


AN ABSTRACT OF THE THESIS OF

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Title ECONOMIC, POLITICAL, AND PHYSICAL PROBLEMS  
INVOLVED IN EXPANDING THE CULTIVATION OF SWAMP  
RICE IN SIERRA LEONE

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Swamp rice offers tropical populations the most feasible means of obtaining a dependable and plentiful supply of protein-rich cereals. An acre of swamp rice land will support many persons and the crop does not cause erosion. A further production of this type of rice appears warranted in Sierra Leone and perhaps in other areas in Africa where the soils and terrain are suitable and there is enough water.

This study surveys economic, political, and physical problems involved in the cultivation of swamp rice in Sierra Leone and is an interpretative research project based on information obtained by interviews and study in the field during a visit to that country. Library research was also utilized, but only for general background, because little material about swamp rice in Sierra Leone is available. In Sierra Leone agricultural reports, land surveys, and scientific articles were consulted and discussed with their authors. Interviews were held with Government Ministers, Agricultural Officers,

scientists, political and economic experts, and rice growers and traders.

As a result of these investigations it appears that swamp rice is an excellent crop for Sierra Leone, for it can be grown in reclaimed mangrove swamps and coastal grasslands, and does not cause erosion as does upland rice. Adequate acreage remains available for future development of swamp rice farming. The climate is well suited to rice growing, and the coastal soils are fertile.

Moderate capital investment will be required for the reclaiming of the southern mangroves, the clearing of grasslands, the building of empolders to keep out salt water, the drainage of permanently-flooded swamps, and small dams or bunds for flood control on some of the rivers.

The problem of land tenure in Sierra Leone, however, is a serious one. Litigation over land ownership is especially prevalent in the north where the farms are small and virtually owned by individual families. In the south rice schemes have been developed as cooperatives on unused land owned communally by the tribes. In this area the matter of individual incentive is an important consideration.

Another inhibiting factor is the labor supply, which in the swamp-rice farming areas is inadequate for further land development. New-comers are resented in local areas and, moreover, the rigors of swamp farming discourage settlement. The improving educational

system has had an effect of reducing the local labor supply. High wages and prices may be the best way to encourage people to farm swamp rice.

The long-run market potential for swamp rice is favorable, especially within Sierra Leone itself and in Africa. Many people in Africa are already turning to rice as a staple in their diet.

ECONOMIC, POLITICAL AND PHYSICAL PROBLEMS  
INVOLVED IN EXPANDING THE CULTIVATION  
OF SWAMP RICE IN SIERRA LEONE

by

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ECONOMIC, POLITICAL, AND PHYSICAL PROBLEMS  
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CHAPTER I

THE PROBLEM

Introduction

In countries with a subsistence economy, it is difficult, if not impossible, to develop industry without first improving agriculture. Cash crops for export must be developed to provide capital for industry and money with which people can buy manufactured products. Men cannot be taken from the fields until those left at home can produce more food per capita than they do now in their subsistence economies. African nations are aware of the need to raise the standard of living of their people, but economic progress is complicated by rapidly increasing population. In some parts of Africa, an increasing pressure of population has caused the people to be less well-fed today than they were 20 years ago.

On the basis of present knowledge, Africa appears to have relatively few extensive areas of soils with a high level of natural fertility. Some serious erosion problems exist, and the climate is likely to be severe. During the years when population was at a stable subsistence economic level, the problems of poor soil and erosion were partially

solved by the centuries-old system of "ladang." This is a shifting agriculture based on slash and burn, on cultivation for two or three years, and fallow for eight to twelve years. Today, because of population pressure, ladang cannot be employed everywhere; "living space" is at a premium, and the people do not possess sufficient land which they can allow to lie fallow for the required periods of time.

### Statement of the Problem

In tropical lands the cultivation of swamp rice is a good way to ensure a steady and abundant supply of cereals and to check erosion. Often, two crops can be grown in a year, and no fallow periods are necessary. Perhaps a further production of it is warranted in those areas of Africa that have suitable soils, terrain, and enough water. This study will survey economic, political, and physical problems involved in the cultivation of this cereal in Sierra Leone, a specific area of tropical Africa that meets the three requirements.

### Purpose of the Study

Much controversy has arisen concerning the advantages of a swamp rice culture in Africa as a substitute for the outdated ladang system. The purpose of this study is to appraise the opportunities and limitations of swamp rice production as an effective measure in the economic development of Sierra Leone. The following questions

pertaining to the physical, economic, and political problems involved will be discussed.

Physical. Are there suitable lands available for expansion of swamp rice growing? Can obstacles related to the required irrigation and drainage be overcome? How critical are pests and diseases?

Economic. A number of questions need to be considered in the economic sphere. What are the characteristics of the labor supply? What are the merits of rice as a cash crop as well as a subsistence crop? Are markets available? What are the capital requirements? Is transportation adequate?

Political. Will political elements be the final determining factor in the success or failure of schemes to improve a country's economy? May petty rivalries among tribes make it difficult to adopt schemes that are best for the country as a whole, and may intense preoccupation with the national interests limit the quest for world markets for cash crops? And we can ask ourselves whether there are other political and social questions relevant to this study. Should development schemes be initiated on a small scale or a large scale? What are the problems of changing traditional systems of land tenure? Also, can the West African peasant be inspired to accept a more modern way of life? Education will be important.

It is to be hoped that this study, in addition to throwing some light on a few of these questions and adding to the knowledge of the

physical, economic, and political problems connected with swamp rice production in Sierra Leone, will point out the complexities of the problems.

### Delimitation

Sierra Leone was chosen as the country to be studied because it is small, the source materials are in the English language, and the country has a relatively stable government.

### Sources of Information

This study is an interpretative research project based on information obtained by field study and interviews in Sierra Leone, supplemented by library research. Although much background information is available in libraries, little printed material exists in the United States about the growing of swamp rice in the country of Sierra Leone. For this reason a two-week visit in Sierra Leone was important. Agricultural reports, land surveys, and scientific articles were consulted and discussed with the persons who had written or edited them. Interviews were held with Government Ministers, Agricultural Officers, scientists, political and economic experts, and rice growers and traders.

## Method of Presentation

The survey of the problems connected with expanding a swamp rice economy in Sierra Leone will be preceded by an overview of the land and its inhabitants. A discussion of the history of swamp rice in Sierra Leone and the methods of rice growing will comprise the next section. Present-day farming methods in three different types of swamps are emphasized.

A discussion of the physical, economic, and political problems will comprise the largest segment of the study. These topics will be discussed separately, but because they are all interrelated, there will be an overlapping. The problem of education is both political and economic and is included in the political section. The nature of the labor supply is also both political and economic but will be presented under economic problems.

Although the political scene is relatively stable in Sierra Leone, policies are constantly changing. This has made it difficult to pinpoint definite policies in regard to swamp rice. Political information in this study has been updated to the summer of 1964.

Figures pertaining to economic problems are largely inaccurate and often unavailable. A broad survey was made of the local and export market situations by interviews and by reading studies of Sierra Leone's total economy. It was possible to discover the nature of the

labor supply but not the specific number of people available.

The physical problems will be treated with greatest attention to detail in the study, because more data are available.

### Definitions

The following terms are defined as used in this study:

Ladang: A system of agriculture whereby land is cleared by slashing trees and burning them, the land is farmed for two or three years, and a fallow period follows for eight to twelve years. Thus farmers move frequently from place to place.

Paddy: Unmilled or rough rice, either growing or cut.

Scorch: A disease of the rice seedling.



