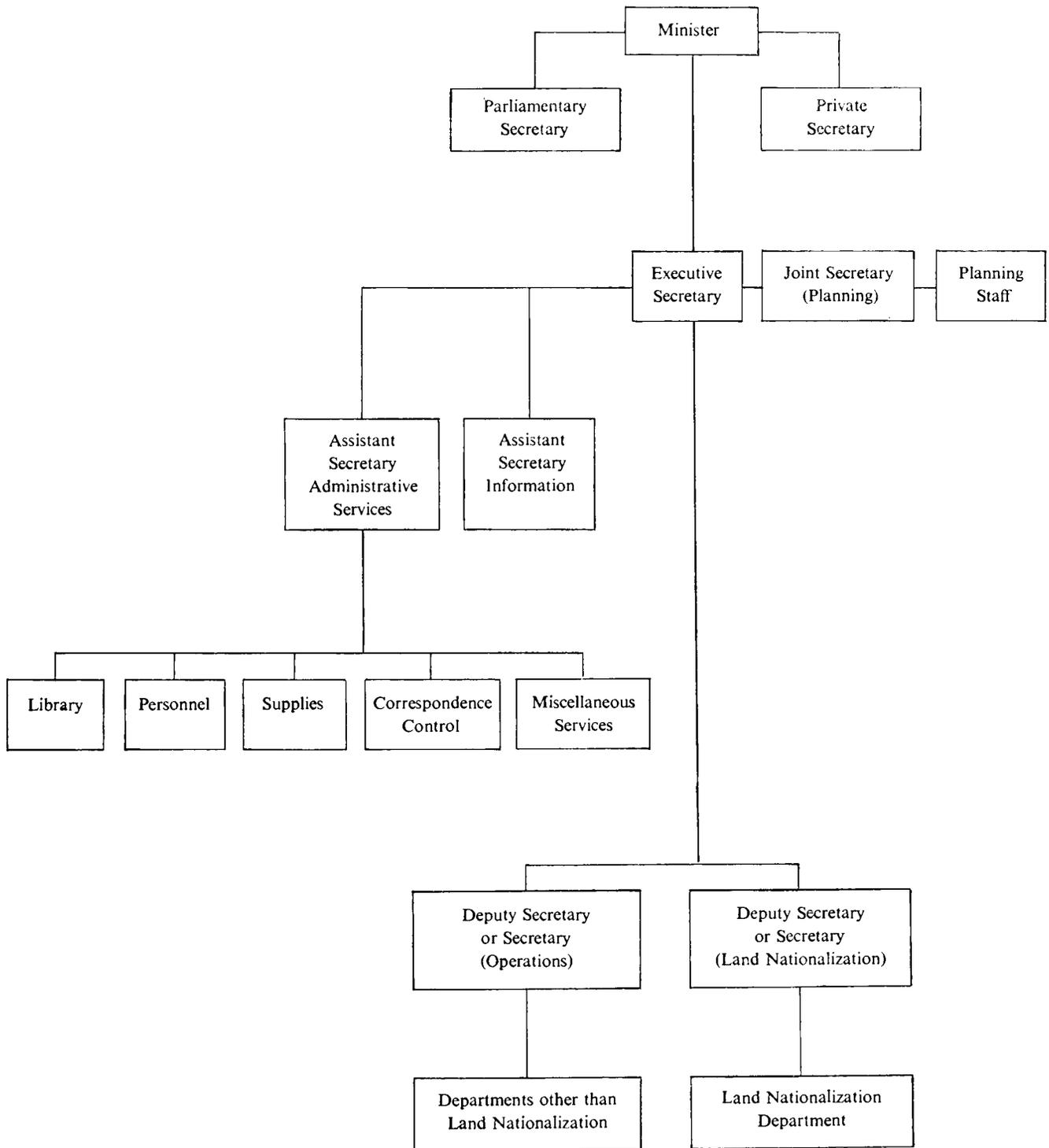
c. Agricultural Information Service

The officer-in-charge of information should have a technical knowledge of agriculture. A flair for writing and enthusiasm for development should also be major assets. The most suitable person would, of course, be one who is in the agricultural service with experience in journalism. Such talent is available in the department. Timely information is important, accessibility to documents and direct relationship with all departments is also desirable. This officer should be an assistant secretary and his unit should therefore be in the secretary's office. Funds should be

PROPOSED GOVERNMENT AGENCIES CONCERNED WITH AGRICULTURE



PROPOSED ORGANIZATION OF SECRETARIAT OF MINISTRY OF AGRICULTURE



allocated to the preparation of information and technical bulletins, to the publication of a popular periodical, and to the preparation of occasional special exhibits and exhibiting equipment.

Acceptance of and participation in the program by the farmers is of utmost importance if the Ministry's program is to be successful. Automatic response and concerted effort cannot be expected from the multitude of farmers. Hence information on the various aspects of the program must constantly reach the farmers. This information should stress things of interest to the farmer. The language must be simple and pictures must make the simple obvious. Useful pamphlets are published by the Department of Agriculture. They should be revised, brought up to date technically, and put into language understandable to the farmer. In addition, simple explanations of the regulations on land tenure, the land nationalization program, the government loan program, marketing information, as well as every other facet of the agricultural development program, should be widely disseminated. A farm magazine should also be published. Initially it should be issued whenever enough material has been gathered. The printed material is only one of the means of educating the farmer. Audio-visual aids should be used wherever possible.

d. Library

Another unit needed is a central ministerial library with a qualified librarian. Most departments have libraries of their own and there is the secretariat library, but access to these is difficult and books are not properly catalogued. A central library for agriculture with a qualified librarian can keep the ministry staff informed on new additions to the library and provide a central location for keeping agricultural publications.

e. New Department for Land Nationalization

Land nationalization is of such basic importance that a separate department should be established in the new ministry and a post of deputy secretary for land nationalization should be established at the secretariat level. All of the present agencies under the present Land Nationalization Ministry should be transferred to this new department with the exception of the crop-reporting function of Commissioner of Settlement and Land Records, which should be under the proposed Statistics Department, and other functions which are now being performed by other existing agencies. In addition it should take over responsibilities for enforcement of rent controls and tenancy disposal which are now under the Ministry of Agriculture and Forests.

f. Expansion of Agriculture Department

The Agriculture Department should be greatly expanded along the lines discussed later in this chapter in the section on extension and research. The Department should also assume responsibilities in relation to the mechanization proposals such as establishment of the machine and tractor equipment pools and state farms which now form part of the ten-year plan for land nationalization. It should also supervise the establishment of model demonstration farms with a view toward integrating all of these proposals into the system of central farms, district farms, and major and minor seed farms for which the Department is now responsible. In addition the Department should re-establish the prewar Marketing Section to carry on work on standardization of grades, weights and measures.

g. Irrigation Engineering

The engineering functions of the Irrigation Department should be transferred to a ministry in which other major engineering works are being performed. Preferably this should be the proposed new Ministry of Engineering Services; otherwise the function should be joined with hydro- and steam-electric organizations. The Irrigation Department of the Ministry of Agriculture should retain responsibility for operation and maintenance of irrigation projects, for supervision of application of water to the land, and for relations with water users.

h. The New Cooperative Societies Department

The Cooperative Societies Department is now under the Ministry of Cooperation and Commodity Distribution, and handles urban consumer and producer cooperatives as well as agricultural cooperatives. The development of agricultural cooperatives is, however, so intimately related to improvements in rural credit, marketing and processing that a Cooperative Department should be established under the Ministry of Agriculture. This Department should take over the cooperative program now being planned by the Ministry of Land Nationalization as well as the agricultural cooperative program of the present Cooperative Department.

i. Other Departments and Offices

The State Agricultural Credit Department, the Veterinary Department, the Fisheries Department, and the Forests Department should continue in their present functions. The Veterinary Department should work in close cooperation with the Agriculture Department in developing better animal husbandry practices. It should eventually add to its responsibilities the work of inspection and certification of livestock products.

The Agricultural and Water Resources Development Corporation now provides funds for financing the Five-year Agricultural Development Plan and is responsible for coordinating all activities relating to it. The proposed planning staff should take over most of the planning functions now assigned to the Corporation and the Corporation should be responsible for providing funds as heretofore. The Corporation should be directly under the joint secretary for planning, who would also be head of the planning staff.

The State Agricultural Marketing Board is now under the Ministry of Commerce. Although legislation was passed in 1950 which will make it an independent board responsible to the President, it has not been put into effect. A board responsible for marketing agricultural commodities abroad would normally be under the Agriculture Ministry or the Commerce Department. However, in view of the importance of SAMB and the tremendous importance of rice both as the basic food in Burma and a major source of incomes for cultivators, the SAMB should be an independent board directly under the President. The composition of the board should be altered to provide adequate representation of all agencies concerned.

Field staffs are now maintained separately by the Agriculture Department, the Irrigation Department, the Ministry of Land Nationalization, Commissioner for Settlements and Land Records, the Co-operative Department, and State Agricultural Marketing Board. More efficient operation would be possible if services and facilities such as transportation, housing, clerical and administrative staff were provided on a common basis. In addition to lower overhead costs it would facilitate coordination between the various officers. Under the Pyidawtha plan field officers from various departments are expected to work together in District and Township Pyidawtha committees. Consolidation of office facilities would carry this one step further.

The post of Financial Commissioner (Land and Rural Development) should be abolished. The position is an anachronism remaining from the colonial days when collection of land revenue was considered to be the principal government function in agriculture. The changeover to the philosophy that the Government should provide services to the farmer means that the importance of revenue collection from farmers no longer justifies the services of the top civil servant in the agricultural field. Instead, the secretary of the new ministry should be given a rank equivalent to that of Financial Commissioner.

D. INCREASE OF AGRICULTURAL PRODUCTION

The several measures for increasing agricultural production suggested in this Report are new to

Burmese agriculture. The intensification of present cultivation is discussed with consideration given to what cultivators would probably do instead of what they could do to improve their farming operation. Intensification of cultivation is considered both for those practices that are possible under present methods and for those that would be possible under more advanced farming methods. Reservoir irrigation, impounding large volumes of water, as distinct from stream diversion systems, is suggested as a means of increasing production and is discussed in relation to farming methods employed. It is proposed that demonstration farms be established and that extension services be expanded in order to point the way of future agricultural development using modern methods. In the long-range view research is essential to increased agricultural production. Areas of specific deficiency are indicated. Lastly, mention is made of the restoration of abandoned land.

1. INTENSIFICATION OF CULTIVATION

Intensification of agriculture is considered to be potentially the most important means of increasing agricultural production because, in its various forms of application, it can be applied to all cultivated areas. The direction and degree of intensification is dictated by need as well as by the natural resources upon which it would be applied. The need of the cultivator, although indirectly tied to the needs of the nation, is usually concerned with basic requirements, particularly food. The nation needs rice exports to support her Pyidawtha (social welfare) program. The achievement of increased production by intensification of cultivation rests with the cultivator.

a. Under Present Farming Methods

(1) The Use of Fertilizer

With present farming methods, the intensification of cultivation is more likely to result from new approaches to the old problem than from renewed efforts along relatively unsuccessful past methods. The use of chemical fertilizer is an example. This might succeed where other methods fail because of its low labor effort and positive, sometimes dramatic, results. Before the war fertilizers, with few exceptions, were too expensive to use, and the variety of their combination was not so diverse or their preparation so complete as at the present time. Today almost any fertilizer combination can be had, such as pelleted to facilitate spreading and storage, or with trace element compounds for correction of specific deficiencies. More important perhaps is the degree of concentration and low cost of present chemical fertilizers. Their use does not require strenuous effort. They have never enjoyed widespread use in Burma, and their

novelty would be a psychological advantage. Furthermore the use of chemical fertilizers would be a short-term investment with immediate returns. Their effectiveness would be limited by a general ignorance of their value and of their application, but demonstrations would be easier than for many other methods of intensification.

Chemical fertilizers offer the greatest benefit at the least cost for most crops. The maximum economic return comes with the first 50 or 100 pounds applied per acre. Without machinery it is extremely difficult to distribute properly small amounts of fertilizer per acre. Therefore all fertilizer estimates are made for the application of 100 pounds per acre.

Experiments in the use of chemical fertilizers have been conducted in several areas in Burma. These tests, carried out during the past 25 years, demonstrated favorable responses in most crops, and covered the use of many chemical fertilizers commercially available today. Table VIII-8 summarizes

TABLE VIII - 8
FERTILIZER RECOMMENDATIONS

<i>Crop</i>	<i>Fertilizer</i>	<i>Application</i>	<i>Remarks</i>
Gramineous Paddy	Sulphate of ammonia ±20%	100 lbs./acre broadcast or drilled	Continued use lowers soil pH with consequent complications. The crop may lodge
	50% Ammonium sulphate 50% Superphosphate ±20%	100 lbs./acre drilled or broadcast	Low-concentrate fertilizers expensive due to freight and handling costs
	Ammonium phosphate 20-20-0	100 lbs./acre broadcast or drilled	Best effect per unit of cost
Sugar Cane	Sulphate of ammonia ±20%	100 lbs./acre broadcast or side-dressed	Solubility favorable
	Ammonium phosphate 20-20-0	100 lbs./acre broadcast or side-dressed	Best effect per unit of cost if soil phosphorus deficient
	Nitrate of soda ±20%	100 lbs./acre broadcast or side-dressed	Solubility unfavorable
Dicotyledenous Cotton	Complete ammonium phosphate 17-45-0	100 lbs./acre broadcast, drilled or side-dressed	Best effect per unit of cost
Other Crops	Ammonium phosphate 20-20-0	100 lbs./acre broadcast, drilled or side-dressed	Best effect per unit of cost

the possible applications of chemical fertilizers on crops indigenous to Burma. The fertilizer requirements for particular crops, indicated in the table, will vary with the nutrient condition of the soil.

Row crops are often benefited considerably by side-dressing fertilizers as the crops grow. The practice is limited to a mechanized operation. Placement can significantly influence the utilization of fertilizers, and mechanization affords the best means of varying such placement.

The diversity in the requirements for different crops and the varieties of the soil types upon which they are grown deny a detailed discussion of relative benefits from fertilizer application. A discussion of rice production and the use of fertilizer will serve as an example. Chemical fertilization of rice has not been completely tested in Burma. The evidence available indicates that, in general, the application of 100 pounds per acre of a 20-20-0 fertilizer will increase rice yields an approximate 20% to 30%. The method of application, the type of fertilizer, the time of application and evenness of distribution all enter into the ultimate results on any plot of soil. Very great differences may be expected in yield and, in extreme cases, harmful or disastrous results can occur by overdosage or improper application. The use of chemical fertilizers seems to offer the quickest increase potential in rice production that is readily adaptable to present agricultural methods. The relationship between the increase in rice production from fertilizer and cost is discussed in Paragraph D-6-b of this chapter.

(2) Partial Mechanization

Another means of intensifying cultivation without instituting radical changes in cultivation methods is partial mechanization of the soil preparation and harvesting operations. Experience in Burma has demonstrated that custom plowing during the dry season is possible under restricted conditions. Although mechanical equipment cannot efficiently operate on small plots, given an area of ten or more acres without bunds, mechanical plowing can prepare the soil faster and cheaper than primitive methods, and do it much better. If such ten-acre plots are sufficiently numerous, a custom plowing center would be feasible. An example for consideration would be a plowing center employing five Farmall Super MD tractors. A unit of this size would justify the establishment of a small service and repair shop to insure proper maintenance of equipment. From Table VIII-9 (*see p. 154*) it is calculated that custom plowing costs approximately K4.00 per acre without consideration given to the movement of machinery and equipment from one field to another, or the cost of

a mobile shop. Assuming that 10% of all time worked is so consumed, and the cost of a mobile maintenance unit is K1·19/acre, the resultant cost per acre for mechanical plowing is approximately K5·19. This figure embraces all costs, as listed in Table VIII-9. A calculation of cost for plowing the same area with oxen, during the beginning of the wet season, under unpleasant conditions and doing an inferior job amounts to K18·3 per acre as calculated from data listed in Table VIII 9.

Essentially the same program is possible for the utilization of separators in conjunction with harvesting grain. One such machine, with a capacity of 17,500 pounds per ten hours, is able to thresh the yield of 13 acres of paddy daily. Stationary threshers need not be confined to threshing paddy. A very wide variety of threshing discs is available for the handling of pulse crops, wheat and cereals generally. Hand-reaped bundles of panicles are presently hauled from the field to the threshing-floor, and to haul them somewhat farther would probably not be sufficiently critical to discourage the use of a mechanical separator. The thresher is easily moved. The quality of the separation and the reduction of lost and damaged grain would reduce the cost of using the thresher. A considerable advantage lies in the rapidity of handling.

The cost of threshing rice mechanically approximates K8·7 per ton, as calculated from Table VIII 9. Present costs, as taken from Table VIII 9, approximate K22·8 per ton. The difference is more than cost, for grain mechanically separated is of considerably higher quality owing to less breakage, and there is more of it due to reduced loss in separation.

Partial mechanization, as analyzed above, is therefore one approach to intensification of agriculture permitting more land to be cultivated, by reason of early plowing, and the obtaining of more and better grain through mechanical separation. Under unusual cases of available moisture during the dry season, either by precipitation or irrigation, a combination of custom plowing and mechanical threshing would permit double cropping, crop rotation and the use of green manures in the cropping pattern.

(3) Simple Improvement Techniques

(a) **Storage and use of manure.** Within the reach of, and often known by, the individual cultivator are numerous simple means of intensifying cultivation. None of them is easy. The average land holding of approximately 12 acres usually has a single pair of oxen to supply farm power. Two oxen normally produce six tons of manure annually, approximately one half the value of which is lost to evaporation and leaching due to improper storage and handling. Accordingly, under common management, one quarter of a

ton of manure per acre is used on the land. This quantity has a beneficial effect amounting to an increased yield of less than 5%. The use of manure involves a discouraging labor effort. The result is that the value of manure is limited and its use not fully exploited, although probably well known. In Europe the degree of utilization of animal manures is very high, and special attention is given to its collection and storage. By placing fresh manure in a concrete basin, so constructed as to drain the liquid portion into a subterranean tank, it is protected from leaching. The liquid manure is drawn from the tank and sprayed over the fields just prior to seeding. The solid portions are stacked in the field and spread by hand. Such a system would be indeed beneficial for agricultural soils of Burma but the costs involved for so storing and handling manure are probably prohibitive for the average Burmese cultivator. However, a number of methods which would involve little expense have been developed by the Department of Agriculture.

(b) **Composting.** The use of compost in Burma has been tested experimentally with favorable end results. Composting serves the dual purpose of soil improvement, much as does green manuring. The usual compost requires the hand mixing of cut and dried vegetation with farmyard manure and soil at an approximate ratio of 3:2:1. After repeated mixing over a period of six to eight months, the compost is spread at the rate of ten or more tons per acre. An average farm would require 120 tons of compost for 12 acres of land. That tonnage would have to be handled several times, being finally spread in May during the busiest season of the year.

Composting is a practice typical of gardening, and highly beneficial. It is economically feasible only if labor is to remain cheap, which is contrary to the objectives of the program. Bulletin No. 29 of the Department of Agriculture of Burma shows that composting is not justified economically unless labor is cheap. The increased yield of paddy by the application of 100 pounds per acre of a 20-20 0 chemical fertilizer is equivalent to the increase in yield from ten tons of compost, and the cost of chemical fertilization is about half that of composting. Furthermore, the quantities of manure available for proper composting are not sufficient for large-scale application. Composting is therefore recognized as an excellent means of intensifying cultivation but too difficult and too costly to merit widespread use without partial mechanization.

(c) **Other.** The intensification of cultivation by better soil preparation, pest control, crop rotation, green manuring, and double cropping does not achieve optimum results under conditions of primitive agriculture. It is doubtful that soil could be much

better prepared than at present, using primitive implements and animal power. A primitive plow reaches three to five inches into the soil and stirs it without folding it over uniformly. The operation is repeated several times in order to pulverize fairly well the soil or puddle it in the case of paddy. No variation of this system is possible. The only means of improving soil preparation is to use equipment that will handle the soil according to its needs. That may involve subsoiling, breaking hardpan, middle breaking, stubble harrowing, deep plowing, disc harrowing or a wide variety of other treatments. None of these practices can be used without mechanical power. Green manuring is another example. A green manure crop must be plowed under when its development has reached a certain stage of succulence. Primitive implements and animal power are not capable of performing that operation, particularly in the heavy soils extending over most of agricultural Burma.

The use of crop rotations and double cropping, as means of intensifying primitive cultivation, is not generally practiced. For most of Burma the principal crop is rice, and two thirds of all cultivated acreage is annually devoted to its production. Crop rotation as an improvement measure cannot be permitted to interfere materially with rice production. Crop rotation must therefore include a second crop. Double cropping with non-mechanized agriculture requires that soil preparation and harvesting operations be speeded, and that irrigation water or sufficient rain be available to raise a second crop.

The new and very effective means of insect control, arising from the development of nerve killing compounds, are of limited use to the hand cultivator. They are most effective when distributed by special machinery designed for use with mechanical farm power.

b. Mechanized and Partially Mechanized

(1) Application Limited

Complete mechanization with latest farming techniques can achieve a degree of intensification of agriculture far beyond that obtained by hand methods. However, the required conditions will be difficult to meet in Burma. First, mechanization should be confined to highly productive soils to justify its relatively high capital investment and operational cost. Secondly, it should be located in an area of the country not too far removed from central markets and the sources of mechanical supplies for demonstration farms engaged in producing critical commodities. Alternatively, a system of decentralized servicing stations could be established. Thirdly it must be operated on a modern, scientific agricultural plan, adapted to a scale consistent with efficient use of

mechanical equipment. An average economic unit would be about 500 acres. Lastly, it must be properly organized and supervised with competent personnel. Such conditions are not impossible and in due course could very well become common as in many other countries. At the outset, programming on a modest scale, perhaps in the form of demonstration farms to gain experience, would be desirable and more compatible with investment of foreign exchange in equipment than would large-scale development.

(2) Advantages

(a) **Efficient farming.** Modern agriculture automatically permits crop rotation, green manuring and the fullest use of natural and chemical fertilizers. Practices that are impossible under primitive agriculture are an integral part of modern farming. Double cropping becomes a standard practice, water permitting, and farm output can often be more than doubled.

Mechanization is the key to modern farming. Machine power is cheaper, more versatile, and easier to handle than are oxen. Farm equipment is available for doing every job on the farm and is designed to fit practically every unusual characteristic that an agricultural area can present. Seed-bed preparation using mechanical equipment is superior to that of primitive plows and harrows. One operation with mechanical equipment does the work of four or five primitive operations, and does it better. The placement of fertilizers, seeding, furrowing, harvesting and cultivation are more efficient and cheaper with mechanical equipment. Some operations, such as chemical insect control and bulk handling are possible only with mechanized farming. About 10% of all paddy acreage now occupied by bunds could be farmed under mechanization by reduction and realignment of bunds along contours. Instead of depleting the soil, farming with machine equipment actually improves the soil medium and the use of soil-improving crops becomes possible.

(b) **Soil improvement.** Crop rotations, for example, have the objectives of greater economic yield through better soil utilization and soil improvement. Different crop types can be grown for building soil organic matter for protecting the soil, and for controlling weeds and insects. Soil fertility is better maintained by root zone feeding at variable depths. To be effective, crop rotations should follow the basic cycles of green manure, row crops, small grains. Green manure should be mixed with an adaptable legume, of which a number are currently raised in Burma as cash crops. Green manure contributes to the tilth of the soil and supplies a desirable level of nitrogen and carbon in a balanced ratio. Soil drainage improves

the land and often, depending on the green manure type, produces a grazing benefit that may cover the cost of the practice.

Legumes tend to exhaust soils of phosphorus. Consequently phosphatic fertilizers should be used with hay crops where required. Row crops follow green manure in order to utilize the high nitrogen level established by green manure crops. In general, row crops draw heavily on the supply of all soil nutrients. They require cultivation and therefore expose the soil to erosion. Consequently row crops should not be grown for more than one quarter or one third of the rotation period. Small grains follow row crops as moderate users of soil nutrients and afford soil erosion protection. Small grains following legumes are sometimes subject to lodging due to a superabundance of nitrogen in the soil. If necessary, as is probable in most areas of Burma, it is important that phosphatic fertilizer be applied in sufficient quantity to balance the high soil nitrogen level. Crop rotation on paddy lands is predicated upon double cropping and controlled irrigation. The selection of a suitable rotation is difficult because of the heavy clay soils and the traditional preference for rice production. Upland areas are capable of more effective crop rotations and permit a wider selection in rotation. The cost of establishing crop rotation is small and the benefits are significant, both immediately and in a long-range view.

Although water deficiency during the dry season, except with irrigation, precludes the possibility of green manuring in much of Burma, there is need for it. There is a major and general deficiency of nitrogen in soils that have been cropped for extended periods. The organic content of nearly all soil types in Burma is also low. The practice of green manuring can correct both deficiencies to a considerable extent. To increase the total and available nitrogen in the soil it is necessary that a legume be used for the green manure cover crop. There are a number of indigenous legumes that are suited to the soils and climate of Burma, principal of which are *Crotalaria*, *Lathrus*, *Psophocarpus*, *Mucuna* and *Vigna* species. A non-legume, plowed under for green manure, will decompose slowly due to the paucity of soil nitrogen upon which soil microorganisms depend for their activity. Consequently, decomposition ceases, or nearly so, with an exhaustion of available nitrogen reserves, and intermediate products of decomposition are released. Some of these are toxic to plants. A crop planted into an improperly decomposed, green-manured field would immediately suffer from shortage of nitrogen.

Many beneficial effects of green manuring other than replenishment of soil nitrogen can be had in terms of improved soil tilth, greater availability of certain nutrients held in the organic fraction of the

soil, such as nitrogen and many trace elements, and the preservation of many nutrients in the body of the cover crop that might otherwise be lost to leaching. The practice of green manuring is readily adaptable to crop rotation patterns.

(c) **Diversification of farming.** In those areas of Burma that are suitable for livestock, principally on the Shan Plateau and to a lesser but nevertheless important degree in the Dry Zone, a diversified farming program would have merit. Perhaps a fattening program of short duration could even be carried out in the Delta area, should it develop that forage legumes become established in crop rotations of lower Burma. The production of oleaginous crops often coincides with conditions conducive to good livestock production. A combined operation utilizing green manure for soil improvement and livestock production, grain production as a cash crop, and groundnuts or sesamum for marketing oil and for feeding concentrates to dairy stock or hogs warrants investigation.

(d) **Lower costs.** Cultivation costs under mechanized agriculture and under present cultivation methods have been analyzed (Table VIII 9). The costs have been prepared in three parts to show costs now, costs with present cultivation methods but with ample irrigation water throughout the year, and costs of mechanized farming with irrigation. The differences in yield resulting from these varying practices are significant even though based on limited data. Estimates of total costs from each of the cultivation methods followed are assembled in Table VIII-10 (*see next page*). These estimates are based on probable costs after establishment of enough mechanized farming units to support adequate maintenance and repair services. Initial costs of mechanized farming may be substantially higher.

The costs of cultivation have been separated into those of labor, machinery or animal and equipment expenses, and common or other costs. For calculation purposes, the various operations such as soil preparation, fertilizing, seeding, chemical treatment, cultivation and harvesting, have been listed separately with a varied choice of procedure according to the crop grown and the prevailing conditions. Table VIII-9 reflects all costs of cultivation, as applied to individual operations.

Labor, as shown in Table VIII-9 is divided into that for mechanized and that for hand or oxen. It is assumed that labor under hand or oxen methods will continue to earn the current wage of K2.5 per day. Semi-skilled labor necessary for the maintenance and operation of mechanized equipment is expected to receive the wage of K5 per day. The daily work capacity of machinery and the man-days and cost per

acre, at the pay rates listed above, are recorded for individual farming operations. It should be noted that the transition to the higher wage is not to be regarded as a handicap but would constitute an instance of direct achievement of the end objective of the entire development program which is to raise the relative income of the individual.

That portion of Table VIII-9 relating to the use of modern farm machinery lists the cost to Government of equipment units delivered in Rangoon and the depreciation rate of equipment in years. Depreciation cost is recorded for the period of cultivating one crop. In a few cases where a single crop occupies land for an entire year, machinery depreciation costs cover the same period. The same principle applies to the use of special equipment that serves the requirements of a single crop. It is assumed that the Government would finance any mechanized cultivation program. Accordingly a 6% interest rate has been taken as an expected revenue to the Government for provision of capital. Maintenance expenses have been calculated at a 10% value of the annual depreciation for all pieces of equipment except power units. Tractors have been considered to cost from K20 to K35 per day, according to size, for maintenance and operation, exclusive of labor. The final columns of the machinery section of Table VIII-9 show the cost per acre and the total cost per crop of each unit of equipment.

Animal and equipment costs have been taken from a publication entitled "A Colonization Scheme for Uncultivated, Reclaimed and Disforested Areas." In order to establish an equitable comparison with mechanized agriculture, and to reflect a more accurate picture of recurring costs, the same considerations of depreciation and interest have been shown for hand or oxen agriculture costs as those for mechanized costs. Costs for hand or oxen methods are based on an average farm holding of 12 acres. Mechanized costs are calculated for a 500-acre farm.

The common costs of land revenue, fertilizer, seed, insecticides and other materials are assembled in Table VIII-9 as a general guide to specific needs. Any or all of these requirements vary with individual crops, and that variation has been taken into account in the final calculation of cultivation costs for each crop.

The use of fertilizers and the use of modern machinery produce yields considerably in excess of those of present agricultural methods. An estimate of the increase in yield for each of the operations of soil preparation, fertilizer use and its placement, seeding techniques, furrowing, insecticide usage, preflooding or water control, cultivation and harvest quality has been prepared. Increases are expressed in terms of percentage.

The proper preparation of soil involves plowing,

TABLE VIII - 10
PER-ACRE CULTIVATION COSTS
(in kyats)

Crop	Labor			Machinery		Other			Total without Fert.			Total with Fert.		
	Present	Irrigated	Mod.	Present	Mod.	Present	Irrigated	Mod.	Present	Irrigated	Mod.	Present	Irrigated	Mod.
Paddy	49.7	50.2	1.97	20.8	26.86	3.9	38.9	38.9	74.4	74.4	34.7	109.9	109.9	69.7
Sesamum	10.75	16.25	3.04	20.8	32.96	3.9	38.9	38.9	35.5	41.0	39.9	66.6	76.0	74.9
Maize	24.25	26.75	2.02	20.8	24.03	3.9	38.9	38.9	49.0	51.5	26.7	84.0	85.5	65.0
Sugar Cane	109.5	119.5	63.36	33.7	34.08	59.9	94.9	94.9	203.1	213.1	157.3	235.1	248.1	192.3
Pulses	24.35	31.65	2.96	20.8	31.72	3.9	38.9	38.9	49.0	49.0	38.6	91.3	91.3	73.6
Groundnuts	25.75	28.95	3.88	20.8	42.35	11.9	46.9	41.4	58.5	58.5	58.1	96.6	96.6	93.1
Tobacco	43.0	45.65	30.57	20.8	17.49	3.9	38.9	38.9	67.7	67.7	52.0	105.3	105.3	87.0
Cotton	24.25	26.75	13.51	20.8	22.54	3.9	38.9	38.9	48.9	48.9	40.0	86.4	86.4	75.0
Wheat	14.9	22.2	1.34	20.8	20.40	3.9	38.9	38.9	39.6	39.6	25.7	81.9	81.9	60.6
Forage Grass	—	—	.86	—	9.23	—	—	38.0	—	—	13.0	—	—	48.1
Green Manure	—	—	.86	—	9.23	—	—	3.0	—	—	13.0	—	—	—

harrowing, and sometimes subsoil tillage, leveling and suitable mulching or other surface preparation. Tractor-drawn machinery allows any variation of soil preparation imposed by soil conditions or by the crop to be grown. Primitive animal-drawn equipment does not. Accordingly, it is calculated that proper soil preparation using modern machinery should improve the yields of all crops by an average of 5%. In the case of sugar cane the yield should be greater because of the drainage requirements of the plant.

The use of fertilizers increases yields about 30%, according to experimental testing in Burma. The method of placing the fertilizer may vary this yield significantly. Modern machinery is capable of correct fertilizer placement or side-dressing and can produce a still further increase in yield. The lower yields resulting from hand placing of fertilizer are indicated by the numbers in brackets in Table VIII-9.