## Chapter II

### OVERVIEW OF LAND AND PEOPLES

#### Physical Environment

Sierra Leone is a small country in tropical West Africa, lying along the Guinea Coast and located at the western end of the Guinea Gulf where it joins the Atlantic Ocean. It extends inland from the sea about 180 miles. The country contains a former British Colony and a former British Protectorate. The Republic of Guinea lies to the north and west and Liberia to the east. Sierra Leone is roughly circular in shape, is about the size of Massachusetts, Vermont, and New Hampshire combined, and has an area of 27,925 square miles.

The country of Sierra Leone consists of the undulating, much dissected westward slopes of the Futa Jallon highland. It is a well-watered and hilly area. The seaward face of the Sierra Leone Peninsula is composed of thickly-wooded ranges with conical peaks which, in the case of Mt. Horton, attain a height of 2,416 feet. This is one of the few points on the African coast where there is high land near the sea; elsewhere in Sierra Leone a low coastal plain extends inland 30 to 50 miles. The plateau next to this plain, which forms the greater part of the country, has an altitude varying from 890 to 3,000 feet. Mountains exceeding 5,000 feet in elevation are found on the

northeast border near the sources of the Niger River (Figure 1, p. 109).

The hydrography of the country is comparatively simple. Six large rivers rise in the Futa Jallon highlands in or beyond the northern frontier of the country and traverse Sierra Leone in a general southwest course. These rivers are the Great Scarcies and the Little Scarcies in the north, the Rokell and the Jong in the center, and the Sewa and Moa in the south (Figure 2, p. 110). In addition, several shorter rivers also flow to the west and empty into the ocean. The tidal rise and fall of Sierra Leone's rivers is an important factor in the growing of swamp rice in the country, for the tidal fluctuations provide natural irrigation.

Because rapids or cataracts occur in their middle course, none of the rivers are navigable for more than short distances. The lack of adequate river transportation is a problem in Sierra Leone. The mouth of the estuary of the Rokell River provides a deep inlet which forms a safe harbor accessible to large ships. At its entrance on the southern shore lies Freetown, the capital city of the country.

In Sierra Leone rainfall is by far the most important climatic factor. Annual precipitation occurs from April to November with a maximum in August. The climate is monsoonal, and the rainy season falls in the summer. Rainfall is heaviest on the coast near Freetown, and here the water surplus each year attains 218.6 centimeters (Figure 4, p. 112). During the rainy season the rivers rise to great

heights, sometimes 29 feet above dry-season levels, and carry huge tonnages of soil to the sea. Rice is not grown in these heavily-flooded areas, but only where the flooding does not exceed 15 feet.

The rainy season is the most unhealthy time of the year; fever is more prevalent, and activity is especially trying in the steamy climate. The rivers are in flood, and much of the lowland is under water. There is a high percentage of cloud cover (61, p. 40).

Most of the natural vegetation in Sierra Leone has been modified from its original growth by man's activities of felling, burning, cultivating, and otherwise disturbing the natural balance of the forests (83, p. 93). The natural vegetation is divided into four zones: a mangrove swamp belt; patches of rain forest; a closed forest (zone of transition between a rain forest and savanna); and a tall-grass savanna zone in the northeast (Figure 5, p. 113).

The coast line, the creeks and the lower courses of the rivers are lined with mangroves, which have grown on the silt carried down from the highlands for centuries. These trees produce adventitious roots which descend in new places and send up new trunks. The phenomenon has anchored the silt at the rivers' mouths and formed additional land. Near the mangroves are areas of grasslands, which are found especially in the south in the many swampy areas at the mouths of the rivers. Some of these rivers have changed their courses so many times that they are a maze of tangled waterways and meandering

channels and almost join each other before emptying into the ocean.

The mangroves and coastal grasslands are the best areas in Sierra Leone for the growing of swamp rice. The most fertile parts of Sierra Leone are Sherbro and Mendiland in the southwest. In the northwest the Bullom (lowland) district between the Great Scarcies and the Rokell rivers is flat and also fertile. It is primarily in these two areas that swamp rice is now grown (Figure 6, p. 114). Fertile soils in these areas are derived from the silt brought down from the highlands during the flooding season.

### Population

The population of Sierra Leone in 1960 was 2,450,000 people (28, p. 15). The urban population around the year 1950 (percentage of population in towns of 5,000 or more) was 4.8 percent of the total (54, p. 65). The country is inhabited by various Negro tribes, principally the Mende and Temne who make up about 60 percent of the population. Other important tribes are the Bullom, Limba, Koranko, Sherbro, Lokko, Kono, and Fula (Figure 7, p. 115). The tribes who cultivate swamp rice are the Bullom, Sherbro, and Temne. A few of the Mende and Lokko people commute to the swamps on the coast to grow rice there. The people who live in the Freetown area, the site of the former Colony on the seacoast, are mostly Creoles.

With an average population density of 90 persons per square

mile, Sierra Leone would appear to possess a good labor supply (Figure 9, p. 117). As pointed out in an interview with Mr. James Bartlett of the United States Embassy in Sierra Leone, however, the great majority of the people have worked for themselves, and thus industry has been slow to appear (7).

### Cities

Freetown, the country's major seaport and the capital city, is situated about halfway down the seacoast on the Sierra Leone Peninsula, the location of the original British Colony. Bo, the former administrative center for the former British Protectorate and now the provincial capital of the Southern Province, has approximately 30,000 people (7). Other cities with a population of 5,000 to 10,000 are Kenema, Makeni, Magburaka, Kabala, and Lunsar (Figure 8, p. 116) (7). Falaba, near the northeast border, Kambia on the Great Scarcies River, Pendembu, Pujehun in the south, and Sefadu near the eastern diamond diggings are other important towns (Figure 8, p. 116). Bonthe has declined in importance as a port on the southern coast.

### Transportation

Reference to Figure 8 (p. 116) reveals that Sierra Leone lacks a good transportation system. Especially during the rainy season it is difficult to travel from one region to another. Roads are not paved

except in and near the former Colony area around Freetown, and often the outlying areas are completely cut off. Two main railroad lines lead from Freetown, one toward the north and the other toward the south. They lead to mineral holdings or palm oil plantations and not necessarily to population centers. This absence of adequate transportation has held back general economic development and has prevented coherence throughout the country. When building the Sierra Leone railroad lines, the British selected a very narrow gauge. This hinders economic regional development with neighboring Guinea or Liberia, for their railroad gauges are wider.

### Economy

The economy of Sierra Leone is largely based on agriculture and mining, as shown in Table 1. Agriculture has mostly been confined to the cultivation of food crops for home consumption -- chiefly rice and cassava. External trade was for many years dependent upon the oil palm and the kola nut, and this trade was conducted mainly with England, since Sierra Leone was a colonial possession of that country. In the 1920's England was responsible for developing the oil palm plantations. The oil palm is still the most important forest product and leading agricultural export (Table 1). Others are kola nuts, cocoa, and coffee. Recently cotton was introduced into the country, which provides Sierra Leone with a basis for some local industry.

TABLE 1  
EXPORTS OF SIERRA LEONE - 1960

Exports	1,000 U.S. dollars
Coffee not roasted	1,817
Cocoa beans	1,949
Palm kernels	8,168
Iron ore and concentrates	11,578
Diamonds uncut and unworked	<u>46,150</u>
Total exports	72,596

Source: United Nations: Economic Commission for Africa. African statistics. Addis Ababa, Ethiopia, 1962, p. 67.

TABLE 2  
IMPORTS OF SIERRA LEONE - 1960

Imports	1,000 U.S. dollars
Food, beverage, and tobacco	22,900
Basic materials	1,400
Mineral fuels	12,100
Chemicals	4,400
Textiles	17,500
Metals	8,800
Machinery and transport equipment	14,600
Other manufactures	<u>18,300</u>
Total imports	73,800

Source: United Nations: Economic Commission for Africa. African statistics. Addis Ababa, Ethiopia, 1962, p. 100.

Production of minerals is important; they account for the bulk of the country's exports (Table 1). Diamonds are found in several areas, especially in the headquarters of the Sewa River in the east. Iron is another important mineral; titanium and bauxite are available; and off-shore oil is a possibility (69, p. 236). Mining, however, has taken people from the land and caused food shortages (126); this is one reason why food has to be imported in large quantities (Table 2).

Sierra Leone's trade historically has been channelled towards England and the Commonwealth, but in recent years (especially since independence) The Netherlands and West Germany have increased their participation in two-way trade, and Japan in its import trade. The United States is now participating in about four percent of Sierra Leone's trade (7). England and the United States are the two countries most responsible for aiding Sierra Leone in its development at the present time.

### History

The history of Sierra Leone is tied up with the issue of slavery. A group of Englishmen established a settlement at the site of Freetown in 1787 for American Negroes who had gone to England to escape from their owners during the War of Independence or who had been captured by the British and then freed. After 1807, when England had declared slavery illegal, many Negroes rescued from slave ships



by the British were also sent to Sierra Leone. At that time and for many years afterwards the colony was an unhealthy place in which to live because of the prevalence of disease.

The Sierra Leone Colony became a possession of the British Government, and in 1896 a large region around the original settlement was proclaimed a British Protectorate after an agreement had been made with France concerning the boundaries. In 1927 slavery was abolished in the Protectorate, and 215,000 slaves were freed. Slavery was never practiced in the Colony. Land could be owned in the Colony, but in the Protectorate the land still belongs to the tribes, just as it has for centuries. These facts point toward the large economic and political gulf between the two areas.

Historically, Sierra Leone was in some ways the most advanced territory in British West Africa; it boasted the first railway, the first hospital, the first municipal council, and the first college (69, p. 233). More than a hundred years ago Sierra Leone students were attending Fourah Bay College in Freetown and also secondary schools. Ghana, Nigeria, and French West Africa were sending their brightest youth to be educated in Sierra Leone.

### Politics

Among the various people within the country there is a lack of homogeneity. Not only do the many different tribes in the former

Protectorate have a long history of disagreements, but also a cleavage exists between the peoples of the former Colony and the former Protectorate. Added to these problems is the fact that national boundaries cut through the holdings of several tribes (Figure 7, p. 115).

The country of Sierra Leone has traveled a moderate and gradual road to independence, which was gained in 1961. Despite a long preparation for independence, however, political responsibility has proven difficult for this new nation. Lack of experience and confidence hampers the process of making important decisions and leads to confusion.

For all practical purposes, the Government has to work through the paramount chiefs and the lesser chiefs (there are 140 chiefdoms) (125). The Government has little control over them; any new economic, social, or political schemes must have their approval and support. When a new plan is presented to a district council, which is made up of representatives from all the chiefdoms and an administrative officer of the Government, the chiefs are usually willing to listen, but it does not follow that they will implement what the Government desires. The tribes are very conservative. Translating government research or a new program to the village level is difficult.

## CHAPTER III

SURVEY OF SWAMP RICE PRODUCTION  
IN SIERRA LEONEHistorical Review

Diversified opinions are held about the origins of swamp rice in Sierra Leone. One source claims that an indigenous swamp rice (Oriza glaberrima) was cultivated in northern Nigeria at least 4,000 years ago and that Oriza sativa, another swamp rice, might have come across the Sahara from the East (56). Another source asserts that, while upland rice might have been indigenous or might have come from the East long ago, the Portuguese introduced swamp rice (Oriza sativa) from the Far East around 1500 A. D. (34).

According to H. David Jordan, Director of the West African Rice Research Station in Sierra Leone, swamp rice (Oriza glaberrima) was first grown in the Scarcies area in the north of Sierra Leone in the 1880's by farmers who were extending upland rice areas down to wetter areas as population increased. Later more favorable varieties (Orizae sativae), which brought higher yields, were obtained from Indo-China (56).

The Temnes people who live in the Scarcies area were originally from the interior but had moved to the seacoast by the time the

Portuguese arrived around 1500 A. D. (34). They cultivate mostly swamp rice. On the other hand, the Susu, who live over the border in Guinea, are familiar with only upland cultivation (7).

As for transplanting, which is such an important part of rice farming on the Scarcies rivers, it is believed that the idea of transplanting may have been conceived when at an early period some rice pre-germinated before a planting; the shoots were planted and matured to abundant growth. In any case, transplanting was practiced soon after rice was first cultivated in the swamps (56).

The northern mangrove areas around the deltas of the Scarcies rivers were planted to rice primarily in the years 1930-38, and very little of these mangrove lands has been developed since; instead, the newer farms have been in deeply-flooded swamps and lowlands along the creeks (56). The fully-developed swamp rice areas in the year 1962 were 38,000 acres in the Scarcies' estuaries, 3,000 acres in the Boli inland swamps, and 9,000 acres in the southwest grasslands, a total of only 50,000 acres. These figures included what were formerly mangrove, creek, and grassy swamp areas (126) (see Figure 10, p. 118).

The flooded rice field still plays only a small part in the economy of West Africa and in Sierra Leone, even in districts in which natural conditions make rice growing possible (37, p. 143). This is unfortunate, for the flooded rice offers men in the tropics the best

chance to obtain a yearly sufficiency of carbohydrates without risking severe erosion (37, p. 101).

Swamp rice and perennial forest crops are the exceptions to the system of slash and burn and bush fallow which has prevailed so long in Sierra Leone. They do not lead to infertility of the land and erosion as does ladang, when the pressures of population prohibit its proper use. Pierre Gourou, prominent geographer and authority on tropical agriculture, believes swamp rice is important for Sierra Leone, since 500,000 acres of coastal marsh are available for cultivation (37, p. 95).

For many centuries rice has been the most important crop for food in the western Guinea Coast area of West Africa (an area 1,000 miles long and 300 to 400 miles wide). Until recently, however, the rice economy was based only on upland cultivation on farms located inland (120, p. 5). Since the 1930's the emphasis has shifted to swamp rice, especially in the coastal areas. Rice seems to be increasing in popularity as the people become more urbanized and have greater wealth. From a nutritional point of view, this increase is considered desirable, and therefore the Government has given rice production an important place in development programs (120, p. 5).

In the 1930's a program of subsidies to clear swamps for rice cultivation was launched. In 1934 the Sierra Leone Department of Agriculture established a rice experiment station at Rokupr, about

20 miles from the mouth of the Great Scarcies River, for experimental work on rice growing in tidal mangrove areas. The station also provided pure seed of improved varieties, which the Department of Agriculture distributed to local farmers on a loan basis (117, p. 3). Between the years 1938-45, 85,000 bushels of seed were made available (20, p. 241). This occurred during years of considerable rice farm expansion, and the improved seed contributed to the high yields per acre. Pure seed of suitable varieties is essential for maximum development of new areas (58, p. 4).

In view of increased interest in rice by the British West African territories, suggestions were made at the close of 1947 for the expansion of the Rice Research Station at Rokupr in Sierra Leone. A plan was prepared whereby the capital costs would be met by a grant under the Colonial Development and Welfare Act, which would also provide half of the running cost, the other half to be met by contributions from the territories concerned (117, p. 3). The plan was supported by Nigeria, Ghana, Gambia, and Sierra Leone. Since the station was small, it continued to be administered by the Sierra Leone Department of Agriculture. Five years later additional buildings were completed and a larger-scale research program was begun at Rokupr, which already had become a major interterritorial research station (59, p. 773).