Seeding directly affects crop yields. Few crops other than some small grains are best planted by hand broadcasting. Machinery seeds any crop uniformly as to both depth and spacing and fully utilizes soil to the best advantage of the crop sown. A distinct advantage of machine sowing is the considerable saving in seed that results. The average increase in total crop yields with machine seeding is about 10%.

Certain crops grow better if the soil is formed into furrows and ridges. The advantages are ease of

irrigation, subsoil irrigation, drainage, and good aeration. The benefits of furrowing soil are related to better water utilization. It is possible to furrow soil with stick plows, but only a high-yielding, profitable crop such as sugar cane permits the operation to be economically justified.

Insecticide treatments have a pronounced beneficial effect on many crops after an infestation is apparent. Others, such as groundnuts, profit from preventive treatments prior to infestation. Crops arranged in machine-seeded rows are most profitably treated for insect control, and mechanized equipment is most effective and economical for distributing the insecticides required. Insect and fungus control measures, both curative and preventive, are estimated to increase crop yields from 5% to 15%.

Preflooding and water control are classed separately according to the crop to which the practice applies and to the soil differences under which the crops may be grown. In loam soils with high water-holding capacity preflooding could be effective with sesamum or pulses under conditions of hand-oxen agriculture. If the farming is mechanized, furrow irrigation may be more effective. Accordingly both benefits are enclosed in brackets to indicate that either the one system or the other can be used (see Table VIII-9).

The collection and grading of pulse and groundnut crops by hand-oxen methods is so inefficient and poor

TABLE VIII - 11
CROP PRODUCTION AND VALUE PER ACRE
(Farm level)

Crop	Yield			Value		
	Present lbs./acre	Irrigated lbs./acre	Modern lbs./acre	Present K	Irrigated K	Modern K
Paddy	1,330	1,485	1,950	90.2	103.2	135.5
Sesamum	117	210	286	34.6	62.1	62.1
Maize	537	590	860	69.6	76.6	112.0
Sugar Cane	1,770*	2,210	3,100	389.0	486.0	682.0
Pulses	392	450	705	65.0	74.6	117.0
Groundnuts	546	685	1,121	79.1	99.2	162.5
Tobacco	116†	134	203	75.3	87.1	132.0
Cotton	161‡	193	330	72.5	87.0	148.5

* Jaggery.

† Dry Leaf.

‡ Lint.

in quality that machine methods should actually increase yields. Hand picking often leaves rather large quantities of the crop in the field. Modern machinery reduces those losses to a minimum, and, by separation or combine methods, greatly increases the quality of the yield collected. Shriveled or undeveloped seeds, such as groundnut "pops," are not sacked for sale or shipment but instead may be used as a forage supplement or returned to the soil. Better quality produce meanwhile commands a better market price.

Hand cultivation methods are both difficult and expensive. For these reasons, proper weed cultivation is usually poorly done or not at all. The consumption of nutrient salts by weeds is fully as efficient as that of planted crops. The presence of weeds in competition with a planted crop will reduce crop yields approximately in proportion to their relative density, and may cause yields to decline 90% in extreme cases. Broadcast seeding permits no cultivation. Mechanized farming permits cheap and efficient cultivation which is estimated to increase crop yields an average of 10%.

The various benefits of different farming practices rarely stand alone. One is usually dependent upon the other. The benefits are additive in nature and occasionally more than additive. Tables VIII-10 and VIII-11 (*see previous page*) list production costs and gross income for each of the various methods of cultivation employed. Table VIII-12 summarizes

these tables into net returns by crop, according to the cultivation method used.

(e) **Pleasant work for farmer.** Two features of mechanized farming have a bearing on its possible success or failure in Burma. It has been said that Burmans have never used mechanical equipment to a large extent and that for that reason they cannot be expected to operate machines efficiently or to service them properly. This conclusion is not supported by the widespread evidence of the manner in which Burmans have repaired, remodeled and maintained surplus vehicles left in Burma by various military forces after the war. Parts have been hand made when none were available, and a major talent for improvisation has been exposed among some of the Burmese mechanics who, without formal training, have managed to repair such major units of equipment as bulldozers. Experience in Brazil, and with the large land clearing program in Ceylon, as well as experience with mechanized farming in Haiti, indicate that the capacity to learn the use and care of equipment is a talent that all peoples enjoy, given equal opportunities.

With mechanized agriculture, the heavy physical burden that the hand cultivator bears is reduced to the care and operation of machinery. The cultivator directs power where before he often supplied it. The fact is that mechanized farming is not physically difficult, but eliminates forms of labor that may deprive

TABLE VIII - 12

CROP COST, VALUE AND NET RETURN UNDER VARIED PRODUCTION METHODS
(Farm level)

Crop	Cultivated Cost			Gross Value			Net Returns		
	Present K	Irrigated K	Modern K	Present K	Irrigated K	Modern K	Present K	Irrigated K	Modern K
Paddy	74.4	74.4	69.7	90.2	103.2	135.5	15.8	28.8	65.8
Sesamum	35.5	41.0	39.9	34.6	62.1	62.1	0.9	21.1	22.2
Maize	49.0	51.5	65.0	69.6	76.6	112.0	20.6	25.1	47.0
Sugar Cane	203.1	213.1	192.3	389.0	486.0	682.0	185.9	272.9	489.7
Pulses	49.0	49.0	73.6	65.0	74.6	117.0	16.0	25.6	43.4
Groundnuts	58.5	58.5	93.1	79.1	99.2	162.5	21.6	40.7	69.4
Tobacco	67.7	67.7	87.0	75.3	87.1	132.0	7.6	19.4	45.0
Cotton	48.9	48.9	75.0	72.5	87.0	148.5	24.6	38.1	73.5

the individual of health or even result in permanently crippling deformities. These benefits would soon become generally recognized, and constitute incentive and encouragement favoring both care of equipment and further extension of mechanization.

2. IRRIGATION

Dry land farming is nearly always limited by the water supply. A common water conservation measure in the Dry Zone of Burma is fallowing. By maintaining a vegetation-free soil surface, the loss of soil moisture through plant transpiration is reduced. At the planting season, fallowed soils contain more moisture than those cropped or covered with weeds. A greater soil moisture reserve at the planting season gives more security that the seeded crop will not be lost from lack of rain. Fallowing does not "rest" the soil but, if done properly, prevents vegetative cover that would draw upon the soil nutrient supply. A distinct disadvantage of fallowing is that it leaves the soil exposed to erosion. About 18% of the cultivated area of the Dry Zone is annually recorded as fallow. Placing the Dry Zone area under irrigation would eliminate the necessity for fallowing land.

a. Increasing Cultivated Acreage

Rather large acreages sown every year in the Dry Zone fail to mature. These crop failures are usually produced by lack of water generally, although floods sometimes wash out or drown planted areas. The sown acreage that fails to mature amounts to an average of 6% of the cultivated acreage of the Dry Zone annually. Irrigation would eliminate such crop failures almost entirely.

TABLE VIII - 13

INCREASED ACREAGE THROUGH IRRIGATION

Project	Present Acreage		Increase from		Total Increase
	Fallow	Abandoned	Double Cropping	New Land	
Yamethin	81,000	27,000	450,000	67,500	625,500
Mu	194,000	64,666	1,078,000	161,500	1,498,166
Pakokku	2,030	676	11,250	1,690	15,646
Loikaw	13,500	4,500	75,000	11,250	104,250
Grand Total					2,243,562

By removing the hazard of insufficient precipitation, irrigation opens up an entirely new phase of agricultural possibilities in the Dry Zone. The most significant of these is double cropping. Theoretically, double cropping doubles the production of an area. Practically, the degree of increased production through double cropping is dependent upon the degree of intensification that is applied in the area. If irrigation is

considered in company with mechanized farming techniques, the additive benefits of all practices are several times greater than doubling of present, single crop production. Double cropping is equivalent to acreage expansion under present cultivation practices, and in Table VIII-13 is so shown.

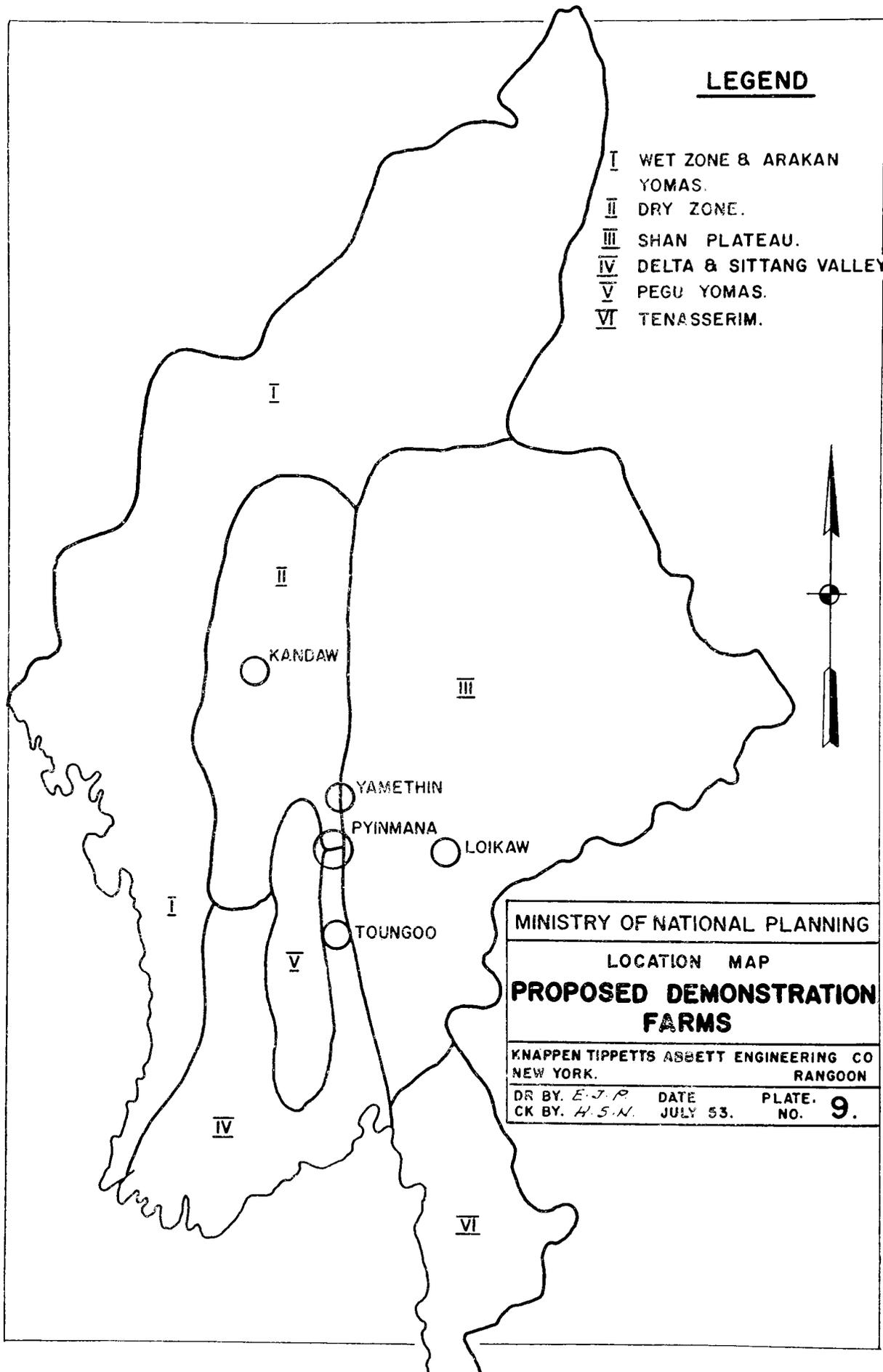
In addition to the placing into cultivation of fallow areas and abandoned crop areas, and the potential double cropping of the total area irrigated, considerable areas that have never been cultivated lie within the canal boundaries of potential irrigation systems. Such areas are usually not Grade I soils, but would probably have been cropped but for reasons of soil texture or shrub cover or forest reserve classification. The availability of water would make such areas potentially cultivable. Table VIII-13 indicates the approximate possible increase, in acres, of cultivation resulting from development of irrigation projects now in the planning stage. The dependence of double cropping upon mechanization of the soil preparation and harvesting operations should be emphasized. The development of new land into cultivated land is accompanied by capital investment in initial land preparation, often land clearing, and initial plowing not easily done under present methods.

b. Impact of Developing Irrigation Projects

The impact of developing the proposed irrigation projects would extend beyond that of increasing cropped acreage. If such development should compel at least a partial mechanization of farming practice in those areas of irrigation, crop production would also be forced into a program of diversification. Using the irrigated soil resource to its utmost economic potential would result in the production of forage crops, and of other crops not previously grown in large quantities in the area. Off-season production would probably become the rule in agricultural commodities such as sesamum, and would permit a more economic utilization of processing facilities. Feed concentrates, produced in the dry season under irrigation, could be fed as a supplement to animals grazing on green manure forage crops in the wet season.

3. DEMONSTRATION FARMS

The introduction of mechanized farming into Burma, however modest the beginning, is a basic requirement for full benefits if proposed irrigation projects are carried out. An analysis of varying benefits according to the cultivation method employed and particularly a consideration of total benefits under the various methods on the Yamethin irrigation project clearly shows that some modernization is necessary to justify fully implementation of the projects.



LEGEND

- I WET ZONE & ARAKAN YOMAS.
- II DRY ZONE.
- III SHAN PLATEAU.
- IV DELTA & SITTANG VALLEY.
- V PEGU YOMAS.
- VI TENASSERIM.



MINISTRY OF NATIONAL PLANNING

LOCATION MAP

PROPOSED DEMONSTRATION FARMS

KNAPPEN TIPPETTS ASBETT ENGINEERING CO
NEW YORK. RANGOON

DR BY. *E.J.P.* DATE JULY 53. PLATE. NO. **9.**
CK BY. *H.S.N.*

a. Purpose

Lacking a background of experience and knowledge in all phases of improvement in farming, Burma should establish one or more demonstration farm units based upon the best available agricultural information and recommendations of experienced personnel. Such farms would provide accurate cost determinations at a practical level, and would constitute a testing ground for laboratory research findings in the fields of both agronomy and agricultural engineering. Demonstration farms would serve as active training centers for future modern farmers by overstaffing. The future development possibilities of demonstration farms include the formation of custom plowing and harvesting services, growing and distribution of improved seed, the storage and protection of farm products, and possibly farm credit transactions.

The establishment of a single demonstration farm as a testing ground for future development is hazardous and uneconomical and would be inconclusive in evaluating farming practices. It is believed that five such farms should be established to yield an adequate cross section of results.

b. Location

The soils which would most urgently require the practices of improved farming methods are those lying within the boundaries of the proposed irrigation projects. Within the span of both wet and dry zone climates, the Yamethin project offers three areas of investigation. At Toungoo the climate is essentially that of the Delta. Pyinmana lies in the transition zone between wet and dry zone climates. At Yamethin the climate is typical of the Dry Zone. Within a single irrigation project, farming can be demonstrated and tested under all three of the major climate conditions of Burma.

There are times when urgent necessity of the population merits consideration of an irrigation program on a small scale. Such a condition exists near Pakokku, in the heart of the Dry Zone, in an area capable of utilizing a small pump irrigation system. The establishment of a successful demonstration farm in that area would have distinct advantages. An analysis of Pakokku soils reveals that they are relatively fertile and of a sandy texture. In quality they might be compared with desert soils which have not been leached of soil nutrients. Placing this area under irrigation and farming it by mechanized methods might result in the creation of a veritable oasis in the desert. Improved farming under dryland conditions should also be tested because of the very large areas of non-irrigated land. An area in the vicinity of Loikaw

provides the conditions of climate and underpopulation that are well suited to this purpose.

Proposed locations for the demonstration farms are shown on the map, Plate 9.

c. Specialization on Demonstration Farms

Each of the suggested locations is particularly suited to demonstration of some specialized form of agriculture. Toungoo, for example, could concentrate on the development of a highly intensified rice production program. The Pyinmana farm could be devoted essentially to sugar cane production. Yamethin could concentrate the activities of its demonstration farm on the diversification of agriculture, Dry Zone soil improvement techniques, and the fattening of livestock. Pakokku, with its sandy soil, is best adapted to the production of groundnuts, and could be used almost exclusively in the field of oleaginous crops. The farm at Loikaw could demonstrate the practicability of combining grain and groundnut production with that of dairy and livestock. The proposed demonstration farms would be similar only in their organization, operation and cultivation techniques. The goals of each farm would be different, with each devoted to the production of an agricultural commodity in short supply within the country or, in the case of rice, of an export commodity of interest to the nation.

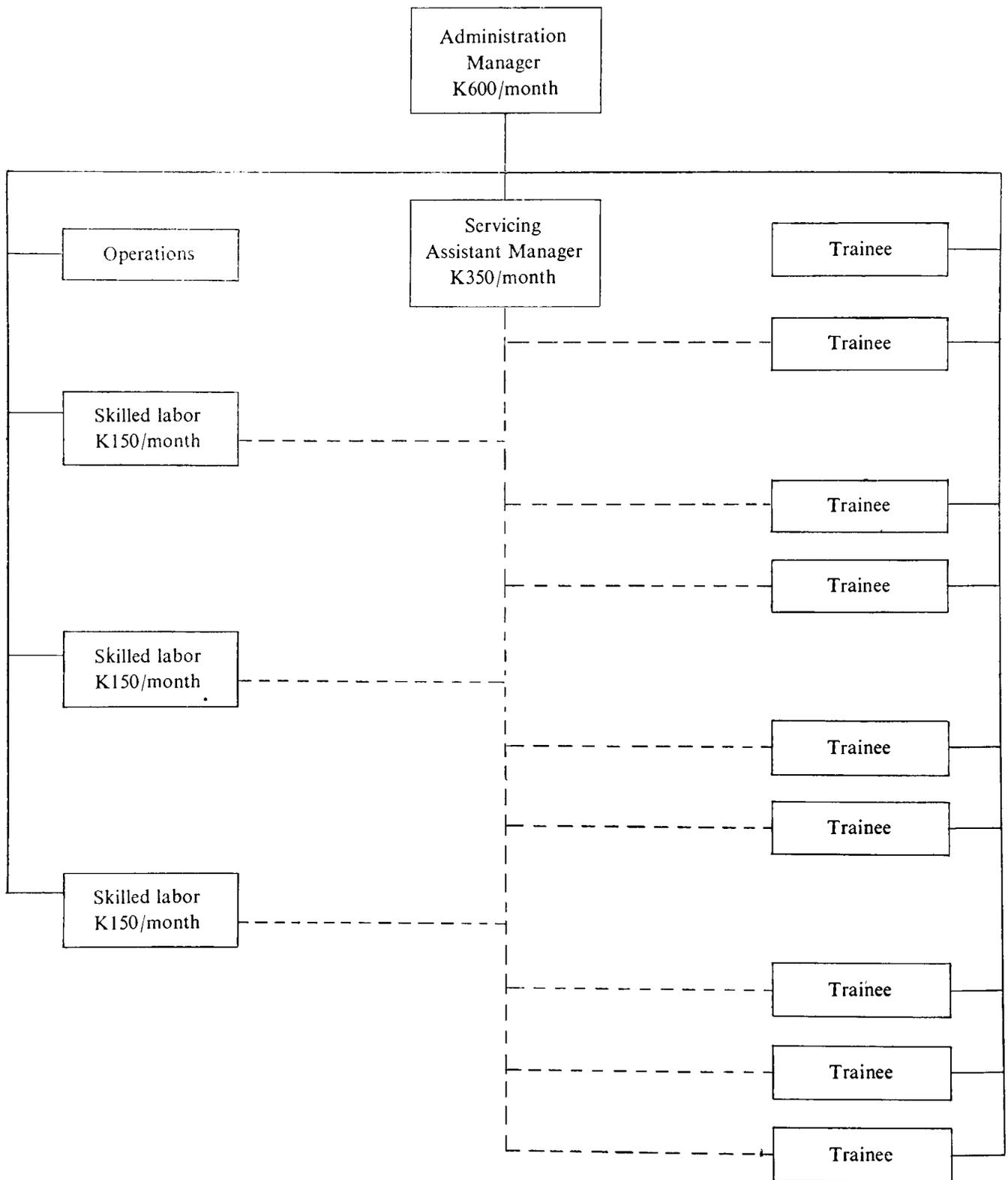
d. Organization and Administration

The organization and administration of demonstration farms could be fitted into any one of several present government agencies, but should function best directly under the Director of Agriculture. From the Ministry of Agriculture the necessary land, funds and understudy personnel could be provided.

Planning and initial operation of demonstration farms should be undertaken by foreign personnel with successful experience in the selected types of farming. Within a short period it would be expected that both authority and responsibility would be taken over by Burmese personnel and the foreign specialists released, or retained temporarily in consulting capacities. It is essential that the chain of authority be simple, strong and commensurate with its responsibility. A suggested organization for operation of a demonstration farm is shown on Plate 10.

The initial step required for establishing a demonstration farm is a survey and analysis of the resources of each of the farms to be organized. Proper interpretation of such data forms the foundation upon which a farm plan is built. Farm plans take into consideration all the factors affecting agriculture. Among these are soil quality in terms of physical and chemical characteristics, slope, cover, soil erodability,

DEMONSTRATION FARM—ORGANIZATIONAL CHART



topography and drainage. The climate is considered with respect to intensities of temperature and rainfall. The aims of the individual farms are kept in mind while preparing the farm plan. The final plan shows the types of crops that should be grown, the cultivation method and machinery to be used, the crop rotations to be followed, the areas to be grazed indicating the grazing period and number of livestock, the soil conservation practices that should be adopted, the particulars of using irrigation water, and a host of other advisory matters. The farm plan should include a complete cost estimate for both capital investment required and operating costs. The preparation of the five farm plans should be the responsibility of an agronomist of experience similar to that obtained in the Soil Conservation Service of the United States, and should not require more than six to nine months.

Among foreign personnel to be employed the most important and useful individuals would be the practical farmers to organize and operate the farms in the initial period. These farmers should work closely with their Burmese counterparts and should be released as soon as training was found to be adequate. As a continuous farming program extends over several years, new problems would develop. An experienced farmer, retained after completion of a relatively short teaching period on the farm, could serve as a farm consultant for a year or longer. Probably three or four foreign farmers could satisfactorily establish the proposed five demonstration farms. After an 18-month or 2-year period, their numbers could be reduced to one or two, acting as advisors.

A few qualified foreign farm mechanics could also do much toward establishing and maintaining a successful program of mechanized farming. Each of the demonstration farms should be equipped to handle all echelons of repair for all equipment on the farm. A program of such scope requires the services of an experienced, practical mechanic to organize and train a cadre of service personnel. The overstaffing program suggested for demonstration farms would permit the training of sufficient personnel to serve several such farming units. One foreign mechanic per demonstration farm for a two-year period would be sufficient not only to maintain farm equipment on the demonstration farms, but to train a cadre of 30 to 50 Burmese mechanics to carry out the same program on as many farms.

The use of foreign personnel in establishing demonstration farms would serve principally to catalyze the broad changes sought in farming methods. It is not to be expected that farming in Burma should follow an exact pattern of that in any other country. The adaptations that Burma would necessarily make in instituting changes could be worked out in the demonstration

farms. Foreign personnel can only suggest methods that have been successful in other parts of the world under conditions essentially similar. The burden of implementation lies with the Burman.

e. Cost Estimate

The following cost estimate for establishing a demonstration farm in the vicinity of Yamethin is considered typical. It is expected that the farm would cover 500 acres and would be engaged in producing the usual variety of agricultural products common in the area. The farm plan would include a diversification of crops with two rotations consisting of green manure, cotton, pulses and sesamum; and forage grasses, corn, pulses and wheat. Rotations would cover a two-year period and provide for livestock fattening during a portion of that period.

The cost estimate is separated into labor, machinery maintenance, improvement and other costs. The cost of foreign personnel necessary for organizing the first demonstration farms should not be a cost charged against the demonstration farms proper and is therefore not included in operation costs. Trainee labor likewise is not charged to costs of demonstration farms.

f. Returns

Table VIII-14 (*see next page*) summarizes the costs and expected returns from a typical demonstration farm operation based upon the cultivation of 500 acres under an irrigated, double-cropping program. Costs and benefits have been calculated on a per-crop basis, and should be doubled for determination of annual values. It is seen that the cost per crop is approximately K74.0. Returns approach K102.5 per acre leaving a profit of K28.4 per acre per crop. Thus annual profits would accrue at the rate of K56.87 per acre per year. Indirect values of soil improvement are not taken into account in the calculation of benefits.

4. RESEARCH AND EXTENSION

a. Government Plans and Organization

A research and extension system has been functioning for many years under the Department of Agriculture. Valuable work has been performed, particularly in the field of plant breeding and development of improved crop varieties, but the work has been of modest scale. Many methods successful in other countries have not been tried in Burma.

(1) Present Organization

The present organization of research and extension work in Burma is outlined on the charts, Plates 11, 11A, 11B and 11C. This organization has been handicapped by its limited staff which has

ECONOMIC AND ENGINEERING DEVELOPMENT OF BURMA

TABLE VIII - 14

DEMONSTRATION FARM COST AND RETURN ANALYSIS (PER CROP)

(Farm level)

Type	No.	Unit	Cost	D. Rate	D. Cost	6% Int.	Maint.	Cost/Acre	Cost/Acre
Labor	1/3	Manager*	K600/Mo.	—	—	—	—	K2.40	9.20
	1/3	Asst. Mgr.*	350/Mo.	—	—	—	—	1.40	
	3	Skilled Labor	150/Mo.	—	—	—	—	5.40	
Machinery	2	Tractors	29,800	8	1,860	894	5,000	15.50	32.27
	2	Plows	5,500	5	550	166	55	1.54	
	2	Harrows	3,880	5	388	118	39	1.09	
	2	Mid. Brkvs.	9,800	5	980	294	98	2.77	
	1	Border Harrow	4,130	5	413	124	41	1.15	
	1	Duster	3,000	5	300	90	30	0.84	
	1	Separator	17,600	8	1,100	528	110	3.47	
	1	Binder	8,300	8	515	250	52	1.63	
	1	Maize Picker	7,970	8	500	238	50	3.15	
	1	Drill	4,030	5	403	121	40	1.13	
Maintenance	All Equipment		7,000	10	350	210	35	1.19	1.19
Improvements	1/3	Mgr. House	6,000	10	100	60	10	0.34	5.54
	1	Labor House	9,000	10	150	90	15	0.51	
	1	Shop	5,000	5	500	150	50	1.40	
	1	Equip. Shed	5,000	5	500	150	50	1.40	
	1	Granary	10,000	15	333	300	33	1.33	
	1	Feed Lot	2,000	5	200	60	20	0.56	
Other	1	Lot Fert.	15,600	—	—	—	—	23.20	25.78
	1	Lot Seeds	645	—	—	—	—	2.58	
Total Cost per Acre									K73.98

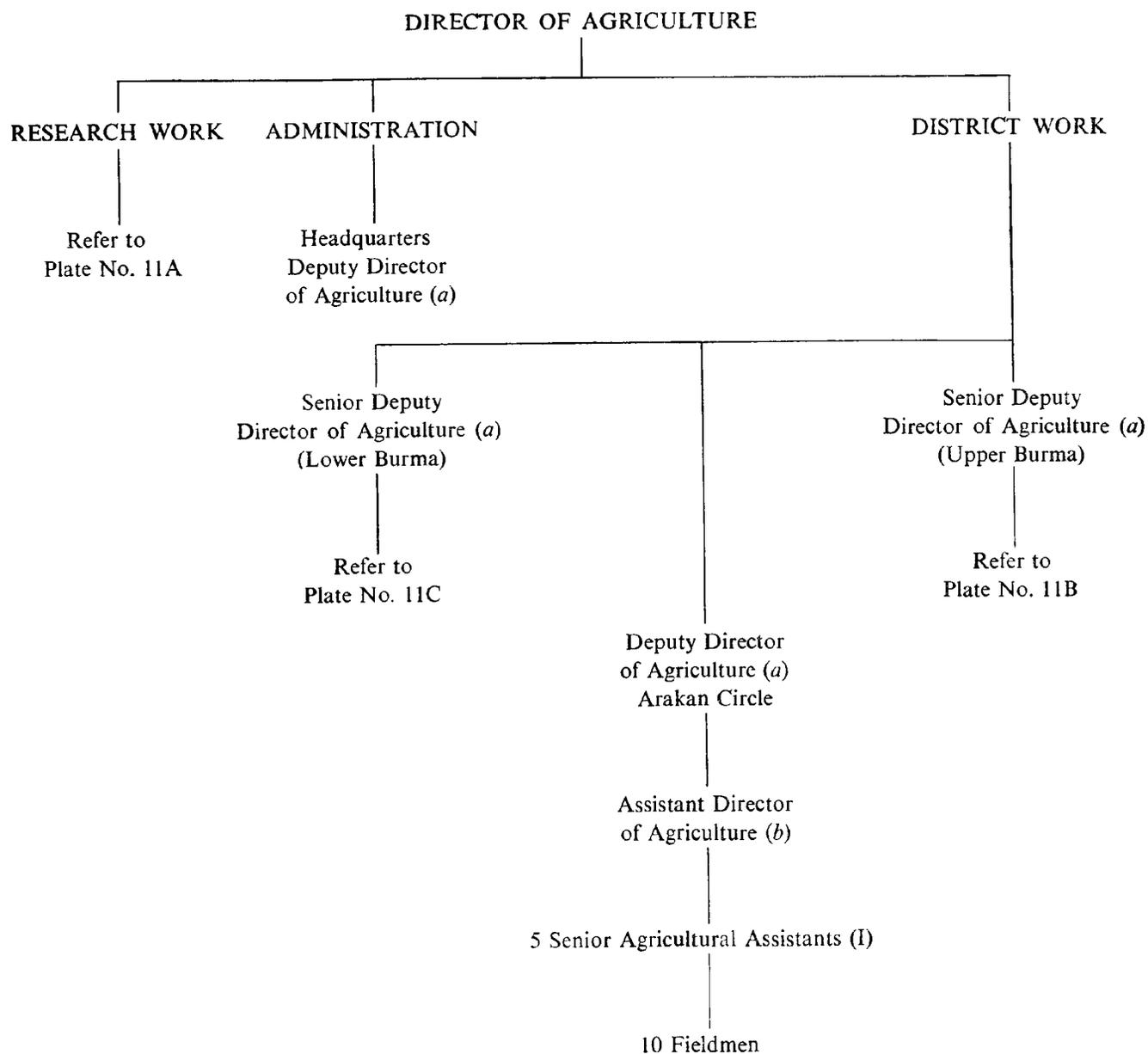
RETURN

Crop	Acres	Value	Cultivation Cost	Profit
All	500	K51,208†	K36,990	K14,218
Total Profit per Acre				K56.87

*Works on three farms.

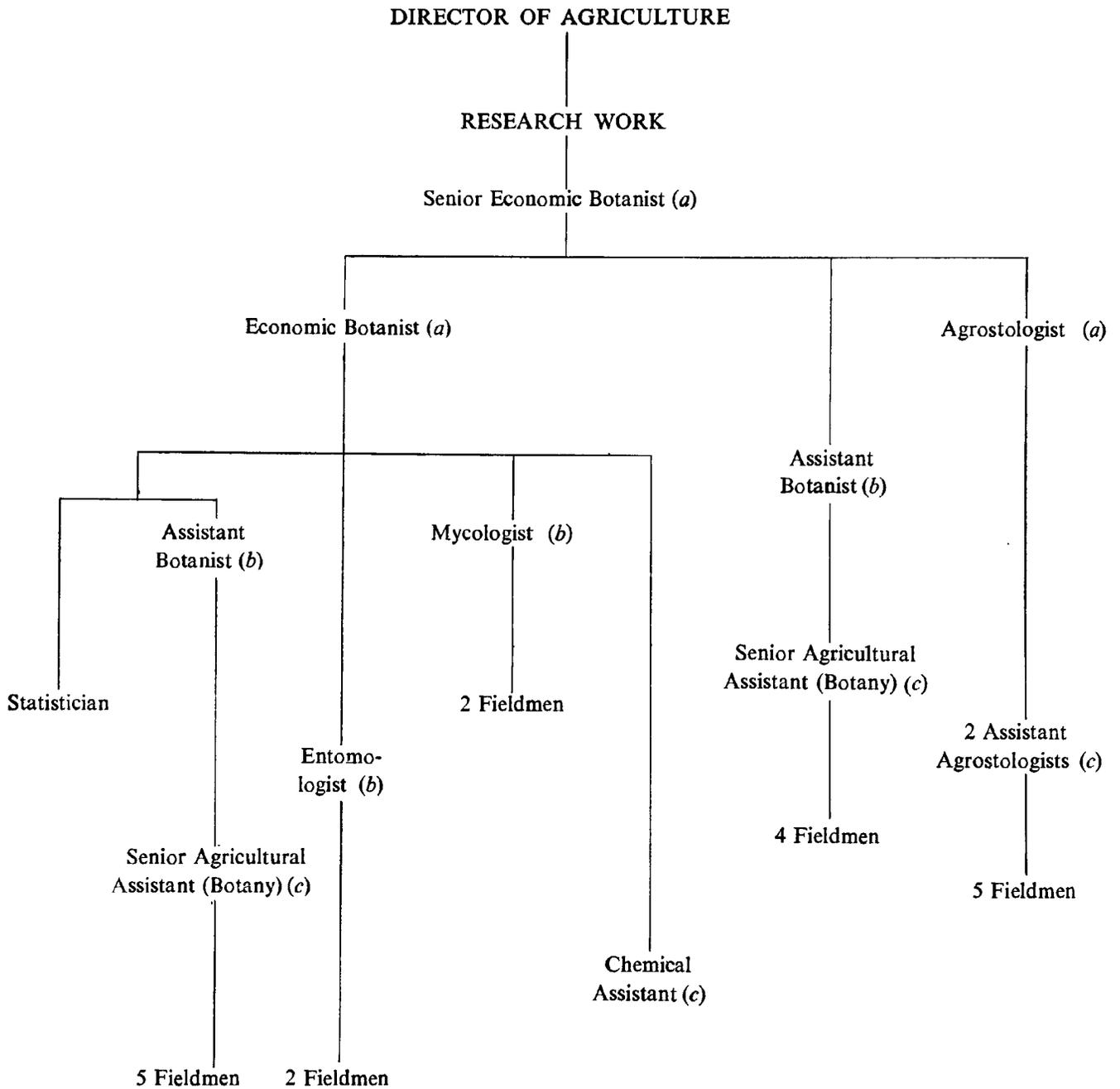
†Based on value of crop production on 375 acres and green manuring plus grazing values on 125 acres.

PRESENT ORGANIZATION OF THE AGRICULTURAL DEPARTMENT

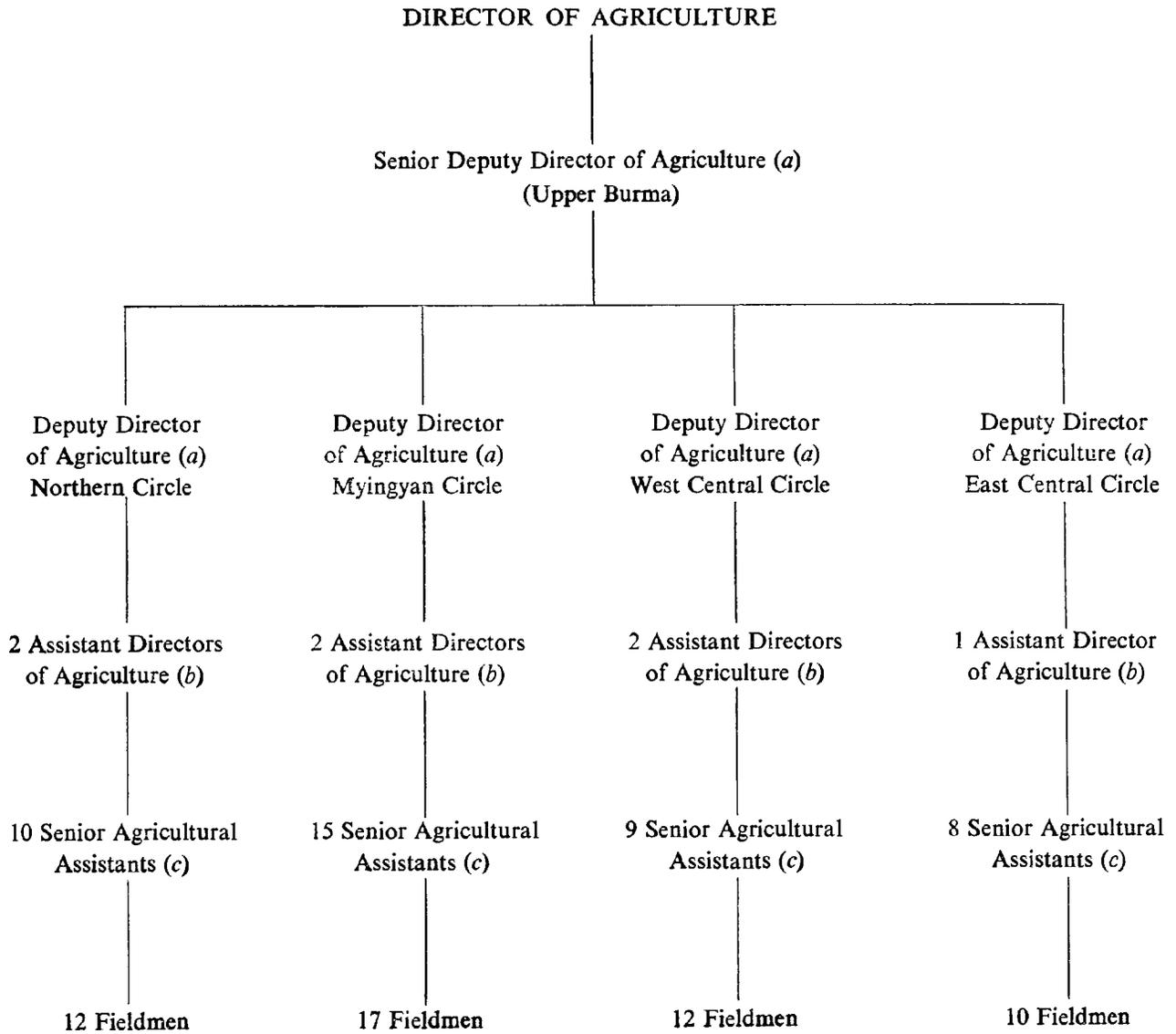


Note: (a) indicates Selection Grade Service.
 (b) indicates Senior Branch of the Burma Agricultural Service.
 (c) indicates Junior Branch of the Burma Agricultural Service.
 The figures indicate the number of posts. Where no figures are shown the posts are single.

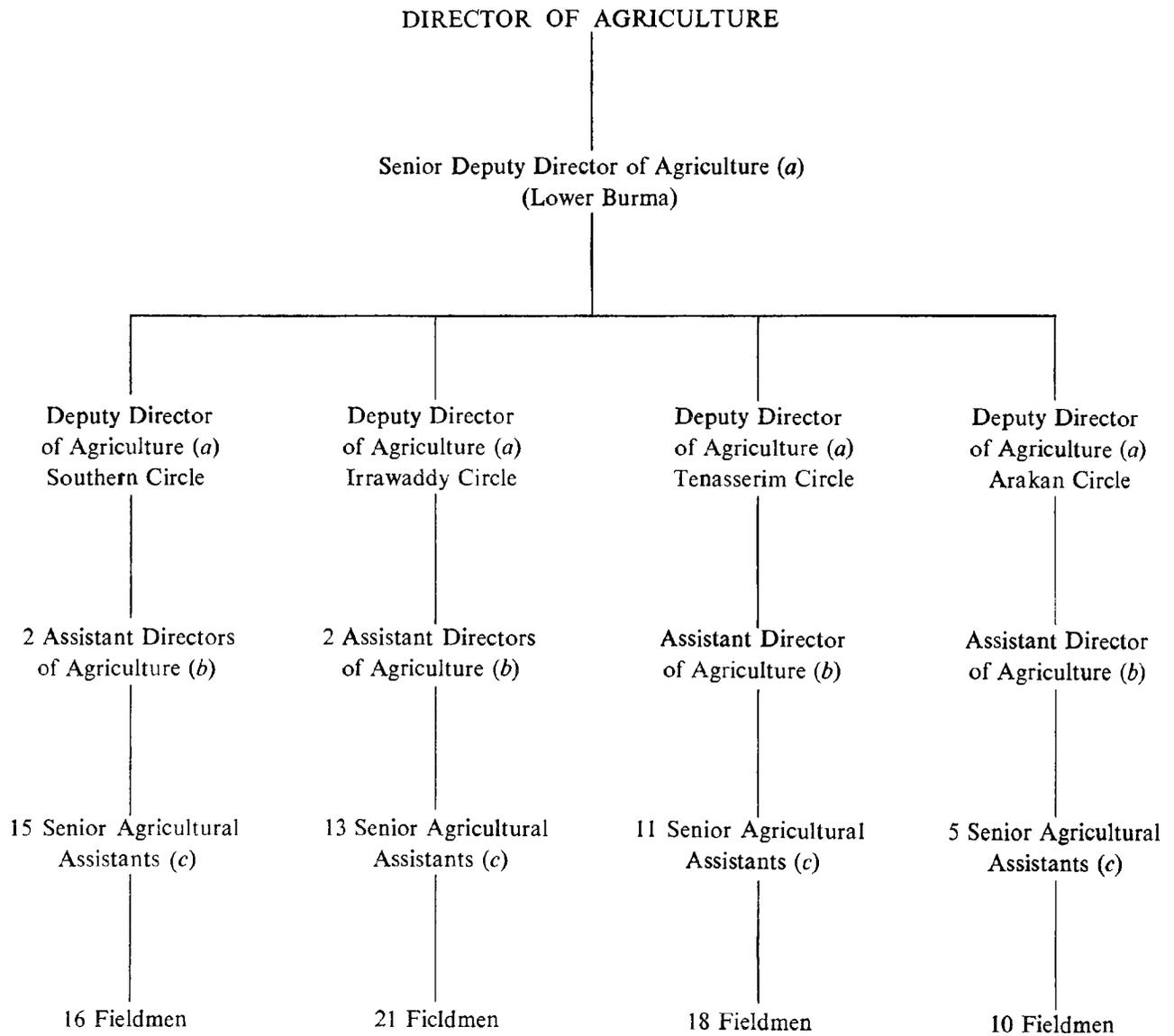
PRESENT ORGANIZATION OF THE AGRICULTURAL DEPARTMENT



PRESENT ORGANIZATION OF THE AGRICULTURAL DEPARTMENT



PRESENT ORGANIZATION OF THE AGRICULTURAL DEPARTMENT



attempted to spread its influence over too wide an area. It has therefore been unable to work closely enough with the cultivators to win their confidence. The average extension worker can spend only about 50% of his time in the field. Much of this time is spent in travel to and from villages. He is usually responsible for about 300 villages but normally can visit only about seven to eight a month. The result is that normally any one village does not see the extension worker more than two or three times a year and many do not see him at all. In a few areas where extension workers have been able to concentrate their efforts the results have been very good. Shangalay Kyun village near Mandalay offers an excellent example of what can be done. The introduction of Virginia tobacco by the Agriculture Department has raised incomes substantially and provided off-season employment to the villagers.

The field worker is further handicapped by the need not only to divide his time between research and extension but also to care for service activities and routine administrative details. In addition to his responsibilities in the extension field he is now responsible for distribution of seed, equipment and fertilizer, supervision of custom plowing, supervision of major and minor seed farms and maintenance of proper accounts for each of these activities. This does not leave him enough time for extension activities.

(2) Agriculture Department

An excellent plan for the expansion and reorganization of the Agriculture Department prepared in 1949 and subsequently modified is still under consideration. A report by the STEM Adviser on extension also gives detailed recommendations for expansion of extension which are in general consistent with the plan of the Agriculture Department (Plate 12). Immediate steps should be taken to implement this plan.

The plan for reorganization of the Agriculture Department calls for a village worker for every five village tracts, a supervisor for every five village workers, a township agricultural officer for each township and a district agricultural officer for each district. This will mean that present senior agricultural assistants will be filling district posts and that new graduates from Mandalay College will also be entering the service at that level. Present fieldmen will be taking jobs as supervisors or township officers. Graduates of the central farm schools, the agricultural training institute, and vocational high schools will be used to fill the remaining posts.

(3) Extension

Training in extension methods has been neglected in the past and should be instituted immediately. In-service training consisting of short training courses at

various district and circle conferences of extension workers can be started immediately. A manual of extension methods should be prepared for use as a practical guide for extension workers. Courses in extension methods should be provided at Mandalay College, the Agricultural Training Institute, and the Central Farm School.

b. Diversification of Research

The needs of agriculture in Burma are more critical in some directions than others. Research could contribute to the long-range satisfaction of these needs. Specific emphasis should be given to the introduction of new crops, improving seed other than paddy, an investigation of trace element deficiencies in soils, and the establishment of the necessary library and laboratory facilities.

(1) Agronomy

The soil and climatic conditions peculiar to Burma present a research challenge to introduce or develop suitable alternative crops for the delta regions. Successful alternative crops, whether producing agricultural commodities or green manure grazing benefits, would render the region much more productive. Increased production also would be of improved quality due to better soil management. Proposed pump irrigation of certain delta areas would permit production in the dry season. An intensification of present paddy monoculture would contribute to a decline in soil productivity with consequent problems. The introduction of suitable second crops that could withstand moderate salinity and grow on stiff clays typical of the Delta appears worthy of research consideration.

Second crops for paddy soils would permit programs of crop rotation. Research in crop rotations would naturally follow the introduction of second crops. Rotations involve using soil to produce crops that sometimes offer no direct return to the cultivator. In other instances it is impractical to utilize the grazing value of green manure legumes. The solution of one problem often creates several new ones as research leads progressively toward better soil utilization. The abundance of a forage crop grown essentially for soil improvement purposes would require research into the possibilities of livestock fattening during certain seasons and possibly the feeding of dairy stock. Conditions for livestock on the Delta are not ideal and research in that field would be necessary before an action program could be initiated. The introduction of new crops and varietal improvement of those now produced is a research problem that extends to all parts of the country. It is more critical in the Delta and, conversely, more applicable in the Dry Zone where growing conditions are less extreme.

PROPOSED EXPANSION OF

DIRECTOR OF

DIRECTOR OF

DEPUTY DIRECTOR OF

Lower Burma

<i>Divisions</i>	<i>Agronomy</i>	<i>Agriculture, Chemistry and Soils</i>	<i>Entomology</i>	<i>Plant Pathology</i>	<i>Animal Industry</i>	<i>Agricultural Engineering</i>	<i>Rural Economics</i>
Class I	Agronomist	Chemist	Entomologist	Plant Pathologist	Dairyman	Agricultural Engineer	Economist
Class II	3 Deputy Agronomists	1 Deputy Chemist	5 Deputy Entomologists	1 Deputy Pathologist	1 Deputy Dairyman	1 Deputy Agricultural Engineer	4 Deputy Economists
Class III	8 Assistant Agronomists	3 Assistant Chemists	10 Assistant Entomologists	2 Assistant Pathologists	3 Assistant Dairymen	1 Assistant Agricultural Engineer	8 Assistant Economists
Laborers or Clerks	16 Fieldmen	3 Fieldmen	9 Fieldmen	2 Fieldmen	6 Fieldmen	2 Mechanics 2 Assistant Mechanics 6 Artisans	8 Clerks

*This diagram shows only the personnel for research in agricultural engineering and entomology.

AGRICULTURAL RESEARCH*

AGRICULTURE

AGRICULTURAL RESEARCH

AGRICULTURAL RESEARCH

		<i>Upper Burma</i>						
<i>Fresh-water Fisheries</i>	<i>Library</i>	<i>Agronomy</i>	<i>Chemistry</i>	<i>Entomology</i>	<i>Plant Pathology</i>	<i>Agricultural Engineering</i>	<i>Library</i>	<i>Total</i>
Biologist		Agronomist						9
1 Deputy Biologist	1 Deputy Librarian	4 Deputy Agronomists	1 Deputy Chemist	1 Deputy Entomologist	1 Deputy Plant Pathologist	1 Deputy Agricultural Engineer	1 Deputy Librarian	27
1 Assistant Biologist		8 Assistant Agronomists	2 Assistant Chemists	4 Assistant Entomologists	1 Assistant Plant Pathologist	1 Assistant Agricultural Engineer		52
4 Fieldmen	1 Clerk	16 Fieldmen	3 Fieldmen	4 Fieldmen	1 Fieldman	2 Mechanics 2 Assistant Mechanics 6 Artisans	1 Clerk	94

The staff required for the custom work is shown separately under departmental setup.

The Shan State, parts of northern Burma, and the Yoma areas generally are characterized by Taungya agriculture. The custom of clearing forested slopes for a two- to four-year period of cultivation leaves these areas open to rapid soil erosion. Such hillside cultivation is traditional, and was probably originally motivated in part by the relatively lesser incidence of malaria in the hills as compared to the valleys. Taungya cultivation is destructive of soil beyond foreseeable repair or feasible reclamation. The volume and seriousness of the problem multiply with its extension. Research could provide a factual background for the problem and would possibly yield methods of hillside agriculture without soil erosion. The erosion of lesser slopes is a relatively minor problem and is probably related to the usual disregard of basic tenets of soil conservation such as contour cultivation, regulated grazing and others. The bund construction on soils producing paddy is ideally suited to the ends of soil conservation, and banded valleys are seen extending into rather steep slopes.

The methods of soil management are devoted presently to production under primitive conditions. Increased agricultural output will come from intensification of cultivation. Such intensification will result from the use of improved seed, fertilizer, mechanization and irrigation. The greatest benefits at lowest cost are those associated with advanced farming techniques. The major research emphasis therefore should be placed in favor of that type of agricultural development. Agronomically, the use of natural and chemical fertilizers, and the use of improved seed offer a wide field for investigation.

(a) **Introduction of new crops.** Among food and oil crops, it is believed that soy beans, safflower, and the castor plant merit special consideration. Soy beans have been planted in Burma without good results but should have further study. The castor plant is seen rather abundantly in the Dry Zone, growing wild. These two, and safflower, are capable of good yields of oil under satisfactory growing conditions in other parts of the world and should be well adapted to the climate in the Dry Zone of Burma. An intensive program of soy bean variety introduction would yield at least a more satisfactory soy bean than has been grown so far in Burma. Safflower is a heavy yielding oil plant, the refined products of which are used principally in the paint industry. Climatic conditions would seem to justify its trial introduction. The castor plant, a well-known medicinal, is finding a new market in the lubrication field. Research workers in Venezuela have developed a spineless or near spineless castor plant variety that maintains an ample yield of oil. The growing conditions in the Dry Zone appear to be favorable for production of this crop and it might be considered

for introduction in an area of ample labor supply for picking the beans.

The classification of soils for the Yamethin irrigation project revealed that large tracts of Grade III soils (see p. 181) extend over that portion of the project lying within the Dry Zone. Some of these soils, and probably many other areas of Burma, are believed to be suitable for sisal production. As a new fiber crop, sisal might yield products useful for cottage industries and, with a little care, make otherwise relatively unproductive land useful. Attempts to produce jute in Burma have not been very successful, but careful testing might indicate the way to better results and should precede any large-scale planting of jute. The close competition of jute with better rice lands, and the considerable hand labor that necessarily enters into jute production are deterrent factors.

The legumes currently produced in Burma are all food or cash crops. The variety is large, indicating that growing conditions are generally good for leguminous plants. The value of such legumes as kudzu, alfalfa, lespedeza and the clovers has never been fully exploited in Burmese agriculture. Such legumes are beneficial as soil improvement crops, particularly in consideration of the grazing benefit that is possible at the same time. It is believed that the introduction of leguminous crops, principally as soil improvement measures, should be given careful testing particularly in the dry zone area. The successful introduction of the legumes mentioned, or of any others serving the same purposes, would have a considerable influence in promoting a diversification of agriculture. Forage legumes, seeded in a mixture of pasture grasses, serve a dual purpose in providing excellent grazing and in improving the soil, largely through the activity of nitrogen-fixing bacteria parasitizing the roots of the host legumes. Legumes need not be confined to second-class or marginal soil, as the production potential of some, such as alfalfa, is sufficiently large to justify production on Grade I soil, under irrigation. The introduction of some legumes into Burma is restricted by conditions of climate, particularly those relating to the peculiarities of photoperiodism associated with temperate varieties of alfalfa, ladino clover, and others. Recent work in the development of leguminous forage and soil-improvement crops in Puerto Rico and elsewhere has yielded varieties of "tropical" alfalfa and kudzu that might be suitable for the climatic conditions of Burma.

The grazing requirements of Burma have never been large and, in the near absence of dairy and livestock industries, grazing management has not been forced into full utilization of unimproved grazing resources. The major problem occurs in the Dry Zone

where, in the dry season, insufficient forage is available and cattle must be fed. A future field of investigation might be the introduction of forage grasses both for range and pasture lands. Planted with legumes, forage grasses provide both grazing and green manure benefits on cultivated land.

(b) Improved seed other than paddy. The emphasis on seed improvement has always been given to paddy, almost to the exclusion of other crops. It is believed that many crops are deserving of attention for development of new varieties to fit the peculiar climatic conditions in Burma. Preference should be given to the improvement of those crops in which the country is trying to become self-sufficient. Principal among these are the oleaginous crops, sesame and groundnut. The several hundred varieties of sesame give an indication, by their abundance, of the almost infinite genetic variation that is characteristic of the plant. Outstanding work in the field of sesame varietal development has been carried out in Venezuela, the results of which have increased yields to an average of 600–800 pounds and more per acre. The very low yields of sesame in Burma, averaging around 117 pounds per acre, may be due to conditions not altogether related to seed variety. A deficiency of trace elements, discussed elsewhere, or cropping methods including water availability, could contribute to the general low yield. All factors that might depress yields require investigation, and careful attention should be given to seed improvement.

Groundnut improvement should begin only after a thorough program of introduction of exotic varieties is completed. Recent work in the United States has produced a new variety of groundnut that yields a hay crop instead of nuts. From Central America it is reported that a new variety has been developed that is practically resistant to leaf-spot fungus (*Cercospora spp.*). The most productive groundnut varieties are those of the Spanish type. They are characterized by having a bunch type growth which permits easy cultivation and harvesting, small nuts and a high oil content. Aside from possibly using a hay type groundnut as a pasture mixture, the principal goal in groundnut improvement should be in the oil production possibilities. Spanish varieties of groundnut are best able to provide the basic stock of genetic improvement for that crop.

(2) Entomology

The essential first field of research investigation in entomology should be classification of the indigenous insect population. Following the separation of insects into those destructive, those useful, and those that lie between the two extremes, studies should be made on insect pests most damaging in their activities. It is

believed that Burma suffers little from “invasion” type insect pests such as the locust, although cyclic variations in population norms could create serious problems of a local nature. The paddy crop has not suffered appreciably from insect depredations. Certain other crops have. Probably the most damaging insects in Burma are those attacking stored grain.

Chemical insect-control methods appear to be effective, within narrow limits, in all climates. The numerous nerve-killing compounds developed recently have revolutionized the methods of insect-control application and greatly increased their effect. Treatment costs have decreased considerably. The nature of the new insecticide compounds requires special distribution equipment, usually involving an appreciable investment. However, the equipment is designed for large-scale and low-cost operation. Indeed, the use of advanced chemical insect-control methods is predicated on modern farming practices for the most part. Research in chemical insect-control should be confined to studies of relative toxicity and effect of insecticides under a variety of treatment conditions. Continuing programs of residual insect-control should include studies of resistance development in certain destructive insects. It is believed that any large-scale program of insect control would fall upon the Government to implement. Accordingly, research should include an investigation into the type and variety of application equipment best suited to the needs of Burma.

The control of insects attacking stored grain and other farinaceous products is influenced by several factors. Basic among these is the manner in which grain is stored. Basha godowns or open deposits of bulk or sacked rice are difficult to treat for insect control. Granaries with grain stored in bulk are ideally suited for such treatment. Investigations into treatment methods should be conducted in cooperation with SAMB or other government handling and storage agencies.

(3) Plant Pathology

Infestations of fungus, virus, and other disease organisms are a problem of unknown dimensions in Burma. Paddy is not greatly affected by diseases other than smut. It appears that rust is a serious and perhaps a critical factor controlling the production and yield of wheat in some parts of the country. Research into disease problems should begin with a survey of indigenous disease organisms, concentration areas, and the principal crops attacked.

(4) Agricultural Chemistry and Soils

The near absence of soil information in Burma permits a wide field of activity in soil classification and

laboratory work. Unusual climatic and growing conditions in the Delta warrant investigation into the relationships of low pH, reduced soil leaching and reasonably high soil calcium levels. The introduction of new crops into the Delta would create a host of new problems in the management of delta soils, and research in soil chemistry would be essential in guiding the development of that program. Within the scope of agricultural chemistry, trace element deficiency investigations should be made on soils of restricted areas. It might be that large tracts of cultivated acreage are limited in their productivity by a deficiency of trace elements.

(a) Trace element investigations. The role of trace elements in crop nutrition is recognized as an important and sometimes a critical factor affecting agricultural production. In recent years attention has been given to marginal and submarginal lands with investigations aimed toward determining the availability of trace elements. Research work in subtropical areas of the world has indicated that otherwise productive land is practically worthless if one or more of the trace elements are absent or nearly so. Most of the research work has been done on boron, copper, cobalt, zinc, molybdenum and manganese. Very significant results have been forthcoming. In Australia the practical application of corrective measures is currently under way with dramatic success.

Trace elements are those that are usually present in soils, but not contributing major amounts of nutrient salts to growing crops. They are rarely deficient to such a degree as to preclude crop production altogether. Their very low concentration leads to extremely low yields that are considerably out of proportion to the trace element representation in the soil complex. Deficiency symptoms usually occur in the quality of produce before the yield is seriously reduced. Trace element deficiencies appear to be more detrimental in dicotyledonous plants.

A review of the agricultural literature of Burma reveals that an unknown "disease," variously known as shock head, green flowered sesamum, or chinbaung, affects the sesamum crop. The symptoms are poor terminal growth and incomplete differentiation of flower parts. These symptoms suggested a deficiency of one of the trace elements, probably boron.

Boron is usually derived from the decomposition of tourmaline. The form of boron available to plants is largely held in the organic fraction of the soil. If the organic matter of soil is low, a consequent reduction of available boron can be expected. Soil pH values exceeding eight have the tendency to render boron unavailable due to a chemical change that occurs in the soil. Boron concentrations of less than one part per million are considered deficient. The application

of very small quantities of sodium borate (Borax), a water-soluble form of boron, on soils containing one part per million or less of boron may have very significant results. However, in excess of 100 ppm, boron may have a depressing effect on agricultural production. Superabundant applications of boron are soil sterilizing in nature, and are often used commercially for that purpose.

Soils in the Yamethin and Pyinmana sub-divisions of Yamethin District have been tested for boron. The results of these tests indicate that boron is generally deficient in the area tested. It is possible that the deficiency is so acute as to be seriously affecting some crops. It is suggested that the malformation characteristics of sesamum are related to boron deficiency. Research can determine what corrective measures are necessary, and whether the deficiency extends to trace elements other than boron.

Investigational work in determining the extent of trace element deficiencies should be restricted to those areas that are suspected of such deficiencies. The conditions conducive to trace element deficiencies are varied, and occur in isolated areas or spread over large tracts of land. Field testing for determining the degree of deficiency and for recommending corrective measures should be closely coordinated with laboratory work.

(b) Establishment of soil analysis laboratory. In line with the determination of trace-element deficiencies, the establishment of a soil analysis laboratory is essential. The planned program of irrigation project construction is necessarily closely tied to land classification. Proper land classification requires laboratory work and, for large-scale programs, a well-equipped soil analysis laboratory is essential. Field kit equipment is very useful and it is believed that all agricultural experiment stations and other field offices should be supplied with equipment of that type.

(5) Animal Industry

This field has not been developed in Burma and no organized livestock production program is functioning. As a new field, investigations should start at the grass roots with a survey and classification of the natural resources that would support such an industry. Those areas apparently best suited to livestock production by reason of climate or potentially abundant feed, namely the Shan States and the Delta, should be investigated first. The survey should cover indigenous and exotic forage plant populations, density and palatability studies. Available supplies for use as supplementary feed, and animal requirements for mineral nutrition in areas of suspected deficiency should be investigated. A cursory survey of livestock pests and diseases prevalent among draft animals

might aid the selection of suitable breeds for introduction into the areas concerned. Some breeds of livestock, particularly the typical temperate types of beef and dairy stock, are unable to withstand the high humidity and temperature conditions of the Delta. A common disease, for example, is tuberculosis. Introduction of livestock breeds must necessarily precede attempts to improve them. It is believed that a long-range research program should be started as soon as practicable in order to have a suitable range of livestock breeds available when those areas of agricultural development in the Delta enter the operational stage. After research determines the feasibility of economic livestock production, plans should be laid for investigating the possibilities of processing dairy and other products of the animal industry.

(6) Agricultural Engineering

Burma does not have a single modern farm. Unusual conditions of soil and climate have discouraged the introduction of mechanical farm equipment. The most productive section of the country is the most difficult to convert to mechanized farming owing to the high rainfall, heavy soils, and the like. Dry plowing alone has largely failed. The causes for failure have been due in part to unsuitability of equipment and partially to poor management and lack of research. Mechanized farming, under conditions quite different from those for which most farm equipment was designed, cannot be expected to function efficiently in the hands of untrained personnel. Unsuccessful attempts to use farm machinery in Burma have strengthened the belief of many agriculturists that mechanical equipment is not suitable for this area. In fact, much of agricultural Burma is ideally suited to modern mechanized farming and it is a responsibility of research to investigate and modify farm equipment to that end.

Agricultural engineering should develop methods of farming that are compatible with the use of mechanical equipment. Such problems as folding green manure crops into heavy clays, mechanically harvesting the various paddy-variety crops, the adaptation of grain separators to handle a wide variety of crops, and the seeding of paddy using mechanical equipment, offer challenges to research. By determining power and equipment types best suited to farming conditions it would be possible for research to recommend farm unit sizes best adapted to economic utilization using modern equipment.

(7) Agricultural Library

A research program is strongly dependent upon an agricultural library. The collection of all agricultural literature relating to Burma could be assembled into a

central library and serve as a nucleus around which a research library could be built. Agricultural research in every part of the world is now many years ahead of practice. However, it does not necessarily follow that every evolutionary step must be taken in solving an agricultural problem. It is often possible to make immediate application of the latest research results. To be aware of the direction and extent of world-wide agricultural research, and to avoid duplicating work already done, it is considered of importance to establish and maintain an active library research center.

c. Extension

The organization of the present extension service is shown on Plates 11, 11A, 11B and 11C, and that of the proposed revision on Plate 12. The proposed organization is an ultimate target to be reached by gradual stages. The cost of the proposed program is given in Table VIII-15.

TABLE VIII - 15
REORGANIZATION OF THE AGRICULTURE DEPARTMENT

	Present Staff		Proposed Staff	
	Number	Cost (kyats)	Number	Cost (kyats)
Senior Administrative Post	1	19,200	1	19,200
Other Administrative Posts	—	—	5	76,000
Selection Grade	14	1,68,000	19	2,28,000
Senior Branch	18	1,14,480	78	4,96,080
Junior Branch	98	4,11,600	366	15,24,600
Inspectors	—	—	483	10,72,260
Fieldmen	126	1,91,646	2,759	41,96,439
Clerical and Peon	185	2,83,578	1,132	18,14,056
		11,88,444		94,28,635
Overhead Costs		10,00,000		1,00,00,000
Cost of Materials		10,00,000		1,00,00,000
Total Cost		31,88,444		2,94,28,635

(1) Fields of Coverage

Burmese agriculture may remain primitive over most of its cultivated acreage for several decades. Efforts to extend agricultural knowledge leading toward the introduction of improved practices should be devoted to primitive agriculture in proportion to its contribution to national welfare. It appears that lack of knowledge about credit, taxes, standards of quality and marketing are as detrimental to the interests of the farmer as the manner in which he farms. Basic information on soils, crops and farming methods will serve to increase production. The dissemination of information on the care and management of livestock will help to reduce animal losses. An

understanding of the services that Agricultural Extension offers will encourage a more active interest among farmers for soliciting advice or technical service, particularly if such service is free of cost. An important field of potential development is that of youth group organization. The present generation of farmers is not likely to change agricultural methods appreciably, regardless of the propaganda to which it is subjected. Long-range extension work will be more effective if efforts are concentrated on youth training.