The main station at Rokupr consists of a 66-acre swamp rice

farm contiguous with the estuary of the Great Scarcies River, which is irrigated by tidal flooding with fresh water throughout the flooding season (See page 23 for further discussion of tidal flooding). In addition, the station maintains its own area for cultivation of upland rices as well as small areas on other types of soil in different parts of Sierra Leone.

The station adopts a practical approach by trying to suit rice varieties to the present environment (86). At the same time it engages in pure research, and the members of the staff frequently report new findings in articles in scientific periodicals.

In Sierra Leone the conditions were so favorable for growing rice in the mangrove swamps that about 40 years ago overproduction became a problem. In the 1920's a trader or two came to the Scarcies area and helped the natives market their rice. The farmers had been going to Freetown to sell their surplus, but they had not been very successful. There was no machinery to process the rice for export. In 1936 a mill was finally established at Kissi near Freetown (Figure 8, p. 116), and rice was exported on the world market.

Throughout World War II rice was abundant in the country, but since Britain kept the price depressed, the farmers suffered (34). The West African Produce Control Board kept the price so low that the terms of trade of rice were reduced (20, p. 24). Quotas of production were in operation at the time, and some of the farmers

endured great hardship in an effort to meet them.

Rice production did increase during the war, but the depressed prices and the necessity of dealing with Lebanese middlemen, who were subagents of the Sierra Leone Government, lessened the people's enthusiasm for growing rice (20, p. 239). Depressing the prices may have been a serious mistake, for development was coming to the country as a whole, especially in minerals, and prices were rising everywhere else (34). Men went to the diamond mines or to the city of Freetown soon after the war to look for work. Rice farming was at a low ebb. Imports became necessary in the 1950's because of a decline in the number of men on the farms, an increase in population, and because of greater per capita consumption in the cities. The rice development schemes were launched to inject new life into the rice economy, and the country hopes to cease importing rice soon (126). Furthermore, it is hoped that rice will become an important cash crop to sell on the world market.

The Government has initiated a rice-buying scheme to increase swamp rice production, in addition to the development schemes. It buys local rice at the same price as the import rate. The rice is milled in government mills and is then sold by the Government at the price level of imported rice (71). In 1962 the Government paid 20 percent more for rice than the selling price, because it paid for the milling, drying, transporting, etc. (34). The Government will sell



rice to anyone, in small or large quantities. Under the British the operation was well managed, but in 1962 local politics had entered the situation, and corruption had thrown the market and the buying-and-selling scheme into confusion (34, 56, 71). This situation will be discussed in the fourth chapter.

### Methods of Cultivating Swamp Rice

Any irrigated lowland rice is known as swamp rice. The plant is standing in water during much of the growing season. Swamp rice can be either transplanted or sown broadcast and either naturally or artificially irrigated. In Sierra Leone all swamp rice is naturally irrigated, either by freshwater tides or in rain-filled swamps. Transplanted rice is grown on the tidally-irrigated lands and in shallow swamps. Rice seed is sown on the grasslands; where the water gets very deep during the flooding season, seeds of varieties of floating rices are sown. Methods of growing transplanted rices and floating rices will be examined in this investigation.

Transplanted rice on tidally-irrigated lands. A distinction must be made between areas of predominantly freshwater tidelands and those where saline conditions prevail. Rice (often called paddy before it has been milled) can be grown in both, but the techniques are different and not presently interchangeable (48, p. 2).

Freshwater method. The bulk of the paddy on the Great

Scarcies and around the estuary of the Little Scarcies is grown under freshwater conditions, using a system of free tidal irrigation. During both the wet and dry seasons tidal water is allowed to flow freely onto and off the land. In the dry season when the water in the rivers becomes saline, high salt concentrations develop in the soils, but these are quickly reduced at the onset of the following rainy season before the rice is transplanted. The soils contain large amounts of sulphur in various forms, and although fluctuations occur in acidity (pH value) in the surface soil, such fluctuations do not interfere with the growing of a rice crop during a rainy season (42, p. 215). The tidal flooding, especially the salt water in the dry season, plays a favorable and important part in weed control.

In the tidal areas the banks are low but have a natural levee slightly higher than the immediate hinterland. The tidal rise is at least four feet, and land near the rivers and creeks is tidally irrigated twice daily throughout the year. The largest zone in use for farming is farther inland and reached by Spring tides in the dry season and by all high tides in the rains. Farther inland still is a strip of land which is reached by high tides only in August and September.

On the Great Scarcies River the tidal effect reaches Kambia, 35 miles from the sea (Figure 2, p. 110). Salinity is an important factor, for too much can damage the rice, two parts of salt in a thousand of water being reckoned the critical point. The creeks at

the western end of the region contain fresh water only from August to October. From Kaikoni upstream, there is fresh water from July to November. Salt water reaches Mambolo at high tides in February and Rokupr (25 miles from the sea) in April (48, p. 2) (Figure 2, p. 110). The river is swollen from July to October, but still tidal, and there is little prolonged flooding along its course.

On the Little Scarcies River the tidal influence extends inland about 15 miles. The river is broad, shallow, and flat (it falls only four feet in the 28 miles from Mange to the sea), and it is predominantly a freshwater river. Konto, 14 miles from the mouth, is the limit of salinity. In the first stage of the rainy season the swamps behind the high banks fill with rainwater. From August to October (at high tides) the river overflows its banks, and the water finds its way out of the swamps through tortuous channels at the rear.

In preparing for a new crop, rice seeds are sown in the nurseries during the early rains in May and June, and sowing continues until the end of August. The nurseries are on uplands and are of three different types. The most common is any small patch of ground near houses or along paths. The second type is found on newly-cleared upland brush, and the third type is on leveled sweet potato heaps. This third type of land is becoming increasingly popular (56).

Traditionally, the land for the seedbeds is not cultivated, and the seed is broadcast on the soil at the rate of 500 or more pounds

per acre, then covered by the use of a very small hand hoe. This technique has certain disadvantages, including waste of seed, weak growth, and conditions favoring diseases, of which "scorch", caused by Piricularia orizae is the most troublesome (48, p. 3). This disease causes the seedling to turn brown and wilt.

A characteristic of rice growing on the Scarcies rivers is the great distance some farmers must travel to their farms. Many of them live well inland and travel as much as 40 miles to their tidal farms by foot, lorry, and boat at planting time. Most of the harvest comes back by the reverse route from December to March. Usually the farmer has a kinsman living in a town near his farm. Otherwise he will build his own hut, raised on stilts, for a temporary residence in the planting and harvesting seasons.

One of the reasons that the area cleared for swamp rice has steadily increased is that the growing conditions are almost ideal. The pace, however, has been a slow one. Mangroves can be cleared only by hand, and the initial clearing of a mangrove swamp is exceedingly arduous work (56).

After the land is cleared of mangrove trees, the first step is to prepare the land by weeding, which begins in June or July. The dominant weed is the salt-tolerant grass "kire-kire" -- Paspalum vaginatum. It forms a dense, tough, matted growth which must be hoed out thoroughly and gathered into piles. Also very common is the

holophyte, Alternanthera sessilis. These two plants mark approximately the limits of dry-season saline flooding. The sedges (tufted marsh plants) which grow further inland are trampled low, if possible under water, before hoeing (48, p. 4). If the Paspalum is stubborn or the soil is hard (usually with raw humus), a preliminary hoeing may be done in March, and the land is left in clods. Since upstream farmers throw their weeds into the river, downstream farms must be fenced with a wide-meshed screen of interwoven sticks. Inland farmers pile their weeds in large heaps to become compost. Cassava may be planted in these heaps to supplement the rice staple.