A program for establishing youth training groups would depend upon local extension officers to implement. The plan is simple. Young members of the farm community are joined into one or more groups, each with a distinctive name. The group is organized into officials and members. Regular meetings are held and agricultural discussions are conducted by the extension officer or other qualified person. Members are encouraged to select farm projects which will be planned by them, with competent help, and executed by them. These projects may cover any one of a number of activities such as hog raising, egg production, vegetable growing, sewing and cooking. The spirit of competition is introduced between members of a single group and between various groups. Accurate project records are kept and periodic reports are given to the group. Youthful expression of sincere enthusiasm for different and better methods of increasing farm production might generate some interest in the agriculturist father. A demonstration of improved production on a peasant farm might serve to encourage the spread of that scope, with the inherent obligation on the part of the participant to do all work associated with his project. The contribution of personal effort toward succeeding, and the spirit of competition, generate the type of youth interest that is conducive to learning. Even though the value of new and better methods is not fully appreciated and adopted by the parent agriculturist, some beneficial effect should be registered.

(2) Means of Implementation

There is a natural resistance by agriculturists to changes in agricultural methods that depart from the traditional customs. Spoken or written propaganda is usually ineffectual with uneducated farmers. It is believed that demonstration is a much more effective means of persuading farmers to adopt new practices for increasing their production. The average farmer is not prepared to travel far or to allow much time to observe demonstrations related to farming. It is necessary, therefore, that small-scale demonstrations be arranged for execution in villages. Such demonstrations are relatively costly, but it is believed that they are more effective per unit of money invested

than lectures or pamphlets. Demonstrations should be made not only for educational purposes but to improve practices in common use. The quality of demonstration work is given the test in the field and the farmers observing it will be harsh judges of poor work. At the demonstration level, errors cannot be made without jeopardizing the whole fabric of the extension system. The average farmer believes only what he sees and an effective demonstration is more likely to convince him than any other means of extension. The initial problem of demonstration extension is to generate sufficient interest among local farmers to attend and observe what is to be done. Their attitude can be expected to be critical from the outset because the practice demonstrated is new. The results of demonstrated practices are usually not readily apparent and many require a waiting period as long as a crop season to become significant. All of the qualifications and explained advantages are forgotten by the farmer with the lapse of time, while the disadvantages that the new practice entails are not. Among the many, however, there are usually a few that profit from the demonstration. Those few farmers are, in fact, the core of people that will unconsciously carry the burden of disseminating agricultural knowledge. The extension officer serves only as a catalytic agent. The following list is suggestive of the wide variety of extension practices that can be demonstrated :

- Farm Supplements and Their Use
- The Storage and Use of Manure
- The Use of Chemical Fertilizer
- Improved Seed, its Storage, Collection and Use
- How to Construct a Granary
- Care and Feeding of Animals
- The Use of Lime
- Irrigation Techniques
- Identifying Animal Diseases
- Methods of Controlling Insects Attacking Oxen
- Farm First Aid
- Simple Methods of Laying out Bunds
- Contour and Strip Farming
- How to Treat Seed for Better Germination
- Improved Seeding Methods
- Improved Cultivation Methods
- Improved Harvesting Methods
- Farm By-products as Livestock Feed.

The use of propaganda as a means of agricultural extension increases its effectiveness if it is presented as entertainment. Roving teams that travel from village to village showing color and sound films demonstrating desirable practices cost relatively little and are likely to have some effect. The average small village is without a cinema, and an opportunity to attend a free show that does not interfere with the daily work

might appeal to many farmers. Follow-up work by the local extension agent would further aid the introduction of improved farm practices.

After demonstration and training film means are partially accepted by agriculturists, the distribution of simple pamphlets might have some beneficial effect. Later a bimonthly or quarterly agricultural publication might be useful, at least for distribution to extension agents.

Probably the most effective extension of agricultural methods is the efficient operation of a demonstration farm. All the demonstrations of farming are on display every day and all phases of farming are capable of observation. Modern farming would employ few of the simple improvement practices recommended for primitive agriculture. The nature of its revolutionary approach to agricultural production would require that modern farming be explained and demonstrated. Organized tours for the purpose of inspecting demonstration farms would acquaint farmers with possibilities of increasing production.

d. Utilization of Aerial Photographs

The agricultural use of aerial photographs is potentially very great. The size of presently unknown land areas topographically suitable for cultivation, natural boundaries, erosion conditions, drainage basins and possible communication routes can be rapidly determined with a high degree of accuracy. Aerial photographs are an aid to land classification by delineating soil type boundaries of the vegetative cover. They are useful on large areas as well as on tracts as small as 100 acres. Aerial photographs are particularly effective in determining drainage areas, and the characteristics of topography at dam sites and along canal lines. Contour maps can be constructed from stereoscopic analysis of aerial photographs, with a degree of accuracy consistent with ordinary plane table surveys.

Administration of the land subsidy program could be facilitated by using aerial photographs for acreage determinations. In the event that land restoration subsidies become differential payments dependent upon the density and other characteristics of the vegetative cover, aerial photographs would serve as authority for determining into which class of subsidy payment any plot of land would fall.

e. Land Classification

Within the framework of long-range agricultural research, land classification should be given consideration. The objective of such a program would be to classify land according to its basic resources and present conditions with the purpose of directing its

use toward obtaining the maximum benefit consistent with economy while managing it as a renewable but destructible resource. Such a land classification would designate areas according to their major suitability for cultivation, watersheds, forest, grazing, wild life or recreation purposes. A land classification recommending general land use should be nation-wide in scope and could form a basis for future legislation dealing with proper land use.

Land classification on a smaller scale is specific in its recommendations and is based upon many local factors that affect the growth of crops. Such land classification is justified principally for irrigated soils, and for new areas that have never been cultivated.

Nation-wide land classification on a reconnaissance scale and more detailed technical classification of highly productive soils merits careful consideration as a relatively low cost means of assessing the agricultural resources of the nation and of indicating the best methods for utilizing agricultural soils. The succeeding paragraphs are a condensed presentation of applicable principles and practices of land classification.

(1) **General procedure.** The normal procedure in soil classification begins with a field reconnaissance of the area to be classified. Aerial photographs or other available reference maps are marked to identify outstanding land features or characteristics that have a bearing upon classification. A general classification of soils is sketched on the map to show gross differences of soil types, distinctions in topography, drainage characteristics, widely varied natural vegetation, and other factors bearing upon classification. The locations of sites for taking soil samples are tentatively selected. Occasional pits are opened for examination of the surface and subsoil layers. Simple field tests are often made for the determination of pH, relative calcium concentration, or other basic soil conditions.

Data accumulated in the field survey are organized and assembled systematically. The geology of the area is determined. A topographic map with a contour interval of five feet or less is obtained, usually from aerial photographs. If the area to be classified is virgin land, the character and diversity of cover is determined. All data are assembled into a rough soil map from which site selections are made for collecting soil samples.

(2) **Sampling.** Land classification appraisers enter the field equipped to perform the tests outlined in succeeding paragraphs. The equipment should include such items as base maps, plane table, compass, hand level, shovels, soil augers, sample containers, electrolytic bridge and accessory utensils, and soil reaction (pH) test kit. Aerial photographs provide the best possible base maps. Soil samples are taken at intervals that are determined by the complexity of the soil types over the area concerned. Usually a sample is taken from every 100 to 300 acres. The degree of

accuracy required for classification may influence the number of samples taken. A soil auger of three- or four-inch diameter is used to take samples. The upper few inches of soil are removed in order to gather samples of mineral soil free of surface detritus. At one-foot or eighteen-inch intervals a three- or four-pound soil sample is collected to a depth of five or more feet. The samples are placed in canvas bags and marked for identification.

(3) **Analyses.** In the laboratory, soil samples are tested for chemical and physical characteristics. Determinations of the quantities of total nitrogen, available phosphoric acid, and available potash are expressed in pounds per acre. The per cent of soil organic matter is measured. The soil pH, indicating the hydrogen ion concentration of the soil, is determined and numerically expressed. A pH value of 7.0 is neutral. Values less than seven are acidic in reaction while those exceeding seven are alkaline. A difference of 1.0 in pH values indicates a soil reaction difference ten times greater. Thus, a soil pH of 4.5 is ten times more acid than one of 5.5, and 100 times more acid than pH 6.5. Other chemical tests measure the presence of toxic concentrations of sodium in its water-soluble and exchangeable forms, and of calcium carbonate and chlorine. The total concentration of salts is determined by an electric conductivity test. In addition, the base exchange capacity of the soil is measured. There are further chemical tests that may be helpful in soil classification. Those include trace element and minor element determinations, principal among them being boron, copper, cobalt, zinc, molybdenum, iron and manganese.

The physical analysis determines textural and water-relation characteristics of soil. Texturally the soil is graded into particle sizes. Particles having a diameter exceeding 2.0 mm are considered as gravel; from 2.0 mm to 0.2 mm coarse sand; from 0.2 mm to 0.02 mm fine sand; from 0.02 mm to 0.002 mm silt; and particles smaller than 0.002 mm as clay. After determining the per cent representation of sand, silt and clay, a textural class is assigned the sample. Variations in textural class range from sand composed of coarse particles to clay composed of extremely fine particles. It is generally considered that sandy loam, loam, and silty loam constitute the best textural classes. Loams with a preponderance of sand, silt or clay are next in order of textural quality, decreasing in desirability as the major fractions become finer. As extreme conditions are approached soil textural quality is lowered proportionally as sand or clay increase greatly in quantity.

The classification of soils to be irrigated requires the determination of soil moisture equivalent which is approximately the amount of water required to saturate a soil from an air dry condition. Usable water capacity measurements are taken to ascertain the mm of water per meter that a soil can hold and use.

(4) **Classification.** The field and laboratory data are assembled into several broad characteristics relating to soil classification. These are sometimes separated into four groups, namely soil profile characteristics, those of surface soil texture, slope and other conditions. The soil profile considers the kind of parent rock material from which the

soil has been derived, as well as its age and degree of weathering. Note is made of whether the soil is of primary formation or whether it has been laid down as a secondary deposit. The permeability of both surface and subsoil layers is considered, particularly for soils to be irrigated. These characteristics are given numerical ratings decreasing from an optimum condition of 100 to those of 50 or less according to their degree of unsuitability. The average of ratings is then taken as a numerical rating of soil profile characteristics. Surface texture is an important factor in classification and relative values are given to each of the textural classes. In areas to be irrigated, slope is a major consideration with such variations as uniformity, undulation and degree being taken into account.

All other characteristics of the soil are grouped into the last soil characteristic contributing to classification. These factors are generally normal or nearly so. However, any one of them could be a limiting factor or one that by its unfavorable condition could render an area unsuitable for cultivation in its tested condition. The general soil nutrient level is one of these. Particular emphasis is given to total nitrogen, available phosphorus, and available potash quantities, for these are the principal nutrients that are drawn upon heavily by growing plants. The soil pH can be a critical factor. Values under pH 5.5 create conditions conducive to a chemical change in the soil complex that renders certain nutrients unavailable to plants. Phosphorus and magnesium are particularly affected, as are several of the secondary and trace elements. The soil reaction is usually slightly acidic and reactions even of extreme acidity are commonly corrected by lime application. Very high pH values are more difficult to lower. Soil reactions approaching either extreme of the pH scale largely determine crop types that will satisfactorily grow, for every plant has optimum conditions of pH and tolerance limits that are often rather narrow. Soil pH values between six and seven are favorable for most cultivated crops.

The classification of soils to be irrigated takes into account the calcium-magnesium balance in the soil complex, as well as a careful consideration of the total salt concentration of the soil. Sodium salts are given special attention. A consideration of soil drainage is intimately associated with those characteristics. Present erosion and soil erodability are considered, together with characteristics of microrelief. There are other factors peculiar to any particular area that could figure heavily in classification, an example being a serious deficiency of one or more of the trace elements.

The group ratings of each of the broad soil characteristics are then assembled and a final classification is obtained for every soil sample analyzed. Arbitrary values are established for soil grades depending on the degree of intensity desirable in classification and the number of soil grades to be used. The usual soil grade numbers lie between five and eight.

After the classified soil sample locations have been plotted on tracing paper, that information is superimposed on aerial photographs. Soil grade limits are usually easily traced directly from aerial photographs and

classified soil sample information. A soil map should show soil sample locations, rivers, cities, canals and other land features of interest.

(5) Classification standards for irrigated land. Five soil grades have been established to fit the needs of agricultural land classification in Burma with due consideration given to the requirements of paddy production. The first three grades are progressively less arable, the fourth is a special or temporary classification. The fifth is a definitely non-arable grade. For irrigated lands or lands to be considered for irrigation, the following classifications are suggested:

Grade I – Arable

Highly suitable for irrigation farming, capable of producing sustained high yields of climatically adapted crops at reasonable cost; smooth lying with gentle slopes; soils deep and of heavy to fairly fine texture; good water-holding capacity; free from accumulations of soluble salts; soil and topographic conditions such that no specific drainage requirements anticipated in the near future, no erosion expected from irrigation, and land development relatively easy.

Grade II – Arable

Moderately suitable for irrigation farming; measurably lower than Grade I in productive capacity; may have lower water-holding capacity, as indicated by light texture or limited soil depth; may require large quantities of irrigation water as indicated by a coarse-textured subsoil. Topographic limitations may include uneven surface requiring moderate costs for leveling. Woody vegetation may have to be removed from the surface. Any one or a combination of these limitations may be sufficient to reduce lands from Grade I to Grade II.

Grade III – Arable

Suitability for irrigation restricted because of more extreme deficiencies in the soil or topographic characteristics as described for Grade II lands. May be more expensive to prepare for irrigation or more costly to farm. May be moderately saline. Adverse potential drainage conditions, correctable at a reasonable cost, may be anticipated. May have good topography, but with inferior soils have restricted crop adaptability; require larger amounts of irrigation water or special irrigation practices, and demand greater fertilization or more intensive soil improvement practices.

Grade IV – Arable

Suitability for irrigation distinctly restricted because of one or more extreme deficiencies in the soil, topographic or drainage characteristics. Soil texture may be very light, restricting the variety of adaptable crops, requiring large amounts of irrigation water or special irrigation practices. May have very uneven topography or restricted drainage, susceptible of correction but at high cost. Included in

arable land, but in the irrigable area only after careful consideration or under conditions of an ample water supply.

Grade V – Non-Arable

Steep, rough, broken, or badly eroded; soils of extremely coarse or extremely heavy texture, or shallow soils over gravel, shale, sandstone or hardpan; inadequate drainage and high concentrations of soluble salts.

(6) Specifications for land classification surveys and tests. The accompanying Tables VIII-16 and VIII-17 present typical descriptive specifications for land classification surveys and tests. More detailed specifications and a description of typical soil tests and the laboratory equipment required to make them have been prepared by the Agricultural Section of the Technical Cooperation Administration in Burma.

TABLE VIII – 16
LAND CLASSIFICATION SURVEY REQUIREMENTS

	<i>Reconnaissance</i>	<i>Semi-detailed</i>	<i>Detailed</i>
Land classes recognized	1-3-5	1-3-5	1-2-3-4-5
Scale of base maps	1 : 24,000	1 : 12,000	1 $\frac{1}{2}$: 4,800
Accuracy—per cent	75	90	97
Maximum distances between traverse—miles	1	.5	.25
Field progress per man-day—square miles	3-5	1-3	.25
Minimum area of Class 5 to be segregated from larger arable areas—acres	4	.5	.1
Minimum area for change to lower class of arable land—acres	40	10	2
Minimum area for change to higher class of arable land—acres*	40	20	10
Soil and sub-strata examination.† Boring or pits (5 ft. deep) for profile analyses, total salt and pH determinations per square mile	1	4	16
Deep holes (about 15 ft.) for full profile analyses; and permeability studies, mechanical analyses, moisture determinations and chemical analyses of the soluble salts of the soil layer—per 50 sq. miles	0	1	2

*In addition to size, the tracts must be of such shape and so located as to permit their being farmed as fields.

†The depths indicated are minimum unless impervious material or permanent water table are encountered at shallower depths. The number of examinations and analyses should be increased as necessary to meet specific objectives or with the complexity of the area. Full use should be made also of road cuts, stream banks, and similar exposures.

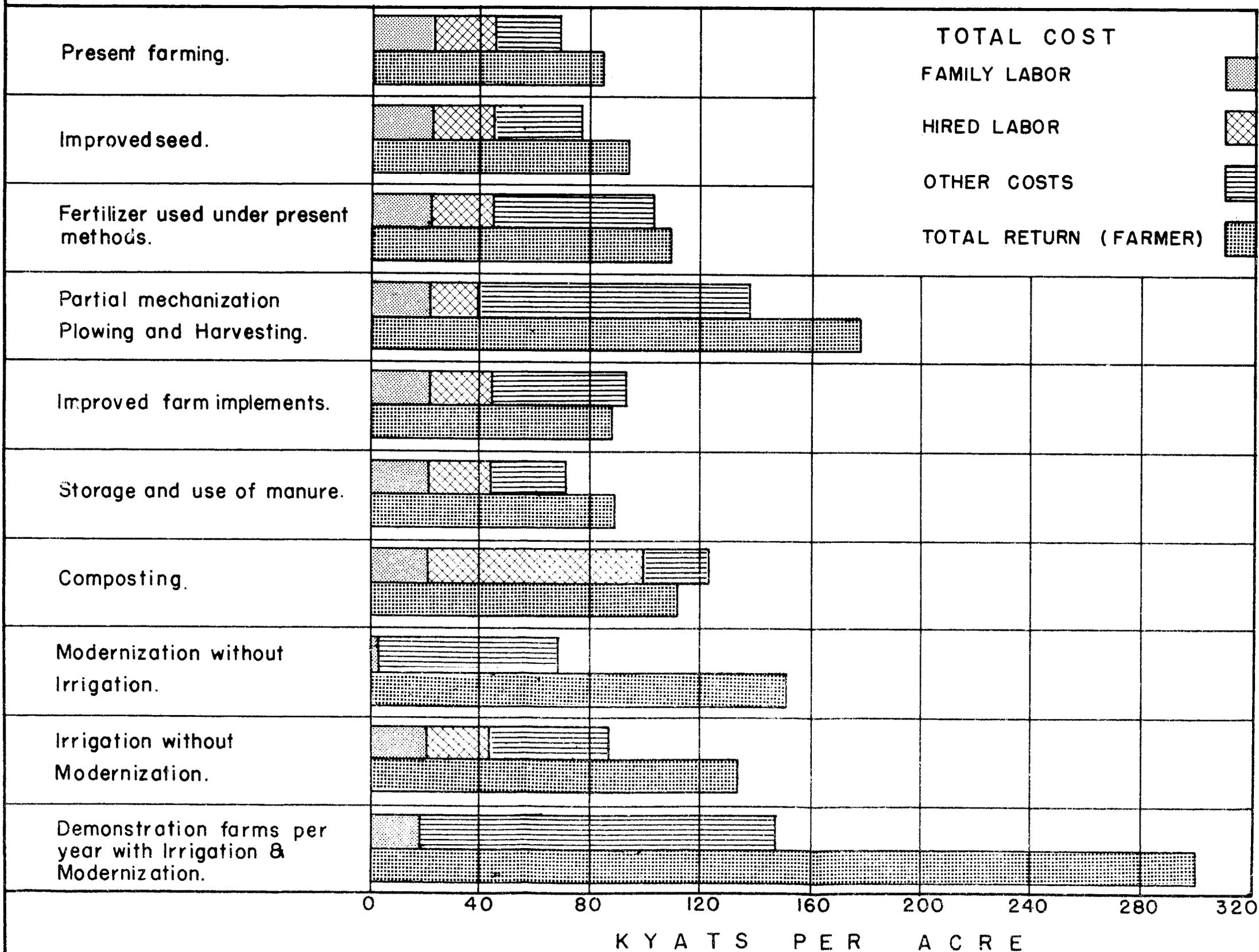
TABLE VIII - 17
TYPICAL SOIL TESTS

<i>Properties</i>	<i>Inspection</i>	<i>Field Laboratory</i>	<i>Complete Laboratory</i>	<i>Experimental Plot</i>
Texture	Observation and "feel" of coarseness, particle size, consistence.	Mechanical analysis of particle size and size distribution by sieve and hydrometer methods.	Mechanical analysis of particle size and size distribution by sieve, hydrometer, and pipette methods.	
Structure	Observation of root penetration, vegetation, porosity; shape, pattern, and arrangement of particles as criteria of aggregation and porosity.	Volumetric—weight determination of pore size, porosity, pore size distribution. Mechanical analysis of aggregate size, size distribution, aggregation by settling volume procedure. Permeameter measurements of permeability on disturbed and undisturbed samples.	Volumetric—weight determination of pore size, porosity, pore size distribution. Mechanical analysis of aggregate size, size distribution, aggregation by settling volume procedure. Permeameter measurements of permeability on disturbed and undisturbed samples.	
Moisture	Field capacity and permeability estimated by correlations with texture and structure.	Field capacity and permeability from correlations with laboratory determinations of texture. Field capacity and wilting percentage determined by moisture content and moisture tension methods. Permeameter measurements of permeability on disturbed and undisturbed samples.	Field capacity and permeability from correlations with laboratory determinations of texture. Field capacity and wilting percentage determined by moisture content and moisture tension methods. Permeameter measurements of permeability on disturbed and undisturbed samples. Field capacity determined by moisture equivalent centrifuge. Permanent wilting percentage determined by test plant growth.	Field capacity determined by irrigation and sampling for moisture content. Available moisture capacity determined by tensiometer or electrical conductivity in the field plot. Direct tests of infiltration rate. Permeability determined by test holes and shallow wells. Drainage requirement tests.
Chemical	Observations of vegetation and of visible insoluble carbonates and soluble salts.	Salinity determined by wheatstone or conductivity bridge or from conductivity of saturated soil extracts. pH values determined by colorimetric or electrometric methods. Insoluble carbonates determined by dilute acid or acid titration. Gypsum determined by conductivity of acetone extracts. Sodium estimated from pH on dilution.	Soluble and insoluble constituents identified and concentrations determined. Exchange capacity and type of clay mineral. Soluble and exchangeable sodium determined by flame photometer or gravimetric methods. pH of soil suspension determined at CO ₂ equilibrium. Fertility and organic matter.	Field tests of amendments for saline—alkali conditions. Physical and chemical effects of water on soil in place. (Note: Experimental plot also used for other studies such as land leveling and effective precipitation.)

AGRICULTURAL METHOD

PRACTICE

COST AND BENEFIT ANALYSIS



f. Implementation Plan

It is considered essential that effective research, if limited by insufficient funds, should be restricted in its area coverage and complete in its intensity of application. Extension is difficult to effect under ideal conditions. A thinly scattered program that is largely concerned with administrative detail is not effective and probably does not pay to maintain. It is believed that extension should be carried out to the tract level and that most support and emphasis should be given to local extension agents. A reasonably reliable and low cost system of evaluating the effect of the extension program should be established in order to determine its economic feasibility and to direct the program toward those means that are most effective.

A program that would be effective from the outset, a basic qualification, must be modest at the start. Consequently it would be restricted to a limited area. It is believed that the areas most deserving of initial attention are those lying within the proposed irrigation projects. After an effective extension program is functioning in those areas, it could be expanded to other areas of high productive potential and to new areas of undeveloped land resources. Finally such a program could extend itself to all cultivated acreage, expanding only as fast as its effect is economically justified.

5. RESTORATION OF PREWAR ACREAGE

Approximately two million acres of formerly cultivated land are now out of cultivation because of insurgency. It has been found that the re-establishment of government control over these areas is followed by a rapid restoration of cultivation. It is the policy of Government to assist this return to cultivation, and subsidy payments are made to cultivators returning to the land. It appears that no other incentive is necessary to restore formerly cultivated land into productive use, and the problem therefore resolves itself to one of establishing government control over the areas concerned.

6. ANALYSIS OF RELATIVE BENEFITS

Each method employed for increasing agricultural production differs in cost, division of cost between labor and cash expenditure, manner of application and results. The methods for increasing production discussed previously have been cost analyzed and the results detailed in Table VIII-18 (*see next page*) shown graphically in Plate 13. Costs are arranged under major headings such as labor, animals and implements. They have been taken from Table VIII-9 or qualified by footnote reference to other sources. Anticipated returns appear under the specific reason for increased production. In both instances values are expressed in kyats per acre.

The costs of present farming are grouped under labor, animal and implement, and other costs. They reflect both farm and government costs. The values of the costs have been derived by considering the production costs of the major agricultural crops grown in Burma, and weighting them according to their relative representation. The average cultivation cost of the average crop grown amounts to K67.70 per acre. The average total return to the farmer has been similarly calculated, based on 1953 prices at the farm level, and found to be K83.60 per acre. The difference, K15.90 per acre, is the calculated average profit to the farmer. Average present cultivation costs and returns form the foundation of the analysis presented in Table VIII-18.

a. Improved Seed

Under present cultivation methods, the use of improved seed, chemical fertilizer, partial mechanization, improved farm implements, the use of manure, and composting are analyzed. Improved seed is calculated to cost the Government approximately K8 per acre to produce and distribute to issue stations where farmers can obtain it. The cost includes production at standard paddy production costs, plus the cost of transportation and handling. In this instance the average hauling distance was arbitrarily estimated to be from Rangoon to Toungoo. (In addition, consideration was given to the income loss that Government suffers by producing improved seed instead of exporting the production of paddy from the same acreage.) The cost of using improved seed is entirely government borne. The average 10% yield increase is calculated, at present prices, to be worth K8.85 per acre if exported. The total benefit to Government (as distinguished from the farmer) of using improved seed is therefore less than one kyat per acre.

b. Chemical Fertilizer

Chemical fertilizer application is calculated to increase the cost of farming by K33.70 per acre. With a 30% increase in yield, the total average return is K25.08 per acre. Within the present price structure the use of fertilizer is unprofitable for the farmer. The world market price for rice is several times higher than the controlled paddy price within Burma. By controlling the price of paddy, all other agricultural production is automatically controlled relative to paddy. At the farm level, a 30% increase in yield of any crop including paddy is worth less than the cost of fertilizer to produce it if sold at controlled prices. However, if paddy were sold at world market prices, the use of fertilizer would be very profitable. Table VIII-19 (*see p. 186*) indicates the per-acre profit-taking position of farmer and Government in paddy production.

TABLE
 AGRICULTURAL METHOD COST AND
 (Based on

Practice	Costs to Implement									
	Labor	Animals and Implements	Production	Transportation	Distribution	Purchase	Machinery	Construction	Misc. Costs	Total Costs
Present Farming	43.00	20.80	—	—	—	—	—	—	3.90	67.70 ^a
Improved Seed	—	—	8.00 ^b	—	—	—	—	—	—	75.70
Fertilizer Use under Present Methods(^d)	0.50	—	—	1.50	1.50 ^e	30.20 ^f	—	—	—	101.40
Partial Mechanization, Plowing and Harvesting(^h)	10.78	—	—	—	—	—	19.56	—	—	136.34 ⁱ
Improved Farm Implements	0.25	24.60	—	—	—	—	—	—	—	92.55
Storage and Use of Manure	—	—	—	—	—	—	—	3.16	—	70.86
Composting	55.60	—	—	—	—	—	—	—	—	123.30
Modernization(^j)	2.83	—	—	—	—	—	27.80	—	36.30	66.93
Irrigation	—	—	—	—	—	—	—	19.50	—	87.20
Demonstration Farms Yr.(^r)	18.40	—	—	—	—	—	64.54	11.08	53.78	147.80

^a Weighted nationwide average production = 0.464 tons per acre; weighted value K83.60 per acre; weighted present cultivation cost K67.70 per acre; average net income = K15.90 per acre (Sanders and Table VIII-9).

^b Government cost to produce and deliver improved seed.

^c Government income by use of improved seed.

^d Based on 100 pounds per acre from Rangoon to Toungoo (considered as an average shipping distance).

^e Estimated 100% of freight cost, storage, handling and local transportation.

^f Based on 10% of 17-45 and 90% of 20-20 chemical fertilizer.

^g See separate report analysis.

^h If irrigated and double cropped.

ⁱ Cost equal to present farming methods except soil preparation and harvesting operation.

VIII - 18

BENEFIT ANALYSIS IN KYATS PER ACRE
1953 prices)

Practice	Expected Returns by Increased Production															
	Soil Pre- para- tion	Ferti- lizer and Place- ment	Seed- ing	Insect Con- trol	Har- vesting	Culti- vation	Farm- ing Bunds	Green Man- uring	Crop Rota- tion	Graz- ing	Fal- low	Aban- doned	Double Crop- ping	Gen- eral	New Acre- age	Total Re- turn
Present Farming	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	83.60
Improved Seed	—	—	—	—	—	—	—	—	—	—	—	—	—	8.85 ^c	—	92.45
Fertilizer Use under Present Methods	—	25.08	—	—	—	—	—	—	—	—	—	—	—	—	—	108.68 ^g
Partial Mechanization Plowing and Harvesting	8.36	—	—	—	1.68	—	—	—	—	—	—	—	83.60 ^h	—	—	177.24
Improved Farm Implements	4.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	87.78
Storage and Use of Manure	—	4.55	—	—	—	—	—	—	—	—	—	—	—	—	—	88.15
Composting	—	—	—	—	—	—	—	—	—	—	—	—	—	27.90	—	111.50
Modernization	4.18	25.10	8.36	6.69	2.51	6.69	8.36 ^k	1.50 ^l	1.50 ^l	1.60 ^m	—	—	—	—	—	150.09
Irrigation	—	—	—	—	—	—	—	—	—	—	15.05 ⁿ	5.02 ^o	—	17.55 ^p	12.55 ^q	133.77
Demonstration Farms	8.36	50.20	16.72	13.38	5.02	13.38	16.72	3.00	3.00	3.20	—	—	83.60	—	—	300.18

j See Table VIII-9.

k Estimated that bunds occupy 10% of land.

l Estimated benefit of cost.

m $\frac{1}{10}$ cow per acre for 80 days.

n 18% of present total return.

o 6% of present total return.

p Weighted average increased yield with irrigation is 21%.

q Estimated 15% new land cultivated under any large irrigation program.

r The high labor and machinery costs are based upon a diversified farming program including supervisory personnel necessary for an initial program.

The total benefit from the use of fertilizer, calculating that all excess production would be exported, approximates K28.2 per acre exclusive of costs. The unusual division of profits between Government and farmer has created an economic situation whereby a practice is economically profitable for Government and unprofitable for the grower. The profit to Government is so great that a partial subsidy of the cost of

plowing and threshing teams would employ three men and a foreman working independently, and organized and operated as nonprofit cooperatives or government services.

d. Improved Farm Implements

The high initial cost of the tractor, the principal power source for farming operations, entails high depreciation and interest costs which may not be warranted unless the tractor is fully equipped with the less expensive accessories and implements usually provided for soil and crop working and for handling farm chores. The improved implements are therefore to be regarded as particularly important to economical mechanization.

The advantages of using improved animal-drawn equipment are limited to better seed-bed preparation, saving in time, and a lessening of the farmers' physical burden. Oxen for the power, sheds, yokes, carts and animal feed and care would still be necessary. The benefits from such improvements are difficult to evaluate because so much depends on the individual farmer's management and planning, the quality and condition of his animal power, and the amount and kind of equipment being used. In many cases, no essential change in the farming methods may result.

e. Storage and Use of Manure

The storage and use of manure to its fullest potential involves the construction of a storage tank and basin that can protect available manure, both liquid and solid portions, until the time of field application. The depreciation, interest and maintenance costs of such a tank, large enough to accommodate the normal manure output of two oxen for eight months, amounts to K3.16 per acre. The value of the stored manure, in terms of increased yield, is K4.55 per acre. Independent of other modernization measures, the practice is therefore barely profitable.

f. Composting

A cost analysis of composting reveals that at present labor rates and without mechanization measures it is more expensive than the returns resulting from its application. Composting costs are all labor since the constituents of compost are available on the farm—manure, soil and vegetable matter. The analysis was based upon a ten-ton application of compost per acre with an estimated yield increase of 33% per year for a three-year period. Labor of composting was calculated at 66.6 man-days per acre, three-quarters of which was spent handling vegetative material, 10% soil, and 15% manure. The cost of K167 per acre was divided by three to obtain annual per-acre cost at K55.6.

TABLE VIII - 19

FERTILIZER USE AND BENEFITS (PER ACRE)

	No Fertilizer		100 lbs. Fertilizer Per Acre	
	Farmer	Govt.	Farmer	Govt.
Cost of Production or Purchase	K74.4	K84.6	K108.10	K110.00
Value	84.6	161.6*	110.00	223.50
Profit	10.2	87.0	1.90	113.50

*At K146/ton plus S.A.M.B profit of K150/ton market price of K296/ton or K16.6/acre.

fertilizer seems desirable to permit and encourage chemical fertilizer use. In any case, as the development program is a government program, the criterion for deciding whether or not to introduce an innovation should be the combined profit of farmer and Government, with any injustice to the farmer being eliminated either by subsidy or adjustment of the profit ratios. It would appear under present cultivation methods that fertilizer application would be profitable only for paddy production as that is the only crop that enters the world market.

c. Partial Mechanization

Partial mechanization, meaning the mechanization of the soil preparation and threshing operations, is the basis for calculation of double cropping. The farming methods would not change, except for plowing and threshing, and the assumption is made that partial mechanization would be carried out on irrigated land. The cost estimate makes provision for five Farmall Super MD tractors with five 3-disc plows, and a maintenance shop truck to service and repair them. Costs of depreciation, maintenance operation and interest are included in the total costs of plowing. Five tractor operators at K5 per day, one mechanic at K8 per day, and a foreman at K500 per month make up the personnel required. It is estimated that four tractors would work seven hours per day while the fifth is undergoing servicing or repairs. Ten per cent of working time is left for moving operations from one area to another. Threshing teams would be equipped with one thresher and one tractor. Each of the

g. Modern Farming

Modern farming was analyzed without irrigation or double cropping. It will be seen at the outset that the total cost is less than that by present cultivation methods and that labor costs are exceptionally low. No labor need be hired. Costs are principally in machinery and equipment, being approximately 18% more than that for animal and equipment under present cultivation methods and for fertilizer. The returns from modern farming are more than twice the per-acre costs, and profits exceed those of present cultivation methods by more than five times.

h. Irrigation

Per-acre irrigation costs were taken from a weighted cost analysis of each of the proposed irrigation projects, i.e., Yamethin, Mu, Loikaw and Kandaw. The costs include depreciation, interest, maintenance, and operation expenses. The total returns of irrigation are increased over those of present cultivation methods by approximately K46.57 per acre without the advantages of modern farming or double cropping.

i. Demonstration Farms

Demonstration farms combine all the advantages of double cropping and modern farming appearing in the table analysis. The costs of training excess personnel and of hiring initial foreign technicians are not calculated in the cost estimate as they are not a recurring part of the program proposed and make no direct or continuing contribution toward increased agricultural production. Of five demonstration farms suggested for establishment in Section D 3, the one requiring the most machinery, and therefore the most expensive, was selected to serve as the cost analysis example.

j. Research and Extension

The contributions of research and extension toward increasing agricultural output were considered too intangible to permit proper evaluation under a cost analysis. Their field of activity would be intimately associated with all of the practices analyzed and their cost should probably be prorated among all of the suggestions discussed. The value of research and extension, if actively pursued, would probably exceed costs of application by many times.

The practices analyzed are, for the most part, treated alone. Their values are individual and in combination are additive or slightly more than additive. If present cultivation methods are employed, a paddy yield will approximate 1,300 pounds per acre. If improved seed is used, the yield will increase to 1,430 pounds. If fertilizer is also used the yield will increase to 1,820–1,860 pounds, etc. It becomes

apparent that a wide variety of combinations for increased production is possible both under present cultivation methods and under varying degrees of improvement.

E. AGRICULTURAL AIMS AND SUGGESTED GOALS

1. PRESENT IMPROVEMENT MEASURES

The costs of present agriculture are not generally realized. A careful analysis reveals that a consideration of depreciation, interest and maintenance factors in calculating farm costs results in a per-acre cost to cultivate of approximately K42.7. This does not include the labor supplied by the farmer and his family amounting to an additional K25 per acre. If it is recognized that it presently costs the farmer K42.7 per acre in cash or in produce to cultivate his soil, the costs of improvements leading to much greater agricultural production and profit are better appreciated.

At present the improvement factors operating in Burma consist of providing improved paddy seed to farmers and the benefits of a thinly spread research and extension service. The costs of producing improved seed are entirely government borne and do not yield a very large per-acre return to Government. The effectiveness of present research and extension is not great.

2. A SUGGESTED PROGRAM

Budgeting requires careful consideration of how to obtain the greatest return for the least investment consistent with all the advantages and disadvantages that accompany any improvement method. With this in mind, a program has been prepared indicating the practices recommended and the acreage that would be devoted to each practice. Prewar production figures from the five-year average 1936–40 are used as a base for calculation purposes. Total acreage under cultivation at that time was 17,400,000. Improved seed was planted on 1,165,000 acres leaving the remaining 16,235,000 acres without improvements.

The suggestions for increasing agricultural production are based upon cost and general practicability. It is estimated that the use of improved seed could be extended to twice the present acreage by the target year 1960. The use of chemical fertilizer, being similar to improved seed in its quantity requirements, freight and distribution pattern, is estimated to be capable of extension to an acreage equal to that of improved seed before the war, or 1,164,000 acres. It is believed that partial mechanization and the proper use of manure could cover 10% of the acreage chemically fertilized, or 116,000 acres each. All of these practices are compatible with no irrigation, or stream diversion irrigation, and present cultivation methods.

Under reservoir irrigation, increased production would result from ample water supplied when needed any time of the year. The weighted average increase of all crops properly irrigated approximates 21%. This increase would also apply to the new acreage brought into cultivation by irrigation, land now fallowed, and land sown but annually abandoned due to drought. If irrigated, the fallowed, abandoned and new acreage would yield a normal crop which is equivalent, for calculation purposes, to an increase in cultivated acreage.

Modern farming, including demonstration farms with reservoir irrigation, seems to offer the best investment considering the expected returns. The hazards of improper establishment and poor management will be great with modern farming. The estimates however, both for cost and return, have assumed that farms would function near their optimum. A lowering of efficiency would have a depressing effect on expected returns. For those reasons the suggested acreage planned for modern farming is only 68,950 for the year 1960. Modern methods would produce two crops per year, and would enjoy all the advantages inherent in a mechanized operation.

Table VIII-20 (*see p. 190*) summarizes the benefits for the farmer and the Government under each of the suggested practices. Farm profits are calculated from a weighted nationwide average based on 1953 prices. Increased farm profits through the application of improved practices were calculated as the total value of the production increase less the farmer's cost of implementing the practice. The calculation of government profit used only the paddy portion of total production. It was assumed that all increases in paddy production would be exported. The export quantity was used to determine government profit with costs to Government first deducted.

The program suggested for 1960 would aim to improve, in varying degrees of intensity, approximately 1,165,000 acres. Most of the acreage improved would have two or more practices in effect. Thus about 7% of the cultivated land in Burma would be improved to some extent, principally in the use of improved seed and fertilizer. The 1960 goal is arbitrary, as are the methods selected and the degree of their individual application. The program would grow from its present status to that suggested for 1960 according to the funds invested in it and the practicability of establishing the various practices. Assuming the 1960 goal is justified on financial and practical grounds, the annual profit increment at the 1960 level of development would amount to over thirteen crores exclusive of cost. The annual cost to realize that increment would be about nine crores, or roughly a total return of $2\frac{1}{2}$ crores per crore invested. The nine crore investment is, however, only the annual cost of

improvements. The total investment necessary to realize the benefits of such improvement practices as irrigation would be much larger than the prorated annual costs shown in Table VIII-20. The suggested program would increase total profits by over 20% while improvements would extend to less than 7% of cultivated land.

F. CONCLUSIONS AND RECOMMENDATIONS

Burma is favored with large areas of flat land, a moderately fertile soil, ample water resources, and a suitable climate for agricultural production. Among Asian countries she is unique in having low population in relation to her potentially cultivable land. Burma has been a major exporter of rice for many years and is financially able to support improvement practices for increasing her agricultural output.

Roughly 16 million acres are presently under cultivation. This area lies in the Wet Zone, the Dry Zone and the hill country. It is estimated that approximately $1\frac{1}{2}$ million acres are out of cultivation due to insurgency. Large tracts of land topographically suited for agriculture have never been cultivated. The principal crop, rice, occupies two thirds of all cultivated acreage with much lesser quantities of sesamum, maize, sugar cane, pulses, groundnuts, tobacco and cotton produced. Farming methods employ animals almost exclusively.

The problems of agriculture are essentially connected with low per-unit yields and are reflected in low national output. Associated problems are those of credit, taxation, research and extension, price control, and storage and marketing. The Land Nationalization Plan and the five-year Agricultural Development Plan should have far-reaching long-range effects on agriculture.

Increased agricultural production requires an intensification of present cultivated acreage, an extension of cultivation into areas not now cultivated or both. Intensification of present cultivation would be most effective in contributing to increased output. Under present farming methods, the program should be formulated on a practical basis consistent with the farmer's interest. It is believed that the use of chemical fertilizer and a service program of partial mechanization would be acceptable to the grower, would considerably increase the profits of farming, and would increase agricultural output. To a lesser degree improved storage and use of farmyard manure would do the same. With modern farming, all the advantages of scientific agriculture are possible and would result in very greatly increased production, reduced costs, and greater profits. Efforts should be concentrated on the production of agricultural commodities in short supply. The development of reservoir-irrigated

programs, both under present and modern farming methods, would contribute significantly to increased agricultural production. The full benefits of irrigation are possible only under conditions of partial or complete mechanization of farming.

A research and extension program is discussed and specific emphasis is given to those phases of research that appear to be most urgent. The introduction of certain plant varieties and the improvement of others is of prime importance in the research field.

The various means of intensifying presently cultivated acreage were individually cost-analyzed to indicate both the investment required and the returns to be expected. The analyses were based upon the assumption that management and machinery would operate near the optimum levels of efficiency. These levels are obtainable if the program is undertaken modestly under competent management.

In accordance with the discussion of the various points of reference in this chapter, it is recommended:

(1) That action on National Agricultural Programs, including Land Nationalization, the Five-year Plan for Agricultural Self-sufficiency, financing the farmers, agricultural taxation, marketing of crops, the State Agricultural Marketing Board, and government organization for agriculture, be diligently pursued, with specific attention as follows:

a. The Land Nationalization Program

Every effort should be made to publicize and enforce the present laws thoroughly, the initial phase being limited to elimination of absentee ownership of tenant land and its distribution to present tenant cultivators; the purchase of owner-operated land in excess of 50 acres should be carried through, exceptions to the 50-acre limit being permitted where a cultivator has equipment necessary for mechanized farming and if there are surplus lands available; individual holders should be encouraged to farm their holdings jointly under a cooperative arrangement; periodic checks should be made to insure proper labor standards and production efficiency; changes in the management unit should be minimized and changes in land-holding right stressed; and the total program should be integrated with development of cooperatives, production methods, mechanization and the pursuit of other goals.

b. The Five-year Plan for Agricultural Self-sufficiency

The program selected by the Agricultural and Water Resources Development Corporation for immediate implementation should be diligently pursued with continued vigilance for additions and changes.

c. Financing the Farmers

To meet the problem of short-term credit, it will be necessary to carry out an intensive information program to educate the farmers in the proper use of credit, build up responsibility at the village level by insisting on adherence to certain minimum financial standards including contributions to share capital, continue the program to establish gradually district branches of the State Agricultural Banks in all districts, encourage repayment of loans in kind wherever possible, and establish procedures to enable the Agriculture Department to issue improved seed, fertilizers and implements on credit in conjunction with the system of state agricultural credit and the farm extension and demonstration services. Preparation should be made for the problem of long-term credit, even though it is not now a pressing one, so that future requirements for livestock purchase, land development, equipment purchase and other improvements may be accommodated.

d. Agricultural Taxation

Land revenues should not be increased until such time as persons in the income bracket of the cultivator are also subject to direct taxes. Since land records and crop statistics are basic data for determining land revenue, land records should be taken over by the agency managing state-owned lands under the land nationalization program, and collection of crop statistics should be separated from the tax collection function and established under an independent agency. Consideration should be given to making the land-revenue tax a source of local government revenue.

e. Marketing of Crops

Assistance should be given the farmers in getting better prices for their crops by formation of cooperatives, standardization of grades, adoption of uniform weights and measures, provisions for furnishing market information, price stabilization policies and inspection of weights and measures. The broad development, testing and regulation of standards should be legislatively assigned to a central scientific organization with enforcement vested in interested agencies. A market outlook service should be established to provide farmers with accurate information on current and expected prices and with timely forecasts of crop acreage and yield. Pricing programs should be set up on crops for which Government is prepared to enter the market and offer incentive prices for new crops such as jute and long stapled cotton. More cooperatives should be established through an expanded agricultural education and information program for acquainting the farmers

TABLE
A PROGRAM FOR INCREASING
(in

Practice	1936-40						
	Acres	Tons Produced	Net Farm Profit	Net Government Profit	Total Return	Annual Cost to Implement	Total Profit
			K	K	K	K	K
Improved Seed	1,165	67	9,860 ^d	825 ^e	20,010	9,325	—
Chemical Fertilizer	—	—	—	—	—	—	—
Partial Mechanization	—	—	—	—	—	—	—
Manure	—	—	—	—	—	—	—
Irrigation and Modernization	—	—	—	—	—	—	—
Irrigation and New Acreage	—	—	—	—	—	—	—
Irrigation of Fallow Acreage	—	—	—	—	—	—	—
Irrigation of Abandoned Acreage	—	—	—	—	—	—	—
Irrigation without Other Improvement	—	—	—	—	—	—	—
Total Profit by Improved Practices	—	—	9,860	825	—	—	10,685
Base Acreage Cultivated	17,400	8,060 ^a	2,76,200 ^b	3,36,000 ^c	—	—	—
Acreage Increased by Irrigation	—	—	—	—	—	—	—
Total Profit by Unimproved Methods	—	—	2,76,200	3,36,000	—	—	6,12,200
Grand Total							6,22,885

a 0.464 ton per acre, the weighted nationwide average production of all crops.

b K15.9 per acre, the weighted nationwide average per-acre profit for all crops.

c Acreage \times 67% (paddy) \times $\frac{1}{3}$ (exportable) \times .58 ton/acre \times K150/acre.

d At K146.00 per ton with no cost to Government.

e At K150.00 per ton minus cost of production; see Table VIII-4.

f At 30% increase.

g Paddy only.

h At K146.00 per ton minus 50% cost of fertilizer.

i At K150.00 per ton minus 50% cost of fertilizer.

j At K146.00 per ton minus K30.34 per acre for machinery.

k At K150.00 per ton.

l At K146.00 per ton minus K3.16 per acre.

VIII - 20

AGRICULTURAL PRODUCTION

thousands)

1960						
Acres	Tons Produced	Net Farm Profit	Net Government Profit	Total Return	Annual Cost to Implement	Total Profit
		K	K	K	K	K
2,330	135.2	19,720 ^d	1,650 ^e	40,020	18,650 ^t	—
1,165	203	10,050 ^h	11,050 ⁱ	59,800	38,700 ^u	—
116	75.4	7,480 ^j	11,300 ^k	23,300	3,520 ^v	—
116	3.8	188.5 ^l	570 ^k	1,125	366.5 ^v	—
69	82.6	15,006 ^o	8,458 ⁿ	23,358	106 ^o	—
206.5	20	3,610 ^p	1,867 ^q	5,477	—	—
248	24	4,330 ^p	2,240 ^q	6,570	—	—
82	8	1,443 ^p	740 ^q	2,183	—	—
773	76	13,710 ^p	10,510 ^r	39,310	15,090 ^v	—
—	—	75,537.5	48,385	2,00,143	76,220.5	1,23,922.5
17,400	8,060	2,76,200 ^b	3,36,000	—	—	—
536.5	248.5 ^a	8,525 ^b	12,840 ^s	31,825	10,460	—
—	—	2,84,725	3,48,840	—	—	6,33,565
						7,57,487.5

m At K180.5/ton (all crops) plus benefit of cheaper farming operations.

n Acreage × 67% (paddy) × $\frac{1}{3}$ (exportable) × 2 (double cropping) × 0.804 ton/acre minus normal exportable surplus and K19.50/acre for irrigation.

o Benefit of cheaper farming operation @ K1.44/acre (double cropped).

p At K180.5/ton.

q Acreage × 50% (paddy) × 0.121 ton/acre × K150 per ton.

r Same as *q*, but minus K19.50/acre for irrigation.

s Acreage × 50% (paddy) × 0.58 ton/acre × K150 per ton minus K19.50/acre for irrigation.

t Cost borne by Government.

u Cost 50% Government and 50% farmer.

v Cost borne by farmer.

with the basis for collective credit, transportation, market data, storage, threshing and simple processing.

f. State Agricultural Marketing Board

Rice should be sold more expeditiously in order to maximize sales at current favorable prices and hold existing markets. Earlier shipments should be made to relieve the rice storage problem. Storage facilities secure against insects, rodents and other spoilage should be provided. Bulk handling facilities should be constructed so that the Government will be able to store sufficient rice to spread its shipment over a larger period and take advantage of short-term fluctuations. The possibility of arranging trade agreements for sale of rice should be explored. An effort should be made to improve the quality of rice, encourage the use of improved seed and establish uniform standards of grading.

g. Government Organization for Agriculture

The principal agricultural functions should be brought together under one ministry. The staff of the secretariat of the ministry should be greatly strengthened to provide a small group of experienced agriculturists of administrative caliber to plan and expedite an integrated program. An agricultural information service should be established to prepare general and technical bulletins, publish popular periodicals and a farm magazine, and prepare special exhibits and equipment. It should use audio-visual programs. A central ministerial library with a qualified librarian should be set up. There should be a separate Department for Land Nationalization with a post of deputy secretary, and all agencies under the present ministry should be transferred to the new department with the exception of the crop reporting functions of the Commissioner of Settlement and Land Records which should be under the proposed Statistics Department. In addition the new Department for Land Nationalization should take over enforcement of rent controls and tenancy disposal. The Agriculture Department should be greatly expanded. The engineering functions of the Irrigation Department should be transferred to a Ministry of Engineering Services, and the Irrigation Department of the Ministry of Agriculture should retain only responsibility for operation and maintenance of irrigation works, supervision of application of water to the land, and relations with water users. A Cooperative Societies Department should be established in the Ministry of Agriculture to take over the program now planned by the Ministry of Land Nationalization as well as the agricultural cooperative program of the present Cooperative Department. The State Agricultural Credit Department, the Veterinary

Department, the Fisheries Department, and the Forests Department should continue in their present functions with work of inspection and certification of livestock products added to the Veterinary Department. The planning staff proposed for the new ministry should take over all the planning of the Agricultural and Water Resources Development Corporation, and the corporation should be made responsible for funds only. The corporation should also be placed directly under a joint secretary for planning who would also be head of the planning staff. The SAMB should be an independent board directly under the President, and the composition of the board should be altered to provide adequate representation of all agencies concerned. The field staffs for all departments should be consolidated into one office to economize and standardize services and facilities such as transportation, housing and administration. The post of Financial Commissioner should be abolished.

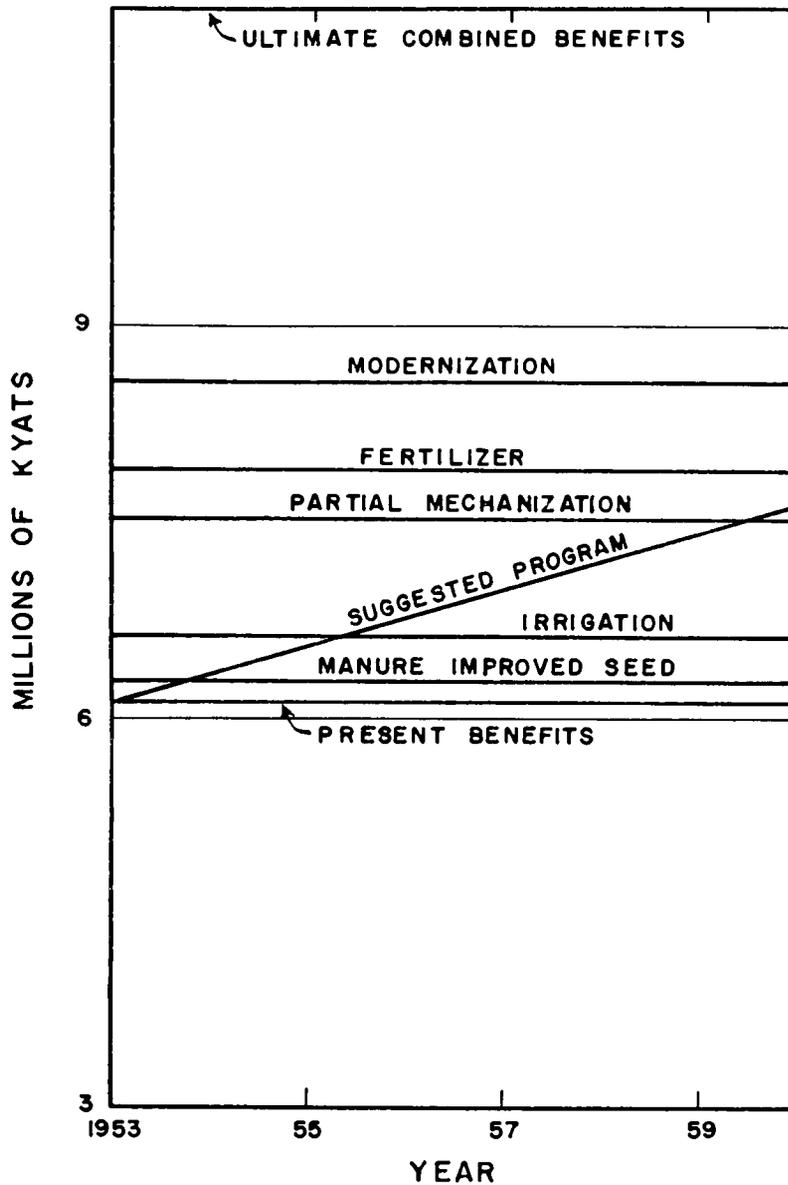
(2) That advanced agricultural practices including new irrigation projects for increase of agricultural production be introduced in accordance with a systematic program phased approximately as shown in Table VIII-20 and Plate 14.

(3) That five demonstration farms be established at the locations suggested on Plate 9.

(4) That research and extension be expanded in accordance with the organization shown on Plate 12. Immediate steps should be taken to implement the plan, with specific attention as follows:

a. Extension

Training in extension methods should be instituted immediately with courses at Mandalay College, the Agricultural Training Institute, and Central Farm Schools. A manual of extension methods should be prepared for use as a practical guide for workers. Fields of coverage should include basic information on soils, crops and farming methods, and the dissemination of information on the care and management of livestock. A program of establishing youth training groups should be started with each group selecting farm projects which will be planned by them with competent help and executed by them. Various means of implementing the research and extension programs should be adopted; for example, arranging for small-scale demonstrations in the villages on a variety of subjects as listed in the discussion, demonstrating desirable practices by means of sound and color films, distributing simple pamphlets and bi-monthly or quarterly agricultural publications, and demonstrating agricultural methods by the efficient operation of a demonstration farm.



IT IS CONSIDERED THAT THE APPLICATION OF RECOMMENDED PRACTICES WOULD NOT EXCEED THE FOLLOWING PERCENTAGES OF PRESENT CULTIVATED ACREAGE:

IMPROVED SEED	50%	MANURE	30%
PARTIAL MECHANIZATION ..	30%	MODERNIZATION	20%
FERTILIZATION	50%	IRRIGATION	7%

MINISTRY OF NATIONAL PLANNING			
POTENTIAL BENEFITS OF IMPROVED PRACTICES			
KNAPPEN TIPPETTS ABBETT ENGINEERING CO.			
NEW YORK		RANGOON	
DR. BY. <i>E.J.P.</i>	DATE	PLATE	14
CK. BY. <i>H.N.</i>	JULY-53	NO.	

b. Research

Specific emphasis should be given to the introduction of new crops; improving seed other than paddy; classification of insects and establishing of control methods and costs; survey of indigenous diseases; and an investigation of trace element deficiencies in the soils and the establishment of the necessary library and laboratory facilities. Investigations should start with a survey and classification of the natural resources that would support a livestock industry, the areas best suited to livestock production, forage plant populations, supplies of supplementary feed, survey of livestock pests and diseases, livestock breeds best suited to the country, and possibilities for the processing of the various animal products. An agricultural engineering staff should be organized to develop methods of farming, for both mechanized equipment and improved implements. Aerial photo coverage of the whole of Burma should be undertaken, and should be used to its fullest in determining

unknown land areas, boundaries, erosion conditions, drainage basins, possible communication routes, and administration of the land subsidy program. Within the framework of long-range agricultural research, land classification should be given immediate consideration with the objective of classifying land according to its basic resources and present condition.