Rice seedlings are left in the nursery for two or three months, and some become overgrown before transplanting. The bundles or rolls of seedlings remain out of the ground for up to two weeks and may reach their destination badly wilted, but they survive (48, p. 4). The tops are cut off so that the plant will not be too tall and heavy and fall over when it is transplanted.

Planting spreads down the river as the salt becomes washed out. Test plots are planted in advance in the more saline areas at time-intervals of a week apart until their survival shows favorable conditions. Usually by the first of August planting is in full swing. It is carried out through the period of maximum rainfall, July to September (56).

The floods are at their peak in August and September, but the

ebb tide ensures drainage twice daily. At high tides, the newly-planted seedlings may be under a foot of water for several hours at a time (Figure 12, p. 119). The critical period for complete submergence is two to three days. A longer submergence will kill the paddy (54, p. 5). The tidal-swamp farm suffers little from weeds during the paddy's growing period, and at most, one weeding is given (in August or September) about six weeks after transplanting.

Harvesting and parboiling. The harvesting begins with early varieties in December and goes on until March. The salt risk is greater at the end of the growing season than at the beginning (56). The farmers must be careful not to stack the sheaves of rice too high or to leave them too long in one place, for there is a likelihood of heating and mild fermentation of the grain, which affects its appearance and milling qualities.

When the harvest is completed, the men and women use sticks or their feet to thresh the grain. It is then winnowed by continual agitation on shallow wicker trays or by dropping from a height in a drafty place. The yields vary from 1,200 to 1,900 pounds per acre in the Scarcies area (48, p. 6).

Parboiling is the next step.

Parboiling makes it possible to produce from a given amount of paddy more rice with less breakage in milling; to use a lower grade of paddy; to obtain a rice with superior keeping qualities; and to retain more of the nutrients of the grain during milling, washing and cooking (27, p. 9).

It is important not to parboil too long lest the rice passes into a more-advanced stage than is wanted.

For parboiling, the paddy is placed in a large pot and boiled for five minutes, left to soak all night, and then boiled again in the morning until the husk begins to split. Sometimes the first boiling is omitted, and the rice receives only one cooking after having soaked all night. The paddy is then spread out to dry for a day in the sun (Figure 13, p. 120). When dry, the husk is readily removed by pounding the paddy in a mortar. New parboiling equipment at the government mills is designed to eliminate the eight hours of soaking, and if the farmers are close to a mill they sell the raw paddy to the mill, which in turn does the parboiling and drying (21).

If rice is dried too fast it will crack. The slow drying in the mills is best in the dry season unless adequate shade can be provided outdoors (21).

A second rice crop a year is possible only out of reach of salt water and where the land remains moist in the dry season (56). This combination of circumstances is most prevalent on the Little Scarcies River, and more off-season rice is grown there (48, p. 6) (See Figure 10, p. 118). The second crop ripens irregularly, is harvested by the women and children; it is not put into storage but is consumed by the farmer's family within a short time.

Saline method. Near the coast, where river water is not fresh

for more than two or three months in the year or where drainage is a problem behind the riverine strip of land, paddy cannot be grown by the foregoing method of freshwater tidal irrigation. The only method that can be used is empoldering. The empolders are small earth dikes or bunds to hold out the sea water and to retain the rain.

Lands on which the *Avicennia* mangrove has been growing can be empoldered with fair success, but where the Rhizophora mangrove grows the soil is less porous, and the badly drained land retains too much salt to grow rice (65, p. 122). Another reason Rhizophora lands are not suitable for empoldering is that they often become excessively acid due to oxidation of sulphur compounds. The sulphur condition results from the tree itself (44, p. 344).

Floating rice in deep-water swamps. A variety of rice grown in southwest Sierra Leone near the coast is much different from that raised in the northern areas described above. Since World War II, Sierra Leone's major effort for rice development has been carried out in this southwestern area. Some 60,000 acres of comparatively level grasslands are in the Bonthe-Pujehun districts (Figure 10, p. 118). They have the further advantage of rich alluvial soil which is regularly replenished by annual flooding (50, p. 227). Although the flooding reaches a depth of 12 to 15 feet during the rainy season, the land is dry enough to support crawler tractors during the dry season.

The southern coast line is formed by alluvium brought down by



five large rivers--Moa, Sewa, Jong, Waanje, and Bagru (Figure 2, p. 110). They have changed their courses often, and by the deposition of silt at their mouths have blocked their own outlets. For example, the Waanje, instead of running southward into the sea, turns due west within five miles of the ocean and meanders parallel with the coast for 30 miles until it joins the waters of the Sewa, whereupon the combined rivers run through a maze of channels beside the coast until they flow into an estuary opposite Sherbro Island, 30 miles still farther to the west.

Without the tractor it would not be feasible to grow swamp rice in the southern grasslands, for the grass is too tough for a native hoe, and the climate is perhaps too oppressive for such human exertion. The use of bullocks for plowing is not feasible because of the tsetse fly which carries the parasite (Trypanosoma brucei) that causes the serious disease called nagama. Tractors, however, can plough up the tough grass roots and cut the grass with a heavy disk harrow. Once the land is cleared, tractor cultivation can keep it clean.

During the rains the water level rises as high as 15 feet, and it is necessary to use Indo-China floating rices (Orizae sativae). An exception to the use of this group of rices is "Mbagboli", Oriza glaberrima, a local floating rice, which some of the farmers prefer (117, p. 8).

Although the population is small in the southwest, adequate

machinery makes development of rice fields possible. Hand labor, however, is not eliminated, and for this reason the lands have been expanded quite slowly. The tractor cuts the grass, the grass is gathered by the farmers into heaps and burned or left to rot, and the seed is sown broadcast or disked in. The rice grows at a faster rate than the rate at which the water fills the swamp at the beginning of the rainy season. After the rice has grown tall and while it continues to mature, it floats on top of the water.

The Southern Grasslands projects were started by the Sierra Leone Department of Agriculture on a very small scale in the field without much experimentation and trial beforehand (126). In 1949, the first year, four acres were planted. Seventy acres were cultivated in 1950, and after that time the acreage approximately doubled each year until 1954 when 3,342 acres were under cultivation (50, p. 227). The plans for expansion called for 6,500 acres in 1955 and a continued doubling of the cultivated area each year thereafter, with the goal of having all plowable land in production by 1958 or 1960 (50, p. 227). It did not work out that way.

At first mechanical cultivation in the grasslands was done on a contract basis with payment in kind at harvest time. It was reported that in this way a farmer could cultivate approximately eight and a half acres and obtain a yield of about 1,800 pounds per acre (average), compared to one or two acres and a yield of some 1,300 pounds per

acre with hand cultivation (50, p. 227). The Department of Agriculture of Sierra Leone arranged for contractors to do the plowing and charged the farmers only three bushels per acre, a rate insufficient to cover the full cost (126). Even with a doubling of the rate the operation would have been quite profitable to the farmer (74). However, the Government wanted to make the scheme so attractive to each farmer that its chance of success would be assured. The underlying philosophy of this scheme was stated succinctly in these words:

The whole essence of the scheme is a gradual approach in the early years, gaining the confidence of local farmers and weaning them to the idea of paying for mechanized work, increasing their holdings, and becoming small capitalist farmers instead of mere subsistence farmers (50, p. 227).

The plan was advancing rapidly until the Department of Agriculture decided in 1956 to demand payment in advance for the plowing; as a result, the amount of acreage plowed during the next two years declined considerably. However, in 1959 the Department of Agriculture predicted that in the 1959-60 season the trend would be reversed, because many farmers already realized that they could afford to pay for mechanical plowing in advance, if necessary (98, p. 3). By 1962 the acreage plowed had increased again, and 8,000 acres were cultivated (126).