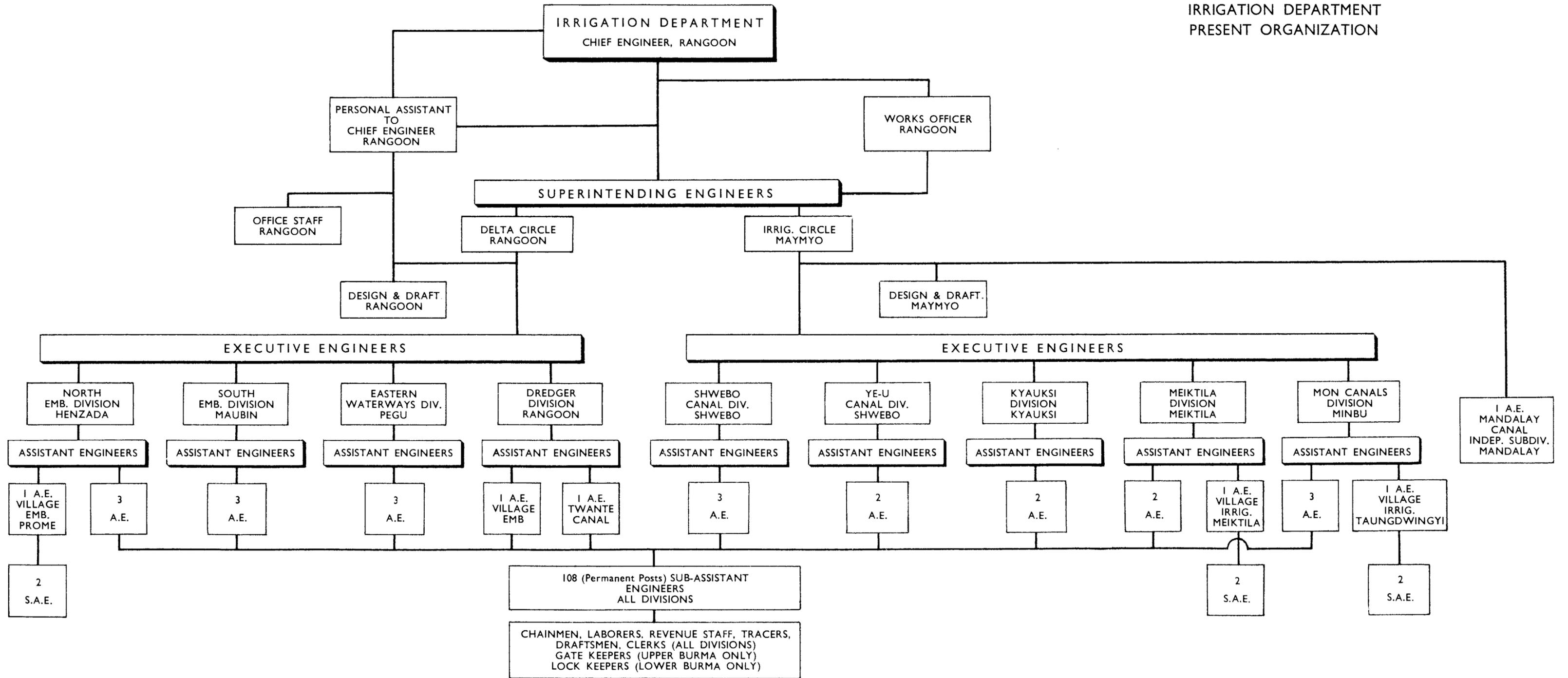
c. Implementation

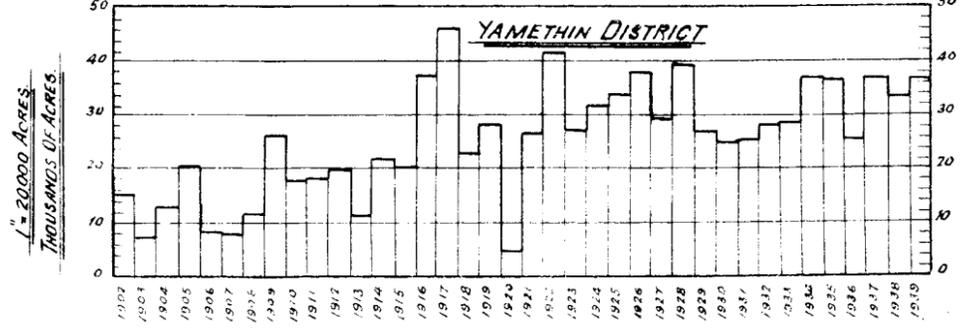
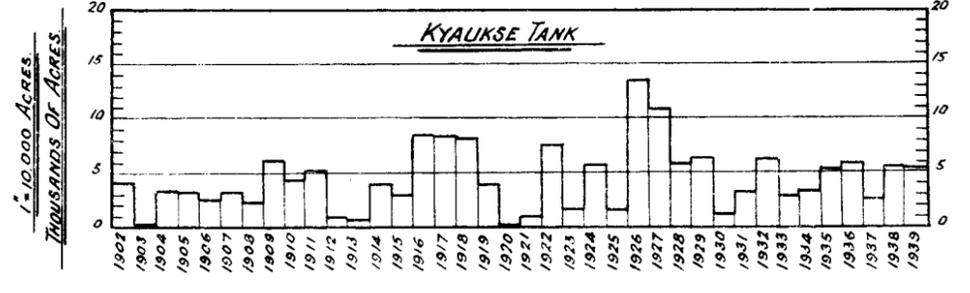
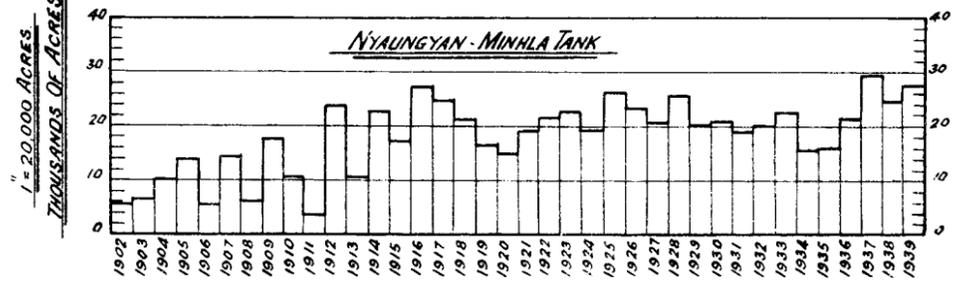
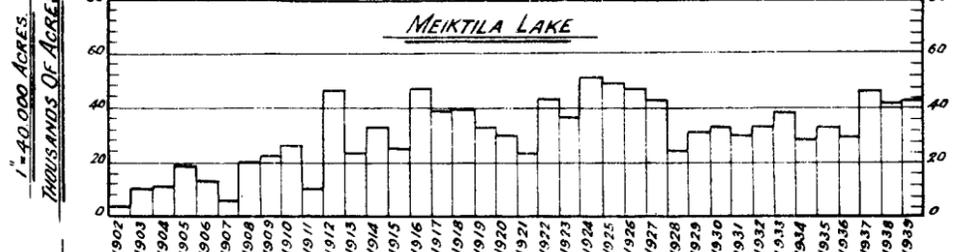
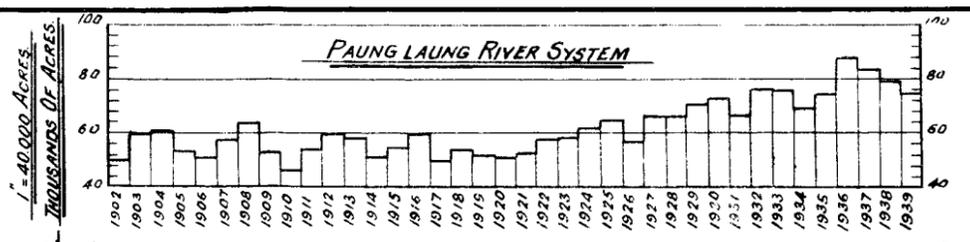
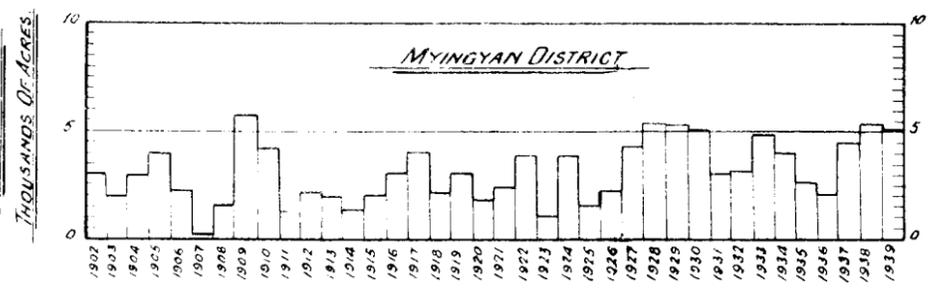
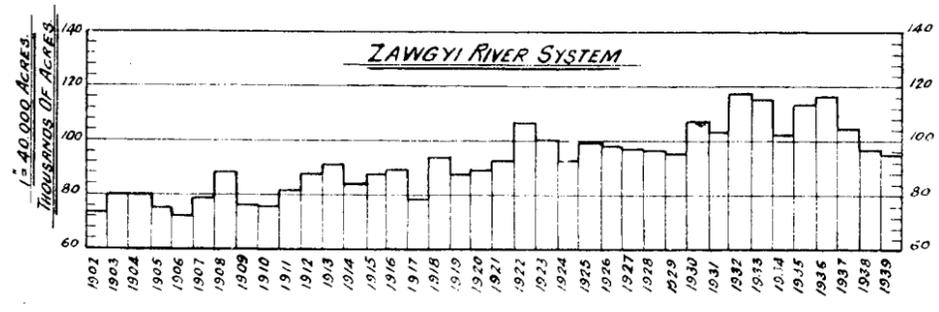
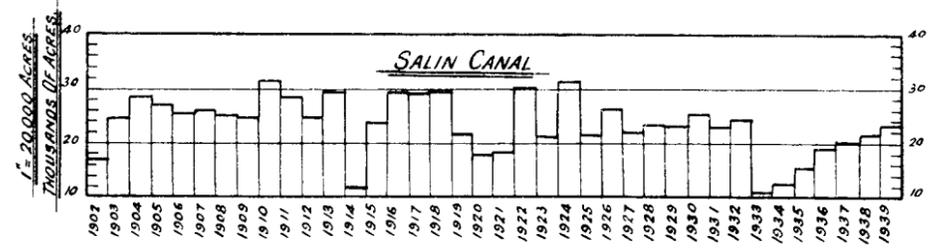
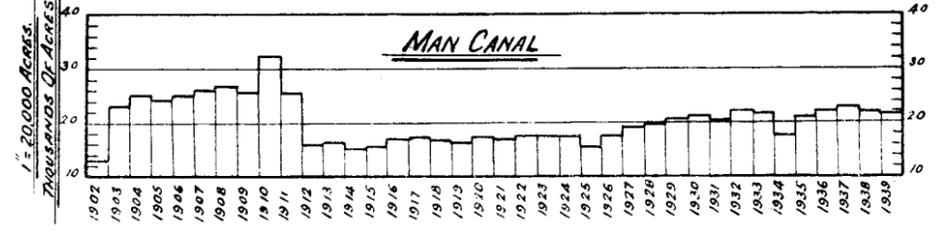
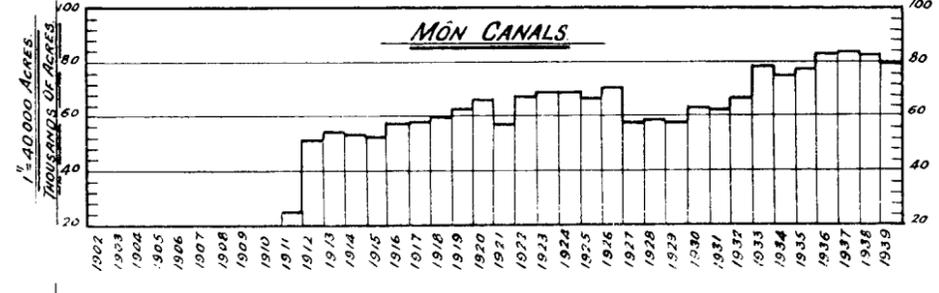
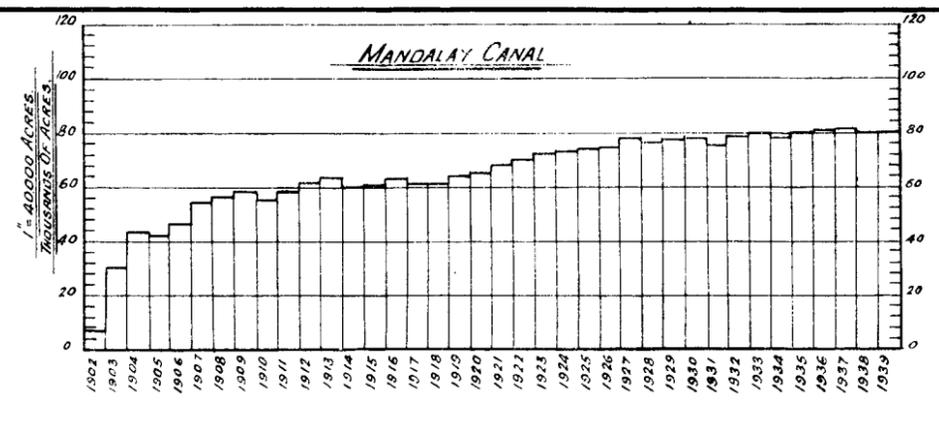
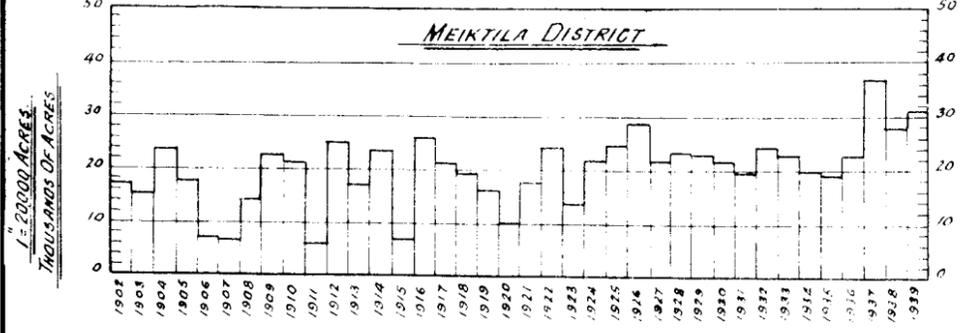
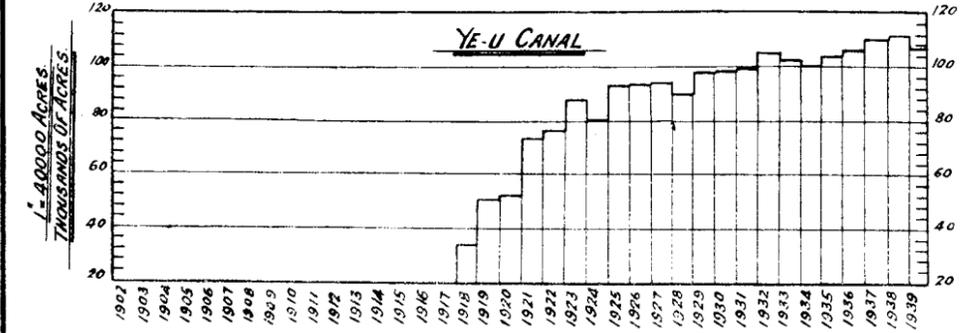
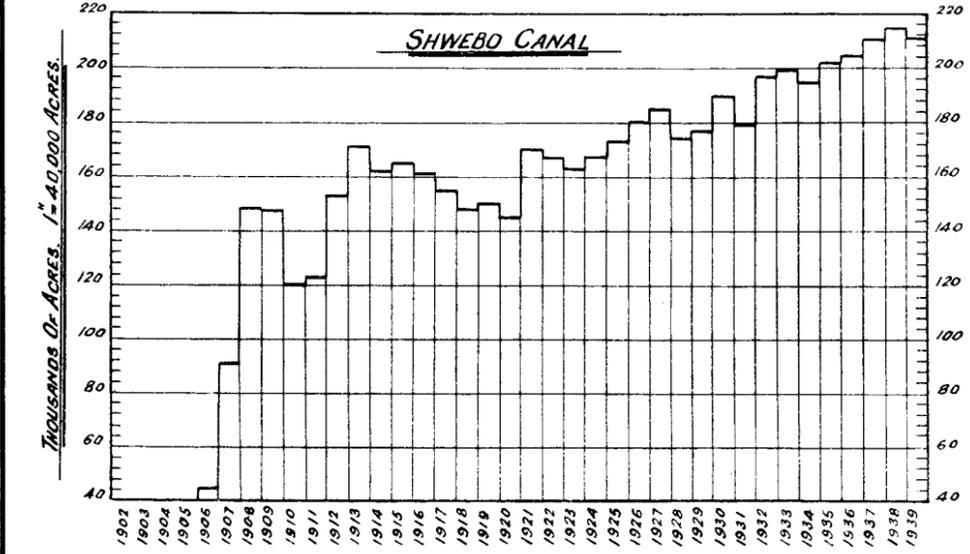
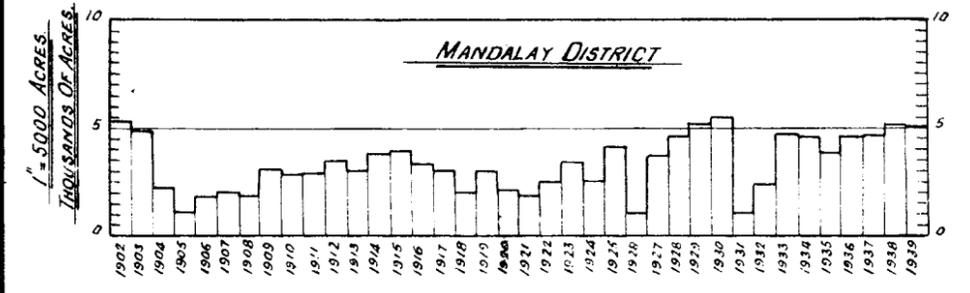
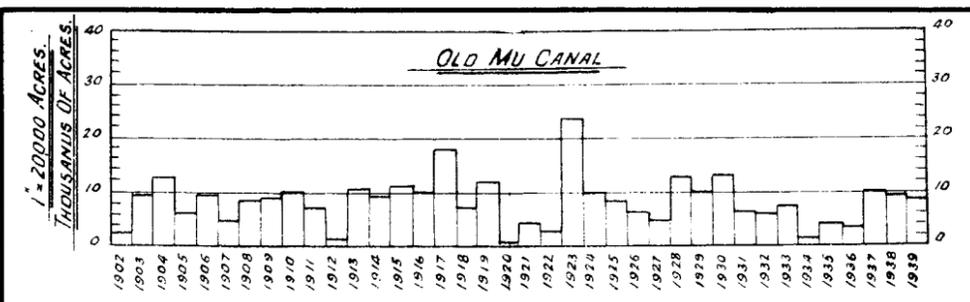
Effective research, if limited by insufficient funds, should be restricted in its coverage and complete in its intensity of application. The beginning extension program should be carried out to the tract level, and most support and emphasis should be given to local extension agents.

(5) That irrigation be developed in the areas of Yamethin, Loikaw, Mu River, and Kandaw Village in accordance with plans set forth in Chapter IX, including water services to the demonstration farms.

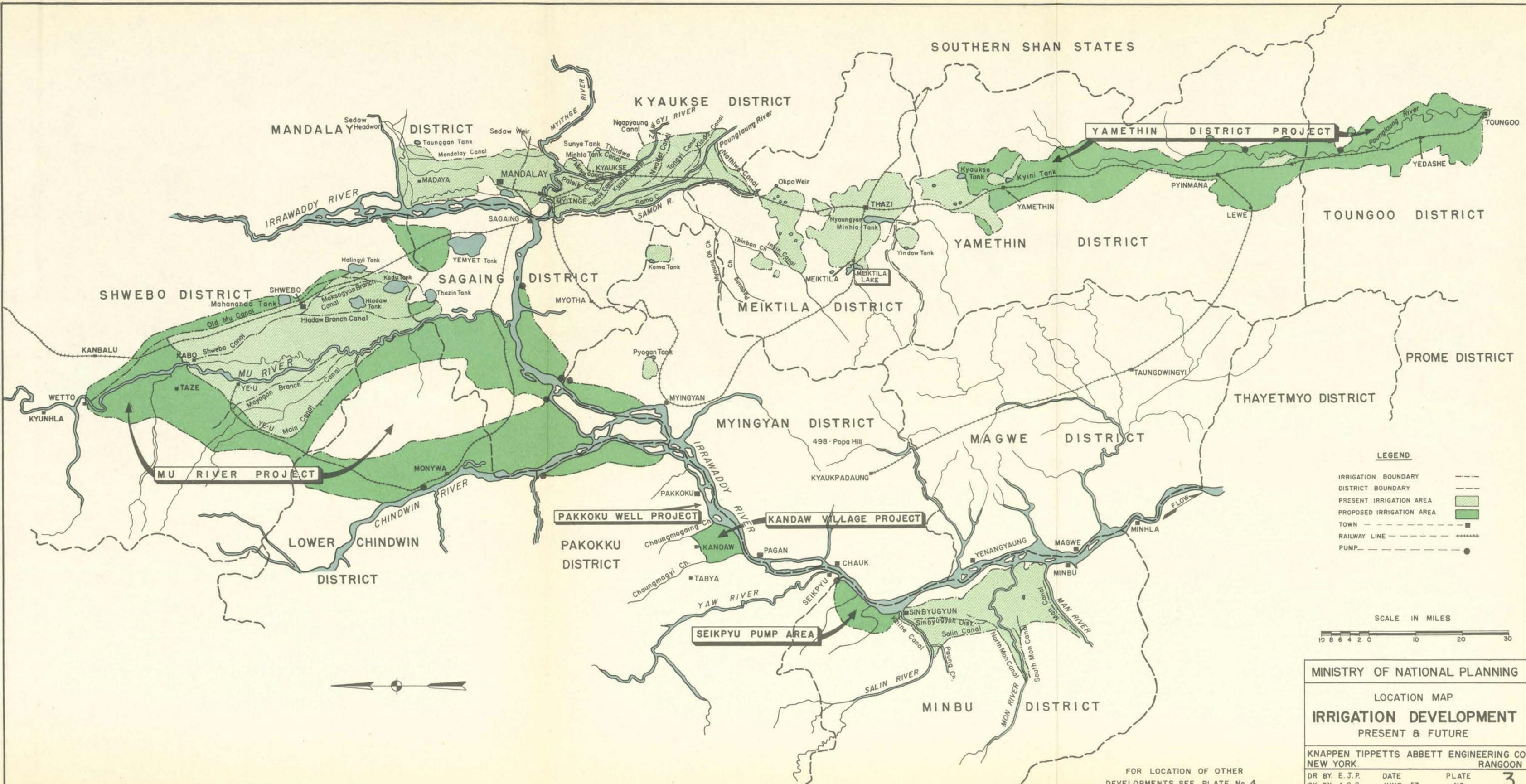
MINISTRY OF AGRICULTURE AND FORESTS

IRRIGATION DEPARTMENT
PRESENT ORGANIZATION





MINISTRY OF NATIONAL PLANNING.
 PRESENT IRRIGATION SYSTEMS
 AREAS IRRIGATED ANNUALLY.
 KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
 NEW YORK. RANGOON.
 DR. BY E. J. P. DATE PLATE
 CK. BY R. R. R. JUNE 53. NO. 2



SOUTHERN SHAN STATES

MANDALAY DISTRICT

KYAUKSE DISTRICT

YAMETHIN DISTRICT PROJECT

TOUNGOO DISTRICT

SHWEBO DISTRICT

SAGAING DISTRICT

YAMETHIN DISTRICT

MEIKTILA DISTRICT

PROME DISTRICT

THAYETMYO DISTRICT

MYINGYAN DISTRICT

MAGWE DISTRICT

MU RIVER PROJECT

PAKKOKU WELL PROJECT

KANDAW VILLAGE PROJECT

LOWER CHINDWIN DISTRICT

PAKKOKU DISTRICT

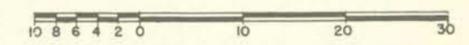
SEIKPYU PUMP AREA

MINBU DISTRICT

LEGEND

- IRRIGATION BOUNDARY ————
- DISTRICT BOUNDARY - - - - -
- PRESENT IRRIGATION AREA [light green box]
- PROPOSED IRRIGATION AREA [dark green box]
- TOWN [square symbol]
- RAILWAY LINE - - - - -
- PUMP [circle symbol]

SCALE IN MILES



MINISTRY OF NATIONAL PLANNING

LOCATION MAP
IRRIGATION DEVELOPMENT
 PRESENT & FUTURE

KNAPPEN TIPPETTS ABBETT ENGINEERING CO
 NEW YORK. RANGOON

FOR LOCATION OF OTHER DEVELOPMENTS SEE PLATE No. 4

DR BY: E. J. P. DATE: JUNE 53 PLATE NO. **3.**
 CK BY: A. R. R.

92° 94° 96° 98° 100°

MINISTRY OF NATIONAL PLANNING

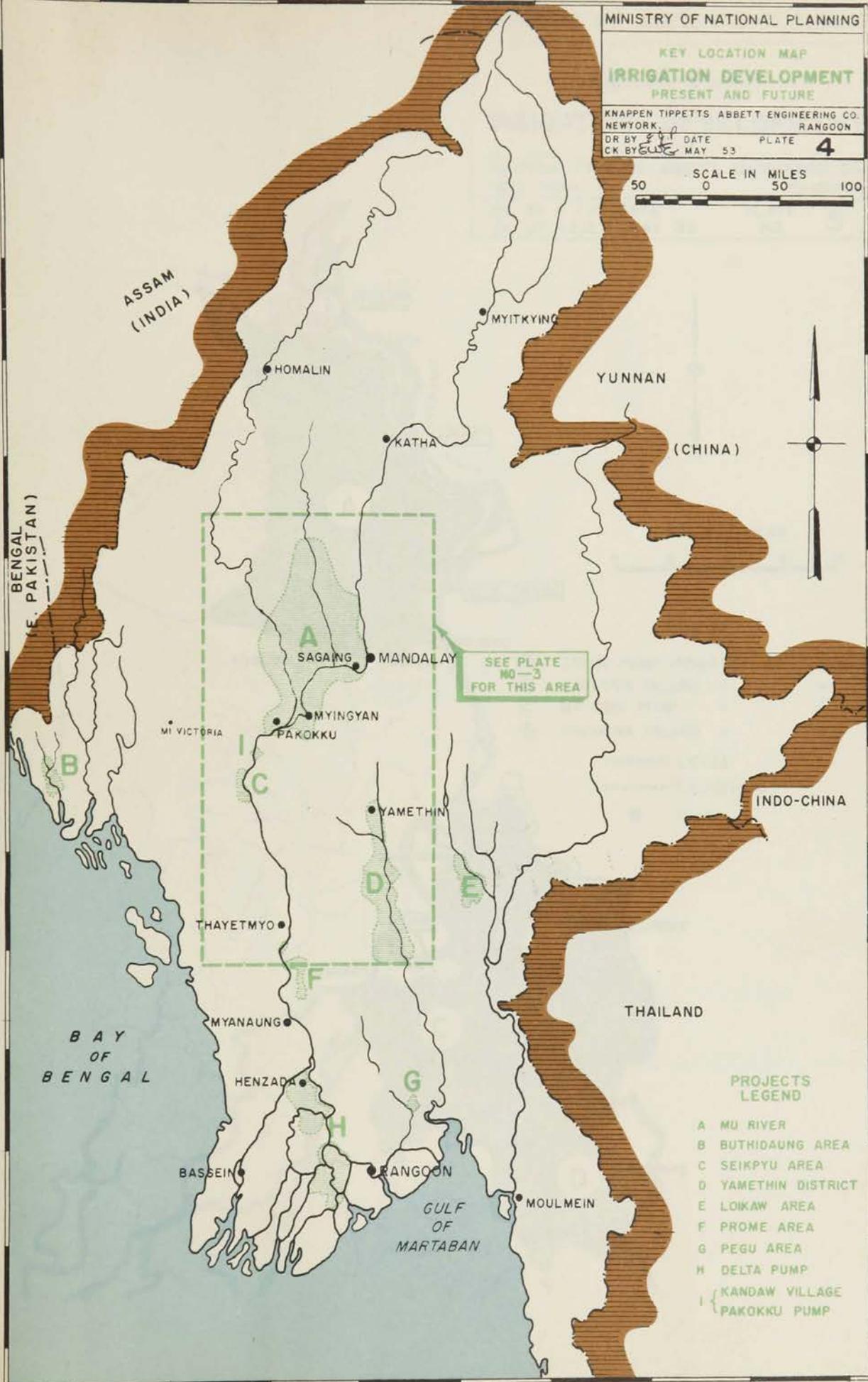
KEY LOCATION MAP IRRIGATION DEVELOPMENT PRESENT AND FUTURE

KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK, RANGOON.
DR BY *[Signature]* DATE *[Signature]* PLATE 4
CK BY *[Signature]* MAY 53

SCALE IN MILES
50 0 50 100



28°
26°
24°
22°
20°
18°
16°



PROJECTS LEGEND

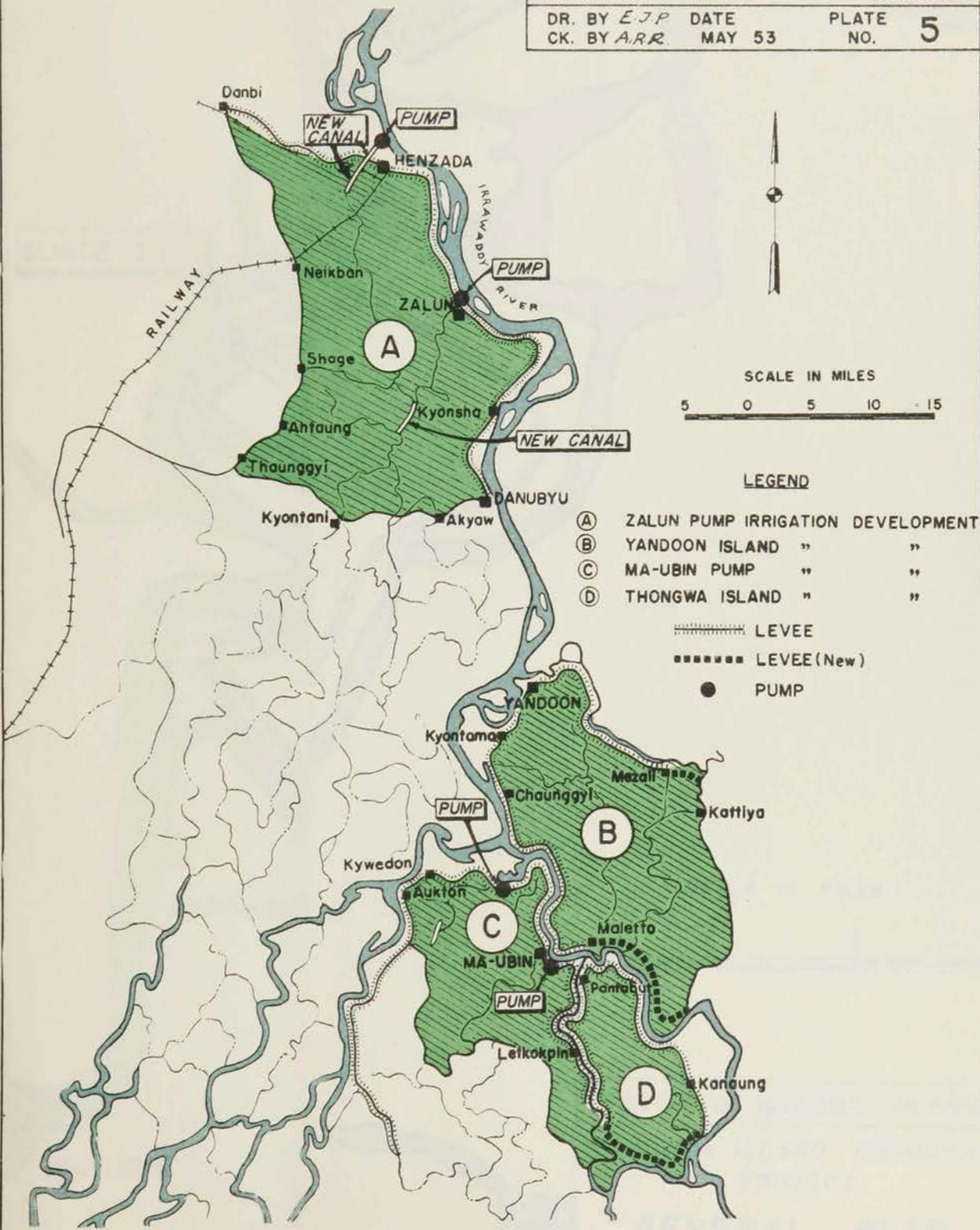
- A MU RIVER
- B BUTHIDAUNG AREA
- C SEIKPYU AREA
- D YAMETHIN DISTRICT
- E LOIKAW AREA
- F PROME AREA
- G PEGU AREA
- H DELTA PUMP
- I { KANDAW VILLAGE
PAKOKKU PUMP

94° 96° 98° 100°

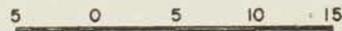
DELTA-PUMP IRRIGATION DEVELOPMENT

KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK RANGOON

DR. BY *E.J.P.* DATE PLATE NO. 5
CK. BY *A.R.R.* MAY 53



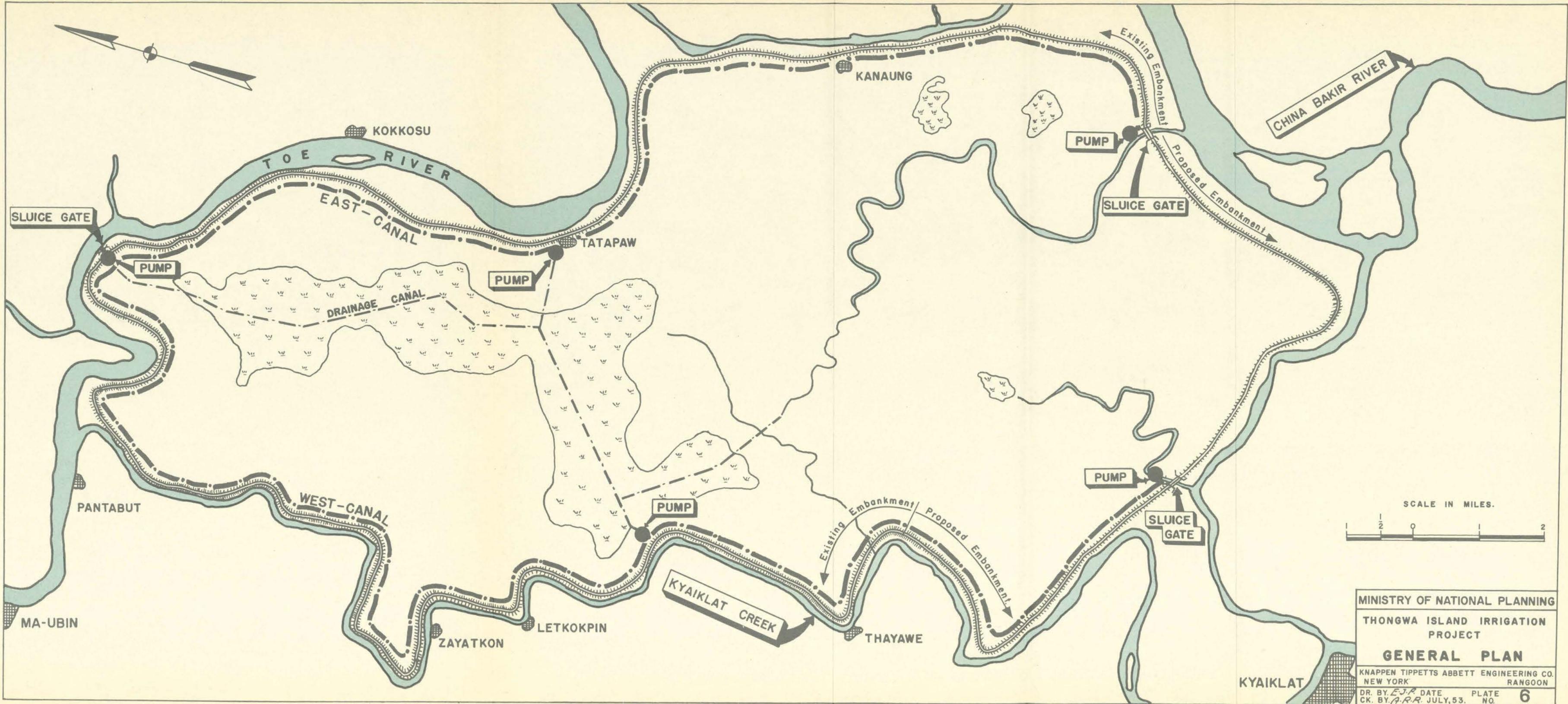
SCALE IN MILES



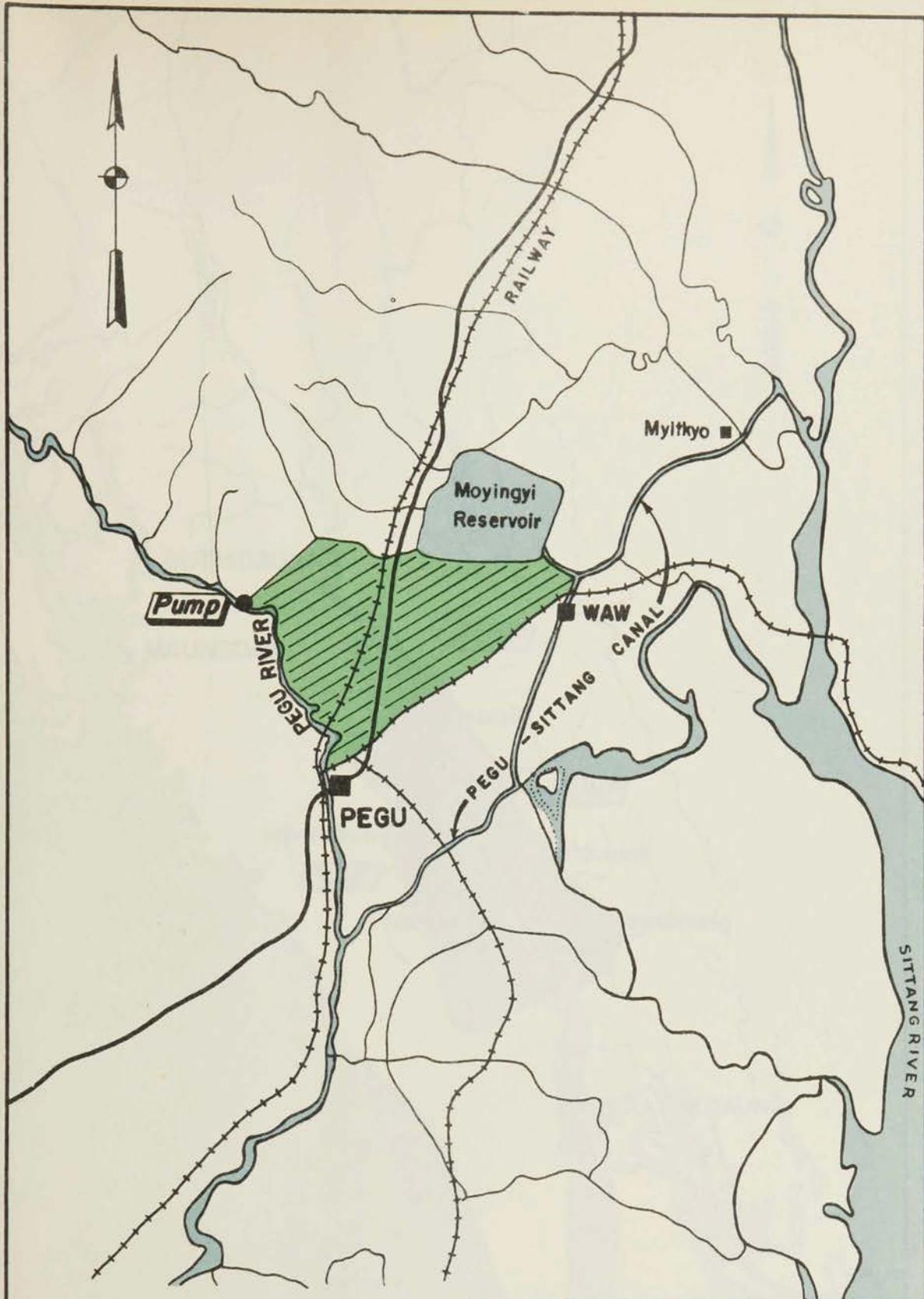
LEGEND

- (A) ZALUN PUMP IRRIGATION DEVELOPMENT
- (B) YANDOON ISLAND " "
- (C) MA-UBIN PUMP " "
- (D) THONGWA ISLAND " "

- LEVEE
- LEVEE (New)
- PUMP



MINISTRY OF NATIONAL PLANNING
 THONGWA ISLAND IRRIGATION
 PROJECT
GENERAL PLAN
 KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
 NEW YORK RANGOON
 DR. BY *E.J.R.* DATE _____ PLATE NO. **6**
 CK. BY *A.R.R.* JULY, 53.