The amount of plowing to be done each year is carefully projected beforehand. Since hand work is still required to develop the

southern grasslands, an adequate supply of labor is essential in each area. Acreage plowed in 1953, 1954, and 1955 rapidly expanded through a well-planned effort involving demonstrations, discussions, and enough labor. In 1962, even 1,000 acres more of plowing would have been too much for the farmers in the south to handle (126). The charge for plowing in 1962 was still three bushels per acre (56).

Transplanted rice in shallow inland swamps. Sierra Leone has made efforts to develop rice production in certain inland swamp areas also -- mainly the boli lands of the Bobali-Tonkolili districts of Makeni (Figure 10, p. 118). Approximately 4,000 acres have been developed in this area (126). The Northern Boli Land Mechanized Rice Production Scheme was begun about the same time as the Southern Grasslands Scheme just discussed, and by 1954 had already developed 2,500 acres (74). The rice farms of the inland swamps average 10 acres per cultivator, although some individuals have expanded their holdings to 40 or 50 acres (50, p. 228). The soil in this area is not so fertile as in the Southern grasslands or in the northern coastal area, because the annual deposit of silt is less. Through the application of a superphosphate fertilizer, however, high yields are obtained (126).

#### Quantities of Rice Grown in Sierra Leone

It is difficult to ascertain exactly how much rice has been

produced over the years and how much is being produced at the present time, for data in the country are inadequate (56). Rice has traditionally been a subsistence crop in Sierra Leone, and there are insufficient production reports. It has been estimated, however, that in 1926 there were 145,000 tons (2,240 pounds per British ton) produced (35, p. 6). Since 1938, the figure has varied between 240,000 to 300,000 tons per annum, depending on weather conditions (56). These figures are for clean rice, which weighs two-thirds as much as paddy (56).

## CHAPTER IV

## EXPANSION OF SWAMP RICE IN SIERRA LEONE

Problems of Physical EnvironmentLand Available for Expansion

Much of the land in Sierra Leone is bush fallow or permanent meadows and pastures; some of this land, especially inland swamps, could be converted to swamp rice. At the present time, however, the areas mainly being considered for expansion are those listed in Table 3 as being "unused land but potentially productive."

TABLE 3

## LAND USE IN SIERRA LEONE

Land Use	In 1,000 Hectares	Percent of Total Area
Land area	7,200	99.4
Arable land and land under permanent crops	3,662*	50.6
Permanent meadows and pastures	2,202	30.4
Forested land	301	4.2
Unused land but poten- tially productive	104	1.4
Built-on areas, waste- land, and others	964	13.4

\*Of which 3,630,000 hectares is bush fallow, which includes land formed by the ladang system.

Source: Food and Agriculture Organization of the United Nations. Production yearbook 1961. Rome, 1962. p. 7.

The present area of cultivated rice lands in Sierra Leone is 283,000 hectares<sup>1</sup> (see Table 4). Another source estimated the area under cultivation at about 650,000 acres<sup>2</sup> (11, p. 15), a land area the size of the state of Rhode Island. These figures include both up-land and lowland rice.

TABLE 4

## RICE PRODUCTION - SIERRA LEONE

Area Planted		Yield		Production	
1948/59	1959/60	1948/49	1959/60	1948/49	1959/60
to		to		to	
1952/53		1952/53		1952/53	
1,000 hectares		100kg/hectare		1,000 metric tons	
317*	283	8.3*	9.3	274*	264

\* Average of four years.

Source: Food and Agriculture Organization of the United Nations. Production yearbook 1961. vol. 15. Rome, 1962. p. 51.

Swamp rice is grown in four different kinds of lowland habitat: (1) the tidal swamp, exemplified by the Scarcies Delta area in the north; (2) inland freshwater swamps, previously ignored by the up-land rice farmer but which the Department of Agriculture now urges him to use (126); (3) the almost uninhabited and extensive riverine

<sup>1</sup> One hectare equals 2.471 acres.

<sup>2</sup> One acre equals 0.4047 hectares.

grasslands of the south of Sierra Leone, which can be utilized with the help of tractors; and (4) the wide inland marshes, or "bolis", which exist where major rivers cross a belt of old sedimentary rocks in otherwise crystalline uplands (intractable to hand labor, but since 1951 heavy mechanical equipment has been used with success).

In these four lowland areas suited to swamp rice growing, 38,000 acres have already been developed in the northern mangrove swamps; the southern grasslands have 8,000 acres of planted rice lands; and the boli areas contain 4,000 developed acres. There is sufficient acreage for more rice plantings in all of these areas, and in addition the southern mangroves remain completely undeveloped (56). (Figure 15, p. 122).

Thus, while 50,000 acres in these areas have been put under cultivation, estimates have been made that the total lands which can be developed for swamp rice include 500,000 acres (37, p. 95). Another estimate is 1,000,000 acres (39, p. 353). These figures came from three earlier reports made in the 1930's. It was then estimated that about 450,000 acres were available for swamp rice, as shown by the following outline.



Existing and Potential Rice Lands in the North (35, p. 3)

ACREAGE

Little Scarcies River

15,417 deltaic  
 1,300 swamp occasionally tidal  
 40,000 inland freshwater swamps deeply-flooded,  
 of which 6,000 acres are always flooded.  
12,000 flooded graslands  
 68,717 total

Great Scarcies River

61,580 deltaic  
 13,000 inland swamps  
3,000 flooded grasslands  
 77,580 total

Port Loko and Rokell Rivers

5,914 Port Loko Creek  
 2,700 Rokell mangrove  
 630 flooded grasslands  
450 swamps  
 9,694 total

155,987 total acreage in the north

Existing and Potential Rice Lands in the South West of the  
 Bagru River (90, p. 2)

ACREAGE

8,472 Ribí  
 51,216 Bumpe  
 30,318 Kagboro Creek  
 21,174 Titibul River  
30,794 Bagru River  
 153,762 total

This southland report includes mainly mangrove areas in the south. The grassland areas estimated include a few among the trees but not grasslands away from tidal areas (Figure 15, p. 122).

Existing and Potential Rice Lands in the South  
 East of the Bagru River (91, p. 1)

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ACREAGE

28,727	Sherbro and adjacent islands, mainly mangroves
54,640	mangroves east of the Bagru River on the mainland
<u>60,000</u>	grasslands
143,367	total

This southland report includes grasslands away from tidal areas (Figure 15, p. 122).

Also to be considered in a survey of available swamp rice land are the estuary lands near Freetown. These, of course, are mostly saline, but it may be possible to empolder them.

It seems reasonable to accept the estimate of 500,000 acres for future development, especially in a long-range plan. However, if quick development were desired -- within the next 10 or 20 years -- this 500,000-acre estimate might prove difficult to achieve (56). The problems connected with empoldering must be overcome, and more accurate surveys are necessary. The estimates of the 1930's were made from aerial surveys which fail to show land contours accurately, or they were made from inaccurate topographical sheets (56).

One example of the difficulties attendant upon estimation of land-use is shown by Figure 16, p. 123. The Lands and Surveys Department made the original estimate for the Tepetuk Swamp on the Little Scarcies River from old topographical sheets (1928) which were based on walks through the bush, and subsequently all estimates of the

Scarcies rice areas for future developments, including Tepetuk Swamp, were made from these rough surveys. An accurate survey done several years later for the West African Rice Mission by the Department of Lands and Surveys showed that only one-fourth of the land originally estimated for Tepetuk Swamp was actually usable (56).<sup>1</sup> Although 650 acres was the first estimate of land to be used for rice in this particular swamp, only 150 to 175 acres were of the type of land required for rice cultivation.

Notwithstanding that the total estimate of 500,000 acres of land which could be developed for swamp rice in Sierra Leone may be exaggerated, it may be definitely stated that lack of land is not a problem, for much land is still available for future development (126). (See Figure 15, p. 122).

### Terrain

Among the physical problems connected with expanding a swamp rice economy is the important one of terrain. In the developed swamp-rice areas this is favorable, for the natural tidal areas are gently sloping and have no drainage problems. The grasslands are not permanently flooded, but the water rises and falls with the rainy season.

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<sup>1</sup>The West African Rice Mission was part of a larger study on rice sponsored by the British Government. Since the main emphasis was on India, the study has proved to be useless for Sierra Leone (56).

In the undeveloped lands drainage constitutes a problem (56). Empoldered lands are a case in point. Mechanical cultivation of empoldered grassland areas can be attempted only after an exhaustive investigation of these grasslands during dry seasons shows that it is feasible. Empoldered mangrove lands cannot be mechanically cultivated at all, for the land is always wet (56). Grasslands which are not empoldered must also be carefully investigated during the dry season and again during the wet season to determine their accessibility.

It is not easy to use large tractors in such areas, since the tractors must be brought around by sea in landing craft during the time of year when sudden storms are to be expected, and must be landed on a slippery bank of mud when the tide is right. A tractor must be operated in remote country, approximately 15 hours from the nearest town by launch and even farther from the nearest source for spare parts. In the course of operation, there may be encounters with bush pigs or other animals. In the north especially, the machines can be used very little because of the difficulty of getting them to the grasslands.

Mangrove swamps have been developed slowly because the land must be cleared entirely by hand labor. Empoldered mangrove swamps will require even more work, since banks to keep out the salt water will have to be built.

One of the plans for reclaiming lands for swamp rice is concerned with development in the mangrove swamps on the Scarcies delta (51, p. 3). These saline swamps are associated with the Avicennia nitida mangrove tree. Nearly all such swamps are situated away from the main rivers, between creeks, and are surrounded by belts of Rhizophora racemosa mangrove. The development of swamps away from the shore can be carried out only by empoldering, for they are almost flat with no natural drainage channels. In order that they may be made suitable for rice growing, the salt contained in the soil has to be washed out and further saline tidal inundations prevented. The Rhizophora mangroves cannot be empoldered until the problem of excessive acidity in the soil is overcome.

Some of the islands offshore support nothing but Avicennia and are considered to be likely areas for empoldering in the near future. Included among these islands are Yelibu, Kortimaw, Yelebuya, and Yelibunglu (68, p. 1). (See Figure 15, p. 122).

Another kind of terrain which must be modified if it is to be made usable for swamp rice is the smaller tributary areas away from the large rivers. To control flooding and to provide more lands for farming, earth dams could be built (50, p. 272).

Further development of swamp rice lands on a large scale will require modification of the terrain in many areas. In order to encourage this expansion, the Government will need to make loans for

empoldering, clearing mangroves, drainage of inland swamps, and construction of small earth dams for flood control. Also, it will have to continue to subsidize the plowing of the grasslands.

### Soils

Another physical problem is the structure of the soil, since for swamp rice this is likely to be more significant than its natural fertility (124, p. 21). Almost any productive soil is suitable, for fertilizers can be applied on those which lack nutrients. A heavy soil, preferably with 40 percent or more of clay, is advisable (56, p. 97). It must, however, be soil which is fairly level and which is capable of holding water without too much seepage (127, p. 54). Adequate surface drainage is necessary for a good stand and for harvesting the crop at maturity.

The soils most favorable are neutral to slightly acid. The pH factor for rice (Oriza sativa) ranges from 5.0 to 6.5 (56). However, swamp rice can thrive on some alkaline soils, because the water removes part of the bases. Certain varieties of rice endure a considerable concentration of salt (51, p. 97). In Sierra Leone the silt soils used for swamp rice on the coastal lands require no fertilizer, but it is needed in the boli lands in the center of the country (126).

Future expansion of the rice-producing capacity of Sierra Leone will depend to some extent on the development of the permanently

saline Rhizophora mangrove swamps in the coastal regions. Large tracts of this type of land are at present uncultivable due to their high salinity and to the extremely acid conditions which result if they are empoldered to keep out salt water (42, p. 215). The Rhizophora form fibrous muds which become acid upon drying. Because there is little indigenous liming material in Sierra Leone, the use of heavy dressings of lime to neutralize the acid formed in empoldered soils would be very expensive. Also, even if liming takes place, the recovery of the soils is very slow (42, p. 215).

The rate and mode of humus decomposition must also be considered. Drying a soil produces a fast decomposition of its organic matter on re-wetting. But in the case of mangrove muds which have remained wet and periodically submerged for many years, a wet-dry cycle may cause different results -- this has yet to be tested (43, p. 249). For successful cultivation of rice the toxic substances produced when the mud is dried will either have to be made noneffective or removed (56). If proposed reclamation schemes take place, the removal of chloride and, if necessary, soluble acids from the empoldered swamps will be effected by leaching with rainwater (43, p. 250).

### Pests and Diseases

Pests. Sierra Leone has few rice pests. There are some areas

in the southern grasslands where the people can leave the rice completely alone between planting and harvesting (126); this, however, is not the case everywhere, and conditions vary from place to place.

One of the most troublesome pests in the mangrove areas is the crab, mainly Sesarma huzardi, which is fond of rice seedlings. The Rice Research Station at Rokupr found that this species of crab breeds mainly in the dry season. Spraying with a 10 percent suspension of technical BHC (containing 6.5 percent gamma isomer) has been adopted as a routine measure at the station during the periods following high spring tides (56). This has proved effective either in killing crabs, or causing them to stop feeding (55, p. 197). Another method of protection is to treat the seedlings in the nursery with technical BHC (55, p. 216). This seems to give the plant some protection if there is enough other food for the crabs.

Weeds constitute the major problem in some areas, but not on deeply-flooded grasslands or tidal lands (127, p. 258). In marginal areas where the weeds are not well controlled through salt-water flooding during the dry season, or which are not deeply-flooded during the rains, the women do the weeding by hand. Even in these areas, usually only one weeding is required after the seedlings have been transplanted.

Another pest is birds, which make their appearance when the grain is ripening and high waters are receding. They must be chased



away, and this is sometimes a job for children. All kinds of methods are used to make noise -- tin cans on strings, bells, scarecrows, and the like (Figure 14, p. 121). Other faunal pests include rodents and monkeys, which arrive with the bush buck and wild pig at the time of harvesting.

Diseases. Rice is less vulnerable to disease than any other major cereal (13, p. 27). In Sierra Leone, particularly, diseases of the rice plant are at a minimum, the only one of significance being scorch, caused by the Piricularia orizae in the nursery where it affects the seedlings (56). A disease of lesser consequence is udbatta, which prevents grain from being formed (39, p. 278). The common diseases of bunt, black smut, stem rot, and blast are negligible in Sierra Leone (126).

### Economic Problems

#### Labor Supply

The wartime experiences in Sierra Leone (approximately 1940-1945) support to some extent the thesis of Professor Ragnar Nurske (an authority on international economics and the underdeveloped countries) that underdeveloped countries have "chronic and large-scale underemployment in agriculture" (20, p. 300). He believes a large part of the agricultural population could be removed, and the output

of produce remain the same or even increased. The surplus men could be put to work on roads or other public works and help in the capital formation in the country (20, p. 300).