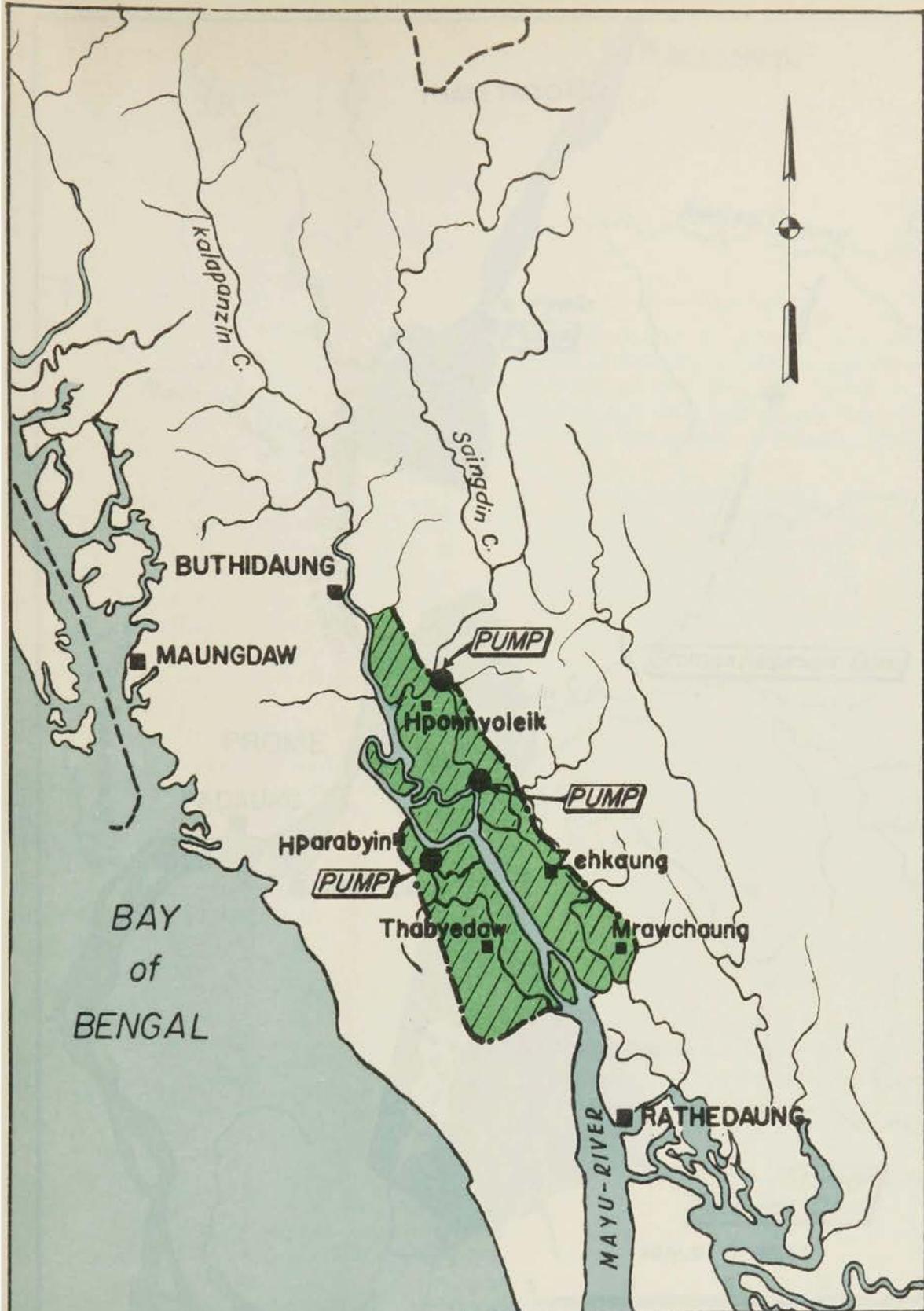


MINISTRY OF NATIONAL PLANNING

**PEGU AREA
IRRIGATION
DEVELOPMENT**

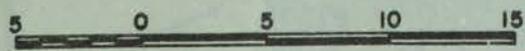
KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK RANGOON

DR. BY *E.J.A.* DATE PLATE
CK. BY *A.R.R.* MAY 53 NO. **7**



BAY
of
BENGAL

SCALE IN MILES

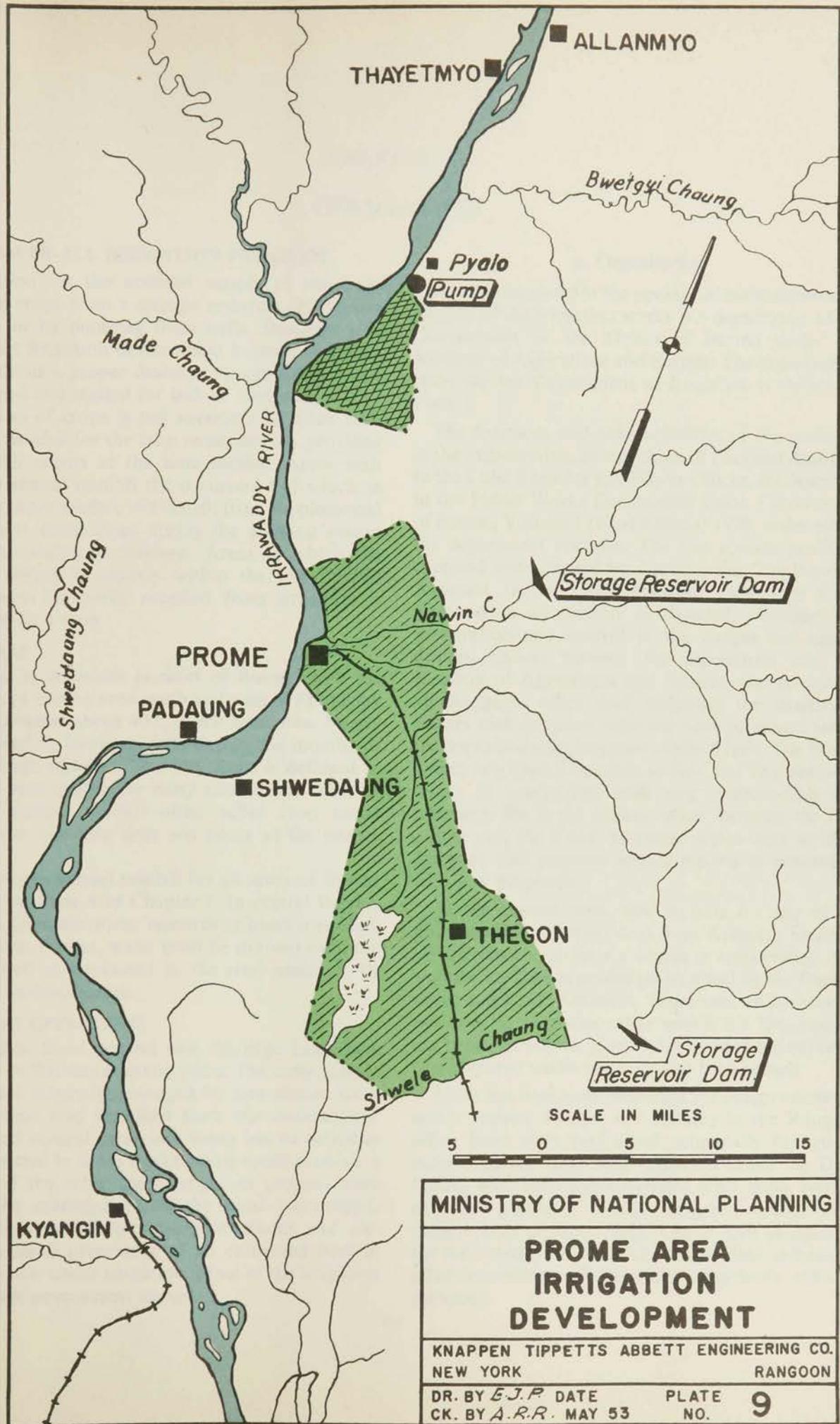


MINISTRY OF NATIONAL PLANNING

**BUTHIDAUNG AREA
IRRIGATION
DEVELOPMENT**

KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK RANGOON

DR. BY *E. J. R.* DATE PLATE
CK. BY *A. R. B.* MAY 53 NO. **8**



MINISTRY OF NATIONAL PLANNING

**PROME AREA
IRRIGATION
DEVELOPMENT**

KNAPPEN TIPPETTS ABBETT ENGINEERING CO.
NEW YORK RANGOON

DR. BY E.J.P. DATE PLATE 9
CK. BY A.R.R. MAY 53 NO.

CHAPTER IX

IRRIGATION

A. OVER-ALL IRRIGATION PROGRAM

“Irrigation” is the artificial supply of water to cultivated crops from a storage reservoir, by stream diversion or by pumping from wells. Drainage is a part of any irrigation development because land irrigated without a proper drainage system can become waterlogged and wasted for lack of aeration.

Irrigation of crops is not necessary in areas with sufficient rainfall for the crop requirements, provided the rainfall occurs at the time needed. Areas with adequate annual rainfall the occurrence of which is not at the times needed, will benefit from supplemental irrigation at those times during the growing season when the rainfall is deficient. Areas in which the growing season is entirely within the low rainfall period must be totally supplied from irrigation if there is to be a crop.

1. GENERAL

Rainfall is abundant in most of Burma, with the exception of the dry area south and west of Mandalay which represents about 40% of the total area. Nearly all the rainfall, however, falls during the months of May through October. The Dry Zone is deficient in moisture even during the rainy season, and areas of plentiful annual rainfall often suffer crop losses because the moisture does not occur at the proper time.

The average annual rainfall for all areas of Burma is shown on Plate 4 of Chapter I. In central Burma, irrigation from the water resource at hand is needed, and in lower Burma, water must be drained from the land as well as contained in the river channels by means of embankments.

2. PRESENT OPERATIONS

Irrigation, flood control and drainage have been practiced in Burma for many years. The early, simple works were originally managed by men elected from among those who benefited from the installations. Centralized control came into being but its activities were restricted to those works which could produce a profit, and the other small irrigation projects were left to the management of the local committees. Many of these fell into complete disuse and disrepair. A small percentage of all cultivated land in Burma is now under irrigation. Most of the irrigation projects are government owned.

a. Organization

An organization for the operation, maintenance and control of the irrigation works is a department of the Government of the Union of Burma under the Ministry of Agriculture and Forests. The organization chart for the Department of Irrigation is shown on Plate 1.

The functions and responsibilities of the positions in the organization, except those of Personal Assistant to the Chief Engineer and Works Officer, are described in the Public Works Department Code, Government of Burma, Volume 1 (First Edition) 1933, under which the department operates. The two specific positions excepted were created by special order. The Personal Assistant to the Chief Engineer assists the Chief Engineer in all matters as directed, including the preparation and control of the budget and expenditures, liaison between the department and the Ministry of Agriculture and Forests, and control of all Rangoon office staff including the draftsmen, tracers and designers who are also personnel under the Superintending Engineer, Delta Circle. The Works Officer is a special assistant to the Chief Engineer with duties in connection with new construction and revisions. He is the liaison officer between the field offices and the Chief Engineer, often acts as chief designer, and prepares special reports in connection with new proposals.

At the present time, new recruits for any of the positions in the Department from Assistant Engineer up are required to have a degree in engineering. New engineering college graduates accepted by the Department enter as Assistant Engineers. Advances in position, as vacancies occur within the Department, are based on period of service, provided the examination required under the code has been passed.

There has been very little need for design except for minor repairs. Design and drafting in the Rangoon office have been performed principally for special reports by the same staff employed under the Delta Circle, with technical assistance from those holding executive positions in the Rangoon office. Other construction or repair details have been prepared in the individual field offices as needed, often without the prior knowledge of the Chief Engineer's office in Rangoon.

The revenue staff, gate keepers, lock keepers, tracers, draftsmen, and clerks make up the balance of the permanent or semi-permanent employees. Survey parties are made up as needed, with the Sub-assistant Engineer or Assistant Engineer as the instrument man. The Revenue Staff includes canal surveyors, inspectors, and water-masters. The tracers and draftsmen are non-technical employees with a desire for that type of work.

The Department of Irrigation is charged not only with irrigation works but with flood control and drainage as well. In these fields of activity two canals, the Twante and the Pegu-Sittang, were constructed to transport agricultural products. This led to the assumption of navigation as one of the responsibilities of the Department. Operation and maintenance of the Pegu-Sittang and Twante Canals and the embankment work on the rivers necessitate the use of dredges and the maintenance of dredge crews as a part of the organization. The natural conditions and physical characteristics of the country divide the work of the Department into two distinct classifications; irrigation in Upper and Central Burma, and navigation, embankments and drainage in Lower Burma.

The Irrigation Department has always given technical assistance, within the limitations of its organization, to irrigation works managed by local village committees. This assistance has been made more effective by the establishing of Sub-division Officers for this purpose alone. The close contact of these officers with the particular villages involved has resulted in better cooperation, and many of the improved irrigation facilities have come through these contacts.

The supply of domestic water for the inhabitants in areas where canals exist is also a minor but vital role played by the Irrigation Department. Village tanks in Shwebo, Meiktila, Yamethin, Kyaukse and Mandalay districts get their supplies replenished from time to time from the irrigation canals. Mandalay, Meiktila, Yamethin and Shwebo now obtain much of their domestic supply from works managed by the Department.

b. Works

Although irrigation in the Dry Zone of Burma has been practiced for centuries, there are no extensive irrigation projects, and the supply of water is generally not dependable because there is no upstream storage for regulated supply. Water is supplied from natural stream flow diversion by low headworks and from numerous small storage tanks.

Early appreciation of the value of the plentiful water supply during the rains has resulted in the farmers using the simple means at hand for storage.

The paddy fields with their many bunds provide this major storage, which probably accounts to a great extent for the mono-crop culture. This type of storage, however, is useful only for the crop growing within the bunds at the time of storage. The small storage facilities and the uncertainty of stream flow limit the present irrigation to supplemental supply during the rainy season only. Crop diversification is practically impossible, and cultivation of crops during the dry season is not the rule because dry weather irrigation is not practiced.

The cultivated land under irrigation and its location are shown in Table IX-1.

TABLE IX - 1
CULTIVATED LAND UNDER IRRIGATION
(1948)

1	2	3	4	5	6
<i>Division</i>	<i>Total Net Sown and Fallow (thousand acres)</i>	<i>Total Land Irrigated in 1948 (thousand acres)</i>	<i>Per cent of all Cultivated Land under Irrigation</i>	<i>Per cent of Total Irrigated Land</i>	<i>Govt.-Owned Irrigation Projects (thousand acres)</i>
Arakan	1,252	—	—	—	—
Pegu	4,430	74	1.7	5.6	0.6
Irrawaddy	4,180	47	1.1	3.5	—
Tenasserim	1,948	62	3.2	4.7	—
Magwe	2,792	187	6.7	14.1	111
Mandalay	3,086	534	17.3	40.2	345
Sagaing	3,500	423	12.1	31.9	287
Total	21,188	1,327	6.3	100.0	743.6

Some of the irrigation systems are supposed to date from earlier than the 9th century. The canal systems in the Kyaukse and Minbu districts are the oldest. The systems were improved by various Burmese kings and many of the works used today were built or improved by the kings as early as the 10th century. The Kyaukse irrigation area is often referred to in Burmese history, and was once known as the economic center of the north. The regular annual increase in the land area irrigated is an indication of the appreciation of irrigation and the knowledge of the artificial application of water for crop cultivation. The acreages irrigated annually under the various systems now in use are shown on Plate 2. The locations of present irrigation works and areas irrigated are shown on Plate 3, represented by the dark green color.

Government-owned irrigation systems are not the source of all the irrigation in Burma, as may be seen in column 6 of Table IX-1. Present data regarding most of those projects not government-owned are not available, and many of the areas were not visited

because of the unrest in the country. Records available before the war were related to land revenue which was based on crop production. Most of these records have been destroyed, and not even the Irrigation Department has knowledge of the details of all the irrigation works.

Data relating to existing government-controlled irrigation projects are shown in Table IX-2. The data were compiled from the Administration Report of the Public Works Department Burma (Irrigation Branch) for the year 1939-40. Only the data of immediate interest are listed. More detailed information may be obtained from the Report.

Capital expenditures are all charges for the first construction and equipment of a project, charges for maintenance on sections not opened for operation, and charges for subsequent additions and improvements. Special rules apply in the case of renewals and replacements of existing works. The expenditures may include both direct and indirect charges which are specified as follows: works, establishment (surveys), and tools and plant, as direct charges; and capitalization of abatement of land revenue on area occupied by works calculated at 20 years' purchase, and audit on accounts charges at 1% on works outlay as indirect charges.

A brief description of the larger of the irrigation systems follows:

(1) Shwebo and Ye-U Canal Systems

These canal systems are fed from the Mu River by a diversion weir 455 feet in length constructed at Kabo. The Ye-U canal takes off on the right side of the river through a headgate structure with three Walton gates each 18 ft. 4 in. wide. The Shwebo canal takes off on the left side of the river through a headgate structure containing 20 gates of 5-foot diameter each. The diversion and headgate structures are integral, the diversion consisting of a masonry weir 455 feet in length provided with falling shutters, and two 30-foot-wide stony undersluice gates on the right end and four 40-foot-wide stony undersluice gates on the left end. The Shwebo canal system came into operation in 1906-07 and the Ye-U canal system in 1911-12.

(2) Mandalay Canal System

This system has its headworks at Sedaw on the Chaungmagyi River. The diversion consists of a masonry weir 310 feet in length with a subsidiary weir 500 feet long and an 80-foot-long undersluice at one end with the Mandalay canal headworks of 12 sluice gates, each 5 ft. 6 in. wide. Another structure of note is the aqueduct for the entire canal capacity across the Thapangaing Chaung for a length of 264 feet. Each side of the aqueduct is fitted with shutters, and when

the chaung is in flood these are dropped, the canal is closed, and the chaung flows both over and under the structure. The Mandalay canal system came into operation in 1902-03.

(3) Zawgyi River System

These irrigation works in Kyaukse District consist of five separate canals, the Nwadet Canal, Ngapyaung Canal, Thindwe Canal, Minye and Tamok Canals, and the Zidaw Canal. They were originally constructed during the days of the Burmese kings, and were later remodeled with modern masonry weirs constructed during the last part of the last century at an expenditure of approximately K23,77,000.

(4) Paunglaung River System

These irrigation works, also in the Kyaukse District, consist of four separate canals, Kinda Canal, Nathlwe Canal, Kyime Canal and Htongyi Canal. Like the Zawgyi River System, they were originally constructed during the days of the Burmese kings and later remodeled at a cost of approximately K21,48,000.

(5) Salin Canal System

This system is of more recent origin, operating originally in 1925-26. It is the last of more than a dozen canals on the Salin Chaung. The smaller systems, all located above, have older water rights, and except for the Khine Canal, are not under government control. The upper canals serve approximately 3,000 acres.

The diversion weir across the Salin River near Linzin is an overfall type ogee section of concrete, 750 feet in length with two undersluice gates each 60 feet wide. The headgate structure of three sluice gates, each 20 feet wide, serves the canal on the right side of the river. Little water reaches the headworks at low river flows. The Khine Canal headgate structure, three miles above Linzin, is somewhat of a temporary structure, and requires constant attention.

(6) Mon Canal System

The diversion weir across the Mon River serving canal systems from either bank of the river, is located at Mezali. The headworks consist of a weir 838 feet long, with 4-foot-high automatic falling shutters, one undersluice gate on the north side and two on the south side, each 40 feet in width. The canals are supplied through a headgate with three sluice gates on the north and a headgate with four sluice gates on the south, each gate 5 feet wide. Supplies of water are usually more than ample to meet the canal requirements. Passage of log rafts is allowed twice weekly. These irrigation works first came into operation in 1911-12.

TABLE IX - 2

PRESENT IRRIGATION IN BURMA

Government Control (1939-40 Report)

1 Name of Works	2 District Location	3 Water Supply Source	4 Minimum Flow Recorded (c.f.s.)	5 Canal Design (c.f.s.)	6 Irrigated Area Rainfall	7 Gross Acres Com-manded	8 Acres Irrigable	9 Acres Irrigated	10 Canal Miles		12 Capital Outlay to Date* Total K
									Main and Branch	Distributaries	
Shwebo Canal	Shwebo	Mu River	9-36	2,624	34-65	264,129	229,815	211,717	70-51	334-71	76,08,869
Mandalay Canal	Mandalay	Madaya River	177-00	1,576	33-69	132,696	126,641	92,061	67-70	132-80	66,04,319
Mon Canal	Minbu	Mon River	Not known	576	34-02	29,518	28,769	21,544	20-55	44-23	12,01,761
Zawgyi River System	Kyaukse	Zawgyi River	174-00	530	31-53	37,617	29,413	24,433	30-50	67-78	8,64,524
Nwadet Canal	"	"	174-00	100	31-53	8,600	5,200	4,106	7-50	7-50	1,32,817
Ngayyaung Canal	"	"	174-00	170	31-53	17,000	14,900	10,595	14-70	16-20	1,95,609
Thindwe Canal	"	"	174-00	380	31-53	33,250	23,400	20,054	21-60	36-70	2,11,025
Minye and Tamok Canals	"	"	174-00	911	31-53	48,000	41,100	5,231	21-14	39-44	9,08,402
Zidaw Canal	"	"	174-00								
Paunglaung River System											
Kinda Canal	"	Paunglaung River	244-00	900	30-65	53,000	42,400	36,193	42-20	69-97	13,40,877
Nathwe Canal	"	"	244-00	282	30-65	20,600	16,480	10,476	10-50	35-21	2,25,520
Kyime Canal	"	"	244-00	600	30-65	42,189	33,751	25,264	24-70	24-90	4,77,648
Htongyi Canal	"	"	244-00	80	30-65	4,570	3,656	2,646	7-50	—	92,849
Ye-U Canal	Shwebo	Mu River	9-36	1,765	35-15	145,482	128,900	107,433	63-70	192-50	62,18,863
Old Mu Canal	"	†	—	—	36-27	58,000	19,500	8,789	23-00	—	—
Mon Canals	Minbu	Mon River	160-00	1,382	35-28	125,309	119,822	79,140	53-80	163-50	78,22,678
Salin Canals	"	Salin River	—	670	32-30	—	29,700	21,406	21-70	54-40	41,72,504
Khine Canal	"	"	—	—	32-30	2,680	—	1,568	3-00	—	—
Inyin Canal	Meiktila	Thinbon Chaung	—	430	30-00	20,046	10,813	5,735	3-25	—	—
				Capacity (ac. ft.)							
			Drainage Area (sq. mi.)								
				19,300	33-45	66,066	55,485	42,437	—	18-74	9,38,351
Meiktila Lake	Meiktila	Drain Area Flow-off	240-00	13,500	37-14	34,330	27,302	27,239	—	35-41	15,56,344
Nyaungyan and Minhla Tanks	"	"	540-00	15,500	35-20	8,521	8,122	5,310	—	8-65	5,89,222
Kyaukse Tank	Yamethin	"	187-00	1,670	37-99	7,879	6,286	2,446	6-80	11-70	—
Taunggon Tank	Mandalay	Thapangaing Chaung	126-00	—	7,044	7,044	5,636	2,570	3-40	7-20	—
Htonbo-Sedaw System	"	Nadaunggya Chaung	139-00	—	9,300	9,300	7,440	4,168	4-72	—	—
Kana Tank	Myingyan	Drain Area Flow-off	91-00	6,850	32-71	4,073	3,258	1,019	—	—	—
Pyogan Tank	"	"	89-00	460	29-58	—	—	—	—	—	—
24 Minor Irrigation Works	Meiktila	"	—	—	31-37	100,844	80,675	30,725	—	—	—
13 Minor Irrigation Works	Yamethin	"	—	—	35-84	62,393	56,559	36,563	—	—	—

* Amounts shown are prewar value.

† Originally, the Mu River, now the various chaungs across which it runs.

(7) Man Canal System

The water supply for this canal system is from a masonry weir across the Man River at Aingma. This weir was originally of stone but was replaced by a similar structure of stone surfaced with concrete. The crest length is 400 feet and is approximately 300 feet downstream from the canal headgate. Coarse gravel enters the canal causing a gradual reduction in the capacity. The water supply in the river is not assured, therefore rotation of service is common.

(8) Other Minor Irrigation Works

Irrigation from tanks or reservoirs is also practiced over a wide area in addition to the irrigation by canals from the various stream diversions. These systems consist essentially of a tank or reservoir provided with suitable outlets to supply controlled water to a network of canals. The runoff from the rainfall in the catchment area of the stream feeding the tank is stored and released when required. The largest of these works is the Meiktila Lake which was originally constructed by the Burmese kings and later modernized with masonry outlets and escapes at a cost of approximately K9,39,000. Another large tank system is the Nyaungyan-Minhla Tank System which was constructed at a total cost of approximately K15,56,000. Numerous other small tanks may be found throughout Burma. The area irrigated from these supplies is limited by their small storage capacities and location.

Silting of the tanks has been very rapid, Meiktila Lake receiving 8 million cubic feet annually and the Nyaungyan-Minhla Tank receiving 11 million cubic feet annually. It is said that this silting did not occur until cultivation was practiced in the drainage area supplying these reservoirs, a practice that was not allowed in the time of the Burmese kings.

(9) Old Mu Canal

The irrigation system under this canal is of great historical importance and deserves mention because of its relation to a future irrigation development to be discussed later in this report. Just when the old Mu Canal was originally constructed has not been ascertained, but it is apparent that one of the Burmese kings used it to supply water to Shwebo. The original diversion works were constructed across the Mu River at Wetto but they were destroyed and never rebuilt. Continued difficulty with the upper end of the canal because of the large drainage courses through which the canal runs has been a factor in the delay in re-establishing the system to its original use. Many of the canal gate, control and drainage structures are maintained, and lands are irrigated from the canal and from the tank at the southerly end of the canal. The present

water supply amounts only to that flowing into the canal from the chaungs across which it runs. Assured supply from the canal is definitely limited.

(10) Twante Canal

This canal was constructed and is maintained by the Department for the transportation of essential produce, especially of rice and timber from Upper Burma. It is 21 miles in length, connecting the Rangoon River and the China Bakir River. The total cost was approximately K1,03,96,000. The canal came into operation in 1916-17.

(11) Pegu-Sittang Canal

This canal connects the Pegu and Sittang Rivers, permitting transportation to Rangoon from the Pegu District without necessitating passage via the open sea. It is 38 miles long with canal locks at each end to compensate for the water level variations between the canal and the rivers. To augment the water supply in the canal during the dry season, the Moyingyi Reservoir was constructed to store rainfall runoff. The total cost of the complete construction was approximately K79,46,000.

(12) Embankment Works

Embankments which protect over 1,150,000 acres of cultivated land were constructed and are maintained by the Department in the Delta and on the Irrawaddy and Sittang Rivers, and River Training Works in the Pyuntaza Plain. The individual works are these:

<i>Name</i>	<i>Area Protected</i>
Irrawaddy Embankments	755,974 Acres
Maubin "	142,808 "
Thongwa "	32,275 "
Sittang "	52,434 "
Yandoon "	57,616 "
Tamatakaw "	13,253 "
Ela "	5,155 "
Belin "	3,263 "
River Training Works in Pyuntaza Plain	116,072 "
	<hr/> 1,178,850 "

c. Field Control

The water distribution is maintained by the Irrigation Department from the main and branch canals and distributaries only. The distribution system to the individual farm plots has been constructed and is maintained by the farmers themselves. Assistance is given by the canal inspectors of the Department so that the supply of water will be economically and fairly distributed. Most of the farm services are uncontrolled openings, the supply maintained by holding

the water in the canal at a constant level. Turnout structures to these farm areas may release as much as 15 c.f.s. for distribution by the group under the turnout. All canal structures down to and including those supplying such services are of masonry or concrete construction with steel fabricated or iron gates. The operation of all gates is by hand and quite efficient in most instances except for time required in opening and closing them. The falling shutters at some of the weirs are raised by hand, a procedure in which the operator stands in water behind a raised shutter preceding the shutter he is raising or lowering. Quite often the sluice gates must be opened ahead of time to relieve the flow over the weir so that the shutters may be raised or lowered. None of the main, branch or tributary canals is lined. Several of the canals inspected are in need of realignment, reconstruction and lining. Many canal bank slopes are too steep and the berms too narrow.

The distribution systems serving individual plots and ownerships are essentially a series of hand dug canals and water courses maintained and modified from time to time by the farmers to fit their needs. Most of the structures are of stakes and mud with an occasional permanent structure in the more important laterals. It is not uncommon to see excess water adjacent to the fields since the supply is dependent on rainfall and therefore usually too plentiful at the wrong time.

Maintenance equipment of the Irrigation Department for irrigation works consists principally of cement mixers, dump trucks, welding units, compressors, pumps, workshop equipment, jeeps and inspection cars. Most work is by hand, materials being hauled in head baskets or trays and by bullock-cart. A large force is maintained for this purpose. Within the last two years, heavy construction equipment has been purchased, and it is understood that more is on order. The heavy equipment on hand at this time consists of two Tournadozers, four Terra Cobra scrapers and four dozers, two of which are D8 and two of which are TD10.

3. FUTURE IRRIGATION DEVELOPMENTS

The water resources from stream flow are abundant throughout most of Burma, as shown in Chapter I. Most of the supply is wasted, however, because it occurs in the rainy season of the year, and the storage facilities are sufficient for only a very minor percentage of the total.

The status of agricultural land in the Dry Zone in regard to acres under irrigation and cultivation is shown in Table IX-3. Other data included under Agriculture in Chapter VIII show that present production is low, much land in the Dry Zone is left

fallow and abandoned because of lack of water, other lands suitable for agriculture are not cultivated because of the lack of moisture, and crops are not grown during the dry season on a significant scale. This loss in full utilization of the land potential is a tremendous factor in the economic life of the country.

TABLE IX - 3
STATUS OF AGRICULTURAL LAND

<i>District</i>	<i>Acres, Irrigated</i>	<i>Acres, Dry Crop</i>	<i>Acres Suitable for Agriculture not Cultivated</i>
Lower Chindwin	110,400	804,300	343,000
Sagaing	55,100	796,500	141,000
Pakokku	116,500	762,600	452,000
Shwebo	628,300	491,400	350,000
Magwe	116,000	1,010,900	208,000
Myingyan	58,200	1,131,200	157,000
Meiktila	20,800	684,400	226,000
Yamethin	302,200	335,400	769,000
Kyaukse	140,200	134,700	65,000
Minbu	150,500	331,600	120,000
	1,698,200	6,483,000	2,831,000

It is evident that a liberal use of the available water supplies for irrigation in the lower Delta during the dry period would add materially to the welfare of the area through increased production, a wider variety of products for home consumption, more diversified crops, and a fuller utilization of labor during the slack periods caused by a one-crop economy.

The Preliminary Report proposed pump irrigation in the Delta area for the dry season only. Due to the excessive moisture during the rainy season, rice is the only crop that can be grown. During the dry period from December to May, the land is so hard that it is impossible to cultivate for any production without water. Location for pump installations and irrigation development will depend on experimental installations, ground-water tests for supply, water table elevation and salinity, stream tests for salinity, and soil tests for pH and crop capabilities. Only those areas best suited and satisfactorily passing the requirements in the before-named tests should be developed. A program of land classification surveys such as proposed in Chapter VIII is prerequisite to the proper determination of suitable lands.

Future irrigation development planning may be evaluated on the basis of benefits that would accrue from increased production by supplying water for crops in areas of low rainfall and low incomes because of dry farming; for a second crop during the dry season in geographically suited areas; for supplemental moisture as needed for crops in certain areas during the rainy season; and for stabilizing the water

supplies by the construction of storage reservoirs to store the water now uncontrolled and wasted.

Future irrigation development projects proposed herein have been predicated on use of the underground water resources by pumping from wells, gravity diversion from streams, or by pumping, or gravity diversion from streams regulated by storage dams proposed solely for irrigation purposes or in conjunction with hydroelectric power generation.

a. The Program

The planning of the future irrigation developments includes classification of the projects into a development program for Early Implementation, Near Future Consideration, and Far Future Consideration as shown in Table IX-4. The location of the projects is shown on the Location Maps, Plates 3 and 4. The listing in Table IX-4 is in order of priority. Although other irrigation developments may be feasible after a period of economic development, those listed and discussed here are considered most worthy at this time. The last four under "Far Future Consideration" are discussed very briefly.

(1) Early Implementation

Projects listed for early implementation are those deemed most suitable for construction within the next ten years. The classification is based on the benefits from increased production to the country and the particular area, and the economic feasibility and correlation in the over-all development plan for Burma. Estimated capital cost, annual charges, and benefits are discussed in Section C of this chapter and shown in Table IX-19. The individual projects are discussed in detail under "Specific Projects," briefly summarized as follows:

(a) Mu River irrigation project. The development of this river for irrigation was recommended for future study in the Preliminary Report, and was low on the priority list for construction. Studies which followed disclosed this project to be the most outstanding of all developments considered.

The area lying in the triangle formed by the Chindwin and Irrawaddy Rivers, from their confluence north to Wetto, is a vast acreage suitable for agriculture, nearly all of which is accessible for irrigation from the Mu River. Approximately 265,000 acres of the area are irrigated now under the Shwebo and Ye-U Canals, but only by river-run diversion and as a supplement during the rainy season. Lands are also irrigated under the old Mu Canal but only from a limited water supply stored from small drainage area runoff.

The Mu River irrigation project will irrigate over 1,100,000 gross acres for supplement during the rainy

TABLE IX - 4

FUTURE IRRIGATION DEVELOPMENTS

<i>Early Implementation</i>	<i>Location by Districts</i>
Mu River Irrigation Project	Shwebo, Sagaing, Lower Chindwin, Myingyan, Pakokku and Minbu
Yamethin District Irrigation Project	Yamethin and Toungoo
Kandaw Village Irrigation Project	Pakokku
Loikaw Area Irrigation Project	Kayah State
<i>Near Future Consideration</i>	
Thongwa Island Irrigation Project	Ma-Ubin
Meiktila Lake	Meiktila
Pakokku Pump Irrigation from Wells	Pakokku
<i>Far Future Consideration</i>	
Pegu Area Irrigation Development	Pegu
Ma-Ubin Pump Irrigation Development	Ma-Ubin
Buthidaung Area Irrigation Development	Arakan
Yandoon Island Irrigation Development	Ma-Ubin
Henzada-Zulun Pump Irrigation Development	Henzada
Prome Area Irrigation Development	Prome
Mon River Irrigation Project	Minbu
Yanbe and Yin River Irrigation Development	Magwe
Myitnge, Myittha, Shweli and Irrawaddy Rivers Development Projects	Kyaukse, Lower Chindwin, Bhamo and Myitkyina

season plus total requirements for a second crop in the dry season. Installation of power generation equipment in conjunction with the irrigation development will produce low-cost power for pumping from the Chindwin and Irrawaddy Rivers south as far as Seikpyu. This pump irrigation is also included as a unit of the Mu River Project, adding an additional 330,000 acres.

(b) Yamethin District irrigation project. This project is the outgrowth of a project report prepared by the Department of Irrigation, for the development of the Sinthe Chaung in the Yamethin District. It was proposed in the Preliminary Report for the irrigation of approximately 78,000 acres from a storage reservoir at a high elevation to reach lands in the vicinity of Yamethin. Detailed studies of the project resulted in a much more feasible project based on the development

of all the water resources in the upper valley of the Sittang River of which the Sinthe Chaung is a tributary.

The over-all project contemplates the development and economical use of the water supply from the Thitson, Shweda, Sinthe, Yezin, Ngalaik, Saing and Swa Chaungs, the Paunglaung River, and the Myaungmadaw Canal-Kyeni Tank installations. Each development may initially be considered as an independent unit for stage construction with final interconnection of several of the stages for distribution of total costs over a larger area. Of the 609,450 gross acres to be supplied with irrigation water from reservoirs on each of the units listed above, 400,250 acres are in the Yamethin District and 209,200 are in the Toungoo District.

The basic characteristics of the general layout are the location of supply canals at the foot of the hills on each side of the plains area and dams where the streams emerge on the plain so that high reservoirs can serve the canals. Although the main source of water supply is from these surface streams, the project includes the tapping of the underground water supply from which the water will be pumped to the land. The underground supply is to serve an area near the extreme northerly headwaters of the Sittang River east of the Nawin Chaung from Tatkon Village north to the Shweda Chaung.

Irrigation from minor works now operating in the area and installations to conserve and use the water supply as it is now available will be improved and incorporated in the project. The plains area between the Shan Hills on the east and the Pegu Yomas on the west will be benefited by an assured supply, not only supplemental during the rainy season crop period, but also for a second crop during the dry season.

(c) **Kandaw Village irrigation project.** This project was not considered in the Preliminary Report, but the area that will be benefited was a part of the total area of the Pakokku pump irrigation proposal. The reconstruction of an old embankment, which dates back to the same period as the original Meiktila Lake construction, will form storage facilities for all the runoff from a small stream drainage area. The tank thus formed will be near the north edge of Kandaw Village. The old system has been out of operation longer than anyone can remember, the embankment having breached soon after the original construction. The area to be irrigated under the project is adjacent to the village on the east and extends south to the Irrawaddy River. The soil is well suited for growing groundnuts, but because of the low rainfall, production is low and uncertain. The water stored in the tank will also be of great benefit for domestic use to several small villages around the tank perimeter.

(d) **Loikaw Area irrigation project.** Lack of detailed maps and field surveys has limited the study of areas for irrigation in the States outside of Burma proper. The lower part of the Yaungghwe Valley, in which Loikaw is the principal town, was visited and found to be topographically suited for irrigation. The project was not included in the Preliminary Report, but studies carried out since that time have placed it high on the priority for development.

The Balu Chaung flows nearly the full length of the valley from Inle Lake at the north end. This natural resource presents excellent possibilities for irrigation development. Small systems are now in operation in the valley so that cultivators with the water supply realize the use of irrigation. The water supply in the river is sufficient the year round if regulation and the means of raising it to the land are provided.

(2) Near Future Consideration

Projects listed for near future consideration are those which would be considered economically feasible after advance has been made in operation and construction techniques, the country is more settled, individual incentives demand more development, and other project developments have been completed. In some instances the development of hydroelectric installations to provide cheap power would be a factor in establishing the economic justification of the project under this classification.

Estimated capital cost, annual charges and benefits are discussed in Section C of this chapter and shown in Table IX-19.

(a) **Thongwa Island irrigation project.** This project is a unit of the Lower Delta pump irrigation development listed in the Preliminary Report. Its location is shown in Plate 5 and a general plan of the project is shown on Plate 6. The area to be benefited is surrounded entirely by streams and protected by levees on all but the southerly side. The project includes the addition of 12 miles of levee to close the ring, installation of drainage and flood gates at the upper and lower sides of the island, construction of a drainage canal through the low area and irrigation canals on the high perimeter, and installation of pumps for irrigation from the streams.

The sluice gates will be closed when the surrounding streams are too high for gravity flow, and the drainage pumps will discharge over the levee. The exact amount of the drainage that will require pumping cannot be determined without more data but it is estimated that it will amount to about 30% of the annual rainfall. The balance will run out by gravity, be used for irrigation or lost by evaporation, transpiration, and percolation.

The irrigation pumps will be installed to pump

either from the drainage canals or the surrounding streams to the high land which cannot be reached by gravity flow. Gravity flow irrigation will be possible under certain conditions from the drainage canal with the upper sluice gate open. Control structures will be constructed in the drainage canal for this operation. It is estimated that pumping will be necessary for only one third of the water supply required for irrigation.

(b) **Meiktila Lake.** Meiktila Lake has been silting in at a rapid rate. The inflow is from a drainage area made up of broken low hills with sparse vegetation.

Some of the area is under cultivation which no doubt adds to the heavy silt content of the inflow. The spillway facilities have been increased from time to time because of the decrease in storage capacity of the lake, and the dependability of the irrigation has been reduced by the decrease in water supply.

The capacity (Table IX-5) for the years 1896, 1923 and 1936 shows the amount of silting at various water levels in the two divisions of the lake. Reports on the rate of silting after 1936 show 8 million cubic feet annually.

TABLE IX - 5
MEIKTILA LAKE CAPACITY
(in acre feet)
SHOWING RATE OF SILTING
(Drainage Area 240.5 sq. miles)

1 Level	2 South Lake		3	4 North Lake			7 Combined Lakes		
	1896	1923 and 1936	1896	1923	1936	1896	1923	1936	
725	7	7	—	—	—	7	7	7	
730	90	90	—	—	—	90	90	90	
735	315	315	—	—	—	315	315	315	
740	1,055	1,055	—	—	—	1,055	1,055	1,055	
745	2,510	2,510	195	2	—	2,705	2,512	2,510	
747	3,310	3,310	556	43	10	3,876	3,353	3,320	
748	3,755	3,755	838	130	55	4,593	3,885	3,810	
749	4,240	4,235	1,220	280	145	5,460	4,515	4,380	
750	4,760	4,745	1,747	525	300	6,507	5,260	5,045	
751	5,325	5,295	2,433	875	530	7,758	6,170	5,825	
752	5,935	5,885	3,248	1,415	885	9,183	7,300	6,740	
753	6,592	6,520	4,178	2,110	1,285	10,770	8,630	7,805	
754	7,301	7,205	5,213	2,910	1,830	12,514	10,115	9,035	
755	8,063	7,950	6,353	3,810	2,500	14,416	11,760	10,450	
756	8,888	8,775	7,588	4,728	3,300	16,476	13,503	12,075	
757	9,803	9,690	8,902	5,744	4,200	18,705	15,434	13,800	
758	10,823	10,710	10,377	6,906	5,195	21,200	17,616	15,905	
759	11,970	11,840	11,992	8,186	6,270	23,962	20,026	18,110	
760	13,238	13,090	13,752	9,616	7,440	26,990	22,706	20,530	
761	14,634	14,470	15,667	11,136	8,740	30,301	25,606	23,210	
762	16,169	15,970	17,732	12,916	10,210	33,901	28,886	26,180	
763	17,791	17,580	19,937	14,861	11,900	37,728	32,441	29,480	
764	19,496	19,285	22,280	16,917	13,840	41,776	36,202	33,125	
765	21,301	21,080	24,765	19,167	16,020	46,066	40,247	37,100	
766	23,201	22,950	27,388	21,562	18,370	50,589	44,512	41,320	
767	25,181	24,880	30,143	24,092	20,975	55,324	48,972	45,755	
768	27,231	26,870	33,043	26,772	23,535	60,274	53,642	50,405	
769	29,351	28,930	36,083	29,602	26,355	65,434	58,532	55,285	
770	31,545	31,070	39,258	32,582	29,335	70,803	63,652	60,405	
771	33,801	33,290	42,571	35,727	32,480	76,372	69,017	65,770	
772	36,129	35,595	46,016	39,032	35,785	82,145	74,627	71,380	
773	38,539	37,995	49,601	42,497	39,250	88,140	80,492	77,245	
774	41,031	40,485	53,326	46,127	42,880	94,357	86,612	83,365	
775	43,621	43,075	57,186	49,917	46,670	100,807	92,992	89,745	

Note: The above capacities have been entirely recalculated from the original surveys.

The embankments and the control structures have been in use for many years. The investment would be of greater value with the silt removed to increase the storage capacity of the lake and permit an increase in the acreage irrigated. The increase in stored water would also stabilize the annual supply over a period of several years by a carry-over of stored water to balance out the dry year cycle.

The removal of the existing silt deposit in Meiktila Lake is only one part of the plan for the development. A program for the relocation of cultivators from the drainage area, and a system of replacing the vegetable cover must be diligently implemented so that the land erosion and silt movement into the reservoir will be virtually eliminated. As was mentioned previously regarding the lake, under the Burmese kings cultivation in the drainage basin area was prohibited, and it was not until after settlement was allowed in the area that silt was deposited in the reservoir in such quantity. Continual removal of the silt deposited at the present rate would involve a great annual expense.

The acreage irrigated annually from Meiktila Lake and the total annual rainfall are shown in Table IX-6

TABLE IX - 6
ACREAGE IRRIGATED ANNUALLY
MEIKTILA LAKE SUPPLY

<i>Year</i>	<i>Area Irrigated (acres)</i>	<i>Annual Rainfall (inches)</i>
1926-27	46,893	55.37
27-28	43,024	43.81
28-29	24,002	30.51
29-30	30,920	27.43
30-31	33,172	45.40
31-32	30,516	26.41
32-33	32,925	28.90
33-34	38,401	38.38
34-35	28,201	34.43
35-36	32,891	49.18
36-37	29,433	26.63
37-38	46,137	51.07
38-39	41,640	36.93
39-40	42,437	—
46-47	31,101	30.37*
47-48	32,595	41.22
48-49	29,587	27.75
49-50	29,547	26.20
50-51	29,191	46.04
51-52	27,770	34.43

*From 1st June.

for the years 1926-27 to 1939-40 and 1946-47 to 1951-52. It may be noted from these records that the acreage irrigated increases with the rainfall. This is substantiated by reports from the Department of Irrigation which state that the increases result from favorable rains. The time of year of the rainfall would also be a factor, but an increase in storage capacity of the lake would provide regulation for all conditions over a period of years. The record after 1947-48 is unreliable because of the unrest in the area.

Several methods may be used in removing the silt from the lake. Large earth-moving wheel machines, drag lines and trucks could work in the dry area, bullock-carts and hand labor could assist in silt removal in both the dry and semi-dry areas, and a small dredger could complete the work in the wet area. A plan of procedure using any one or all of these methods could be developed for immediate implementation. The removed silt could be deposited on the land outside the embankments and existing water in the lake could be held out of the excavation area by leaving a portion of the silt for a dike or ring embankment. The work would be done on the North Lake only, programming the operation over a period of years. Further study and explorations are required to finally determine the most advantageous solution. Such studies should include determinations of silt location and degree of saturation and should include an examination of the possibility of raising the embankments instead of removing the silt.

(c) **Pakokku pump irrigation from wells.** This project has not been adequately studied for technical feasibility because of insufficient data on the underground water resources in the area. Tests made on the soil, however, indicate it to be above average for oil crop production. The provision of supplemental moisture and nitrogen fertilizer is all that is necessary to obtain high production in groundnuts and sesamum.

The topography of the area is not suited to a large single project, but if the underground water resources are found to be adequate, small well installations can be made at each of the areas that are now under cultivation on the ridges. Cheap power should be available for this development, but exploratory investigations and test wells could be started immediately, using diesel power for the first installations.

The estimated capital cost, annual charges and benefits shown in Table IX-19 are based on one installation for each 40 acres; the well 300 feet deep, cased and perforated as required; the pumping head 20 feet; and benefits from one crop per year.

(3) Far Future Consideration

The existence of the necessary physical requirements such as natural water resources and agricultural lands

topographically suited to irrigation, made the projects under this classification worthy of future study and survey for the total irrigation development program. Any of those listed could provide production increases by supplying water for crops or providing drainage and reclamation facilities. Since not all projects can be constructed at one time, these have been scheduled for the time when development in other areas more in need will have been completed and greater production is desired. Estimated capital cost, annual charges and benefits are discussed in section C of this chapter and shown in Table IX-19. The details of costs and benefits are for the first five projects only. The others are considered to be too far in the future for such detailed planning.

(a) Pegu Area irrigation development. This development may be considered as another of the units of the Delta pump irrigation project proposed in the Preliminary Report. The General Location Plan is shown on Plate 7. This project would benefit an area in the vicinity of Pegu by pumping from the Pegu River into a distribution system starting approximately ten miles above Pegu. The provision of pumping rather than gravity diversion is determined by the low initial cost and the freedom from log rafting requirements. Sufficient flow will be assured in the river at all times by the construction of the proposed hydroelectric project approximately 30 miles upstream from the diversion works. Low-cost power will also be available from the hydroelectric project for the pump power.

(b) Ma-Ubin pump irrigation development. This development is another unit of the Delta pump irrigation development, the over-all general plan of which is shown on Plate 5. Map studies of the area indicate it to be geographically suited for such a development. Pumping is proposed from the Irrawaddy River. Although the tests enumerated heretofore as necessary for Delta pump irrigation development have not been made, it is reasonably safe to assume that the water supply for this unit is sufficiently fresh for use on the land. Drainage conditions appear to be excellent. The area lies in the triangle between the Irrawaddy and China Bakir Rivers and is well protected from overflow.

(c) Buthidaung Area irrigation development. Studies in conjunction with the Saingdin River Falls hydroelectric project have resulted in a feasible proposal for irrigation development in the Mayu River valley south of Buthidaung. Preliminary designs and layouts from map study indicate that the possibilities of the development are well established. Field surveys have not been made.

It is estimated that approximately 600,000 acre feet of water will be released from the hydroelectric

development reservoir during the dry season. Existing water courses on both sides of the Mayu River just south of the mouth of the Saingdin Chaung furnish excellent storage and supply canals. The development proposes the construction of gated dams at the mouth of these chaungs with pumping installations from the Saingdin Chaung and Mayu River for the water supply. Water may be supplied to the land on both sides of the storage canals either by low pump lifts or gravity flow. Pumping heads are estimated to be from two feet to eight feet. Amount of land to be irrigated would be at least 100,000 acres, the actual amount depending on the distance south the development area would be extended.

Continued study will determine more exact details of the project and the economic benefits that may be derived therefrom. General details are shown on Plate 8.

(d) Yandoon Island irrigation development. This development is another unit of the Delta pump irrigation development. The area is an isolated piece of land surrounded entirely by streams and protected by levees on all but the extreme southerly and easterly sides. A large part of the area is swampy with elevations below sea level at some locations. A part of the area is now being cleared, and gates have been installed at the upper end for silt recharging by flooding from the Irrawaddy.

This development proposal is to extend levees on both sides of the horse-shoe easterly to high ground, and install pumps for irrigation and drainage as required. It is estimated that all the water for irrigation will need to be pumped from the river because of the high rim around the area. It is difficult to estimate the drainage requirements at this time, but for preliminary design the amount of drainage pumping has been assumed as the water remaining after evaporation, transpiration and percolation, and gravity flow. This amount is estimated at approximately 30% of the rainfall.

By installing the irrigation pumps to lift water either from the river or from the island drainage canal, extra capacity added to the irrigation installation will also handle all the drainage. General plan is shown on Plate 5.

(e) Henzada-Zalun pump irrigation development. This development is also another unit of the Delta pump irrigation development. It proposes irrigation in the Zalun and Henzada vicinity with water pumped from the Irrawaddy River above Henzada and Zalun. The pump locations being above tide water assures a water supply free of salt. These installations will provide the entire pumping requirements, supplying a canal constructed from the pump sites down through the entire area. The connection and cleaning

of incomplete existing chaung courses will form the supply canals for dry season irrigation as well as provide drainage in the wet season. Excavation costs would be reduced to a minimum.

Only the area lying west of the Irrawaddy River and south from Henzada to the highway linking Danubyu and Thaunggyi has been considered for the development because of its topographical suitability to an improvement of this kind. A general plan is shown on Plate 5.

(f) **Prome Area irrigation development.** This project is in a very early study stage but its apparent physical possibilities as regards natural water resources available and agricultural lands topographically suited to irrigation make it worthy of inclusion in an over-all program for Burma. From cursory study of available maps, water supply may be from the Nawin Chaung, a river with a drainage area of over 500 square miles, and the Shwele Chaung with a drainage area of 200 square miles, or by pumping from the Irrawaddy River near Prome. The annual rainfall is not always sufficient for present crops but with an irrigation supply a second crop could be raised in the dry season as well as furnishing supplemental water for crops in the rainy season.

The one objectionable feature known about the area is the heavy silt surcharge of the rivers draining the Pegu Yomas from which the Nawin and Shwele Chaungs flow. Continued studies will determine the economic benefits from developing the area and the details of the proposed works. A general plan is shown on Plate 9.

(g) **Mon River irrigation project.** Detailed map studies of the area listed in the Preliminary Report to be irrigated under the Mon River multi-purpose project have disclosed only a part of the acreage geographically suited for services from the Mon River. Most of this acreage is presently irrigated by systems receiving river-run supply by diversion from three sources. These systems—the Mon River, the Man River and the Salin River—were discussed in Paragraph A-2-b of this chapter.

A weir at Mezali diverts water from the Mon River into a system of canals on both sides of the river for service to 119,800 gross acres. A weir on the Salin River, north of the Mon, diverts water for service to 29,700 gross acres. A weir on the Man River, south of the Mon, diverts water for service to 28,630 gross acres. Of this 178,130 gross acres, 122,090 acres are irrigated annually. The loss in acreage is due to unequal distribution of periods of water supply, inadequacies in the distribution system, and flooding by the Irrawaddy River of land adjacent thereto.

Additional benefits would accrue to the area by the

construction of a storage reservoir dam under the hydroelectric development, making possible the storing of water now wasted. The storage would be available for irrigation use on second cropping during the dry season and cropping on areas flooded in the wet season, for stabilization of the supply for supplemental water in the rainy season, and for expansion of irrigation to areas not now served. The three projects should be connected into a single system, however, to benefit all three areas and economically use the available water supply. This would require costly revising and rebuilding of portions of the existing works because the existing Mon River diversion is lower in elevation than either of the other two.

In addition, a storage reservoir on the Mon River of capacity for sufficient annual runoff to supply the acreage to be benefited by irrigation and for operation of the proposed hydroelectric installation, will inundate many acres now cultivated and numerous small villages. The entire development area is also in the hands of insurgents. It has seemed advisable to defer further study on this development to a later priority. Developments in other areas more in need will have been completed, and refinements in present installations will then be open for consideration. Location of the existing works and the area served is shown on Plate 3. Improvements to existing works would improve operation efficiency, but these must wait for settled conditions to return to the area.

(h) **Yanbe and Yin Rivers.** Irrigation from these rivers was listed in the Preliminary Report. A cursory study of maps available in the area of Taungdwingyi shows the area to be rather rough, and the rivers heavily silt-laden. Detailed field data would be needed for analysis of the area for irrigation. It has been concluded that these projects should be deferred until future needs require expansion of irrigation to less feasible areas in present economic conditions.

(i) **Myitnge, Myittha, Shweli and Irrawaddy Rivers.** Developments on these rivers were listed as possibilities in the Preliminary Report. Further study has shown little need for storage reservoirs on these rivers for irrigation. Each source yields an abundance of water but the demand will be far in the future, and the investment required excessive for present needs. No further study is recommended for the present.

b. Assumptions and Criteria for Planning

Except in cases where design is based on actual known data, assumptions and criteria for the particular conditions are established from similar situations on which information is available.

(1) Consumptive Use of Water

Consumptive use of water is the quantity of water in acre feet of cropped acre per year absorbed by the crop and transpired or used directly in the building of plant tissue, together with evaporation from the soil. The initial criterion to be established in the design of an irrigation development is this consumptive use. The amount of water supplied from the irrigation system is the difference between the consumptive use by the crop per season and the natural rainfall moisture in the soil for the plant use.

Consumptive use of water can be accurately determined if the soil has been classified and the crop to be grown on each type of soil is known. This procedure has been carried out to some degree throughout the Yamethin District project area and explained in detail in the discussion under Section B of this chapter. Consumptive use requirements thus established are necessary in the detailed design of a project and distribution allocations if the supply is short.

The preliminary designs in this Report have been based on consumptive use data provided from records of water used in irrigated areas, and rainfall utilization in non-irrigated areas determined from the difference between annual inflow and outflow. Detailed studies of these records, and the area conditions on which they were kept, established a definite relationship between consumptive use of water and temperature. Moisture and plant food are required in proportion to the heat utilized. The curve on Plate 10 for consumptive use of water based on effective heat, or the accumulation in day-degrees of maximum daily temperatures above germinating temperature, taken as 32°F. during the growing season, was prepared from this knowledge and data. Maximum daily temperatures during the growing season, length of growing season, rainfall, and inflow and outflow from the area must be known in addition to using the curve to determine consumptive use of water for a locality.

Sufficient data, together with assumptions based on knowledge of local conditions in Burma, have made it possible to establish a reasonable value for annual water requirements for irrigation planning. Consumptive use has been established by plotting day-degrees on the curve; the value thus indicated less the average annual rainfall, less runoff, being the water service per acre.

Experience and observation have shown that there is very little plant growth in the unirrigated areas during the dry season in Burma. Practically all of the annual precipitation may be assumed as being used up during the rainy season and early part of the dry season by runoff, evaporation, and transpiration.

Therefore, water service requirements have been determined for each crop period as a complete cycle in itself rather than for the year as a whole.

The irrigation demand used in the general planning of the projects is as follows:

(a) Mu River irrigation project, Yamethin District irrigation project and Loikaw Area irrigation project. Based on consumptive use of water determined as described heretofore.

Dry season crop, canal evaporation included: 36 inches.

Rainy season crop, canal evaporation included: 12 inches.

Canal seepage losses are assumed as remaining in the area.

Well Irrigation:

Both crop seasons: 36 inches total (on the assumption that crops requiring less water would be cultivated under well irrigation).

Maximum water requirement any month: 12 inches (based on detailed studies made for Yamethin District irrigation project).

(b) All delta pump irrigation developments, including Pegu and Buthidaung areas. Based on assumption rather than method described heretofore, because of the lack of specific data.

Dry season crop irrigation only.

60 inches per season on 30% of the area (rice crop).

12 inches per season on 70% of the area (other crops).

(2) Data Used in Studies

Detailed field data and investigations necessary for design plans are not complete. Specific local data and surveys used in the planning are as follows:

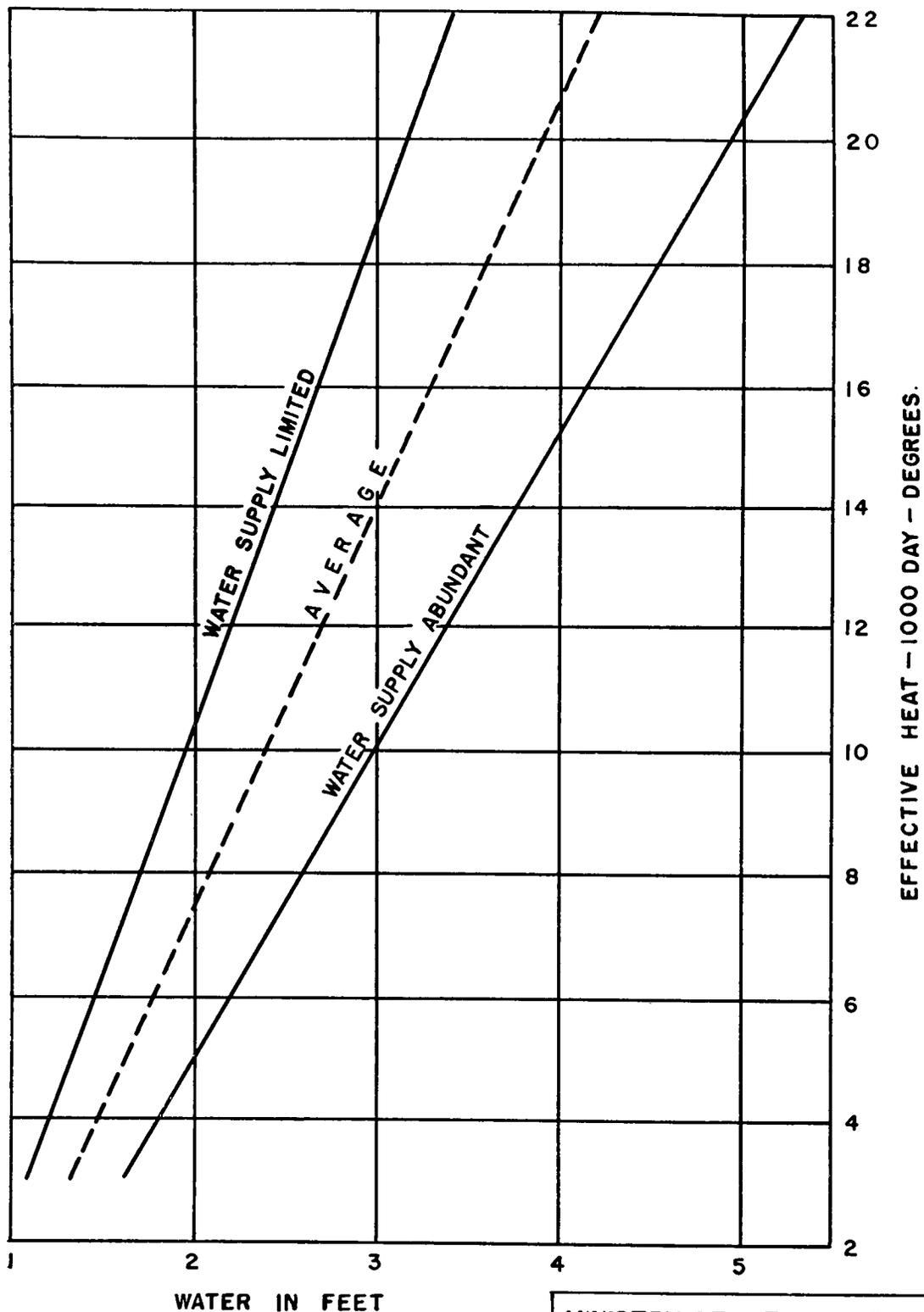
Settlement reports for data on economic conditions in an area, general soil information, rainfall, and crops raised.

One inch per mile scale maps by Air Surveys of India for drainage areas and topographic characteristics for canal location and dam locations, and determination of reservoir capacity and area to be irrigated.

Runoff factors for stream flow were obtained from existing reports, most of which are incomplete and serve only as a basis of assumptions.

Crops yields and soil classification from report "An Economic Classification of Land in Burma" by J. T. Sanders and U Ba Tin.

Report of reconnaissance survey of dam and reservoir sites on the Paunglaung River, Yezin and Thitson Chaungs by the Burma Geological Department. Geological data on the project areas from the same Department.



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