Rice production in Sierra Leone increased during World War II with a smaller labor force only so long as it was forced. This increase was brought about through a quota system which compelled the farmers remaining on their farms to produce a certain amount of rice. At the same time prices for rice were frozen at a low level, and some of the farmers endured severe hardships while they were trying to meet their quotas. Many decided to try other occupations after the war ended and went to the city or to the mines.

The end result of the quota plan was a decline in the production of rice, for prices had not risen to make the extra hard work worth while. Incentive declined rapidly, and consequently rice farming hit such a low level that imports were required in the early 1950's. Though it is well known that good prices and wages are the most important factor when the economy is trying to increase production (107, p. 36), the British completely overlooked this factor in Sierra Leone in the 1940's.

Although the total number of people in Sierra Leone is adequate to support both farming and industry, there was in 1964 a labor shortage in the areas that could be developed for swamp rice (34). Local people object to settlers from other areas, which is unfortunate, for

immigrants have a strong hunger for land and a desire to justify themselves and to improve their condition (4, p. 49). Even if outsiders were welcome, however, they most likely would not be physically adapted for labor in the northern and southern mangrove swamp rice areas (34). A worker must have the physical stamina to enable him to labor in the rice fields for hours with the rain pouring down. Furthermore, since it is not characteristic of the African to be mobile (77), the people are unwilling to move to the new swamp rice areas from other places.

Mr. H. P. Galfetti, a rice trader on the Scarcies rivers since 1925, believes that the only solution to the labor problem in the north is to expand rice production without importing additional labor. Expansion is made difficult, however, because many school children are now consumers instead of laborers. Ten years ago when there were no schools, all the children were put to work in the fields. At present there are two schools in the village of Rokupr on the Great Scarcies River with 600 children attending, and these children do not help even with the harvest (34).

The quality of farm labor is mediocre. Incentive and individual responsibility are lacking. This is apparent among all the tribes of Sierra Leone (77). Since for hundreds of years the needs of the African villager have been very small, there has been no incentive for him to save for the future (52, p. 107). If the labor supply is to be

more productive, there are several problems which must be considered; these include inadequate diets for high efficiency, working in a hot and humid climate, migrants, how to achieve status, incentives, and the role of women (46, p. 12).

Health problems. Human diseases are prevalent in the swamps, and include malaria, sleeping sickness, pneumonia, dysentery, and bilharzia (schistosomiasis). The southern grasslands especially are infested with mosquitoes and malaria, and the mangrove farmers are most concerned about bilharzia (50, p. 65). Bilharzia comes from snails in the water of the swamps. Mechanical production would in part eliminate the chances of infection, but, as stated previously, it is impossible to use tractors in the mangroves.

Living conditions. Another problem arises from the undesirable living conditions in or near the swamps. One of the main reasons that the southern mangroves have not been developed is that people do not wish to live there because of the mosquitoes, dampness in the extreme, and remoteness (56); the southern mangrove areas are even more remote than those in the north.

In the southern grasslands the people live near the fields in temporary housing for a month each during planting and harvesting (126). Normally the people live in towns away from the swamps during the rest of the year. Only one-fourth of the people have to stay on their holdings to do weeding, for the early and deep flooding

cuts down the weeds; those who have to weed often go back and forth by boats and stay in the swamps for only short periods of time.

It is necessary to live closer to the rice fields in the mangrove areas, because there is more weeding to be done on the tidally-irrigated lands, and seedlings must be grown and transplanted. In the north the people have been accustomed to living in the swamps for long periods (34). Even so, some of them also manage to spend only part of the year at the swamp and live the rest of the time farther up the rivers.

#### Summary of the Labor Problem

An adequate labor supply for expansion of swamp rice is not available at the present time. Living conditions are unattractive, the African is not willing to move to new areas, and a person's prestige is lowered if he returns to the farm after working in the city.

Prices and wages are not high enough to overcome these obstacles. Some people of influence in Sierra Leone retain the feeling that farm wages and prices should not be allowed to rise at a rate commensurate with those in other industries, especially those located in Freetown. They fail to see that unless rural wages rise, economic stagnation will probably result. Subsidies or higher prices will be necessary to entice people to farm. Because much controversy exists regarding higher prices for rice and higher wages for farmers,

this constitutes a major problem to be solved before swamp rice production can be increased.

### Market Potential

Domestic market. Until 1963 the domestic market potential for swamp rice was especially bright in Sierra Leone, but a slight decline occurred in 1964. For some time the Government has been trying to discourage the growing of upland rice because of serious erosion problems. The purchase of swamp rice increased regularly each year because it was bought by the Government Rice Mills, whereas upland rice was not. Although the figures do record some purchases of upland rice, this rice was bought inadvertently (Table 5); if it was known definitely that the rice in question was upland rice, it was refused by the mills.

TABLE 5  
PURCHASES OF LOCAL RICE BY THE GOVERNMENT  
OF SIERRA LEONE OVER A RECENT  
FOUR-YEAR PERIOD

Year	Tons of Swamp Rice Purchased (in husk)	Tons of Native-cleaned Rice Purchased (either upland or swamp rice)
1958	3, 971	5, 105
1959	4, 936	2, 845
1960	7, 207	9, 465
1961	19, 314	-----

Source: Figures obtained from Mr. H. D. Jordan, Director of the West African Rice Research Station, Rokupr, Sierra Leone, in an interview in August, 1962.

In 1962 a further plan was initiated; to increase even more the incentive to grow pure swamp rice of a high quality, a premium was to be paid for such rice. This plan broke down, however, when it was found that virtually no rice of the approved standard was brought to the mills. After a year the scheme was abandoned, and the Government Rice Mills once again paid a flat rate for all paddy. In addition, the mills extended their purchases to upland rice.<sup>1</sup> As a result, the incentive for farmers to grow only swamp rice declined in 1964, for it was no longer the exclusive kind to be bought by the Government Rice Mills. Sierra Leone rice experts hope that in the near future the Government will again try to encourage swamp rice by refusing to buy upland rice (56).

Another aspect to consider regarding the local market potential is the Government practice of importing rice from abroad. However, local rice is preferred by the Government, and it would therefore seem that the market for local swamp rice would be good. It is the policy of the Sierra Leone Government to

(a) reach, as soon as possible, a degree of self-sufficiency in foodstuffs, which can be produced in Sierra Leone, but which now have to be imported, thereby reducing the country's dependence on imported foodstuffs and helping to maintain a favorable balance of payments (101, p. 2).

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<sup>1</sup>Information contained in a letter to the writer from H. D. Jordan, Director of the West African Rice Research Station, Rokupr, Sierra Leone, dated May 25, 1964.

Rice exports ceased about 1954. Since that time imports of rice have been high for a country that used to have fairly large surpluses (Table 6). Latest reports indicate that Sierra Leone imported no rice in 1963 and was again using up rice stored from previous years in 1964.<sup>1</sup> In 1964 the imports would not be so high as in 1962 (28,000 metric tons). It is too soon to tell whether rice imports will return to their high level of 1962 after reserves are used up.

TABLE 6  
RICE IMPORTS TO SIERRA LEONE

Sierra Leone produces between 240,000 and 300,000 metric tons of rice each year (56). These imports have been necessary for a number of years in order to supply the total demand for rice in the country.

Year	Metric Tons of Rice Imported
1957	34,000
1958	21,784
1959	44,000 (8½% of value of total imports)
1960	29,000 (4½% of value of total imports)
1961	4,000 (using up rice stored from previous years)
1962 (1st quarter only)	6,579

Source: Figures obtained from Mr. H. D. Jordan, Director of the West African Rice Research Station, Rokupr, Sierra Leone, in an interview in August 1962.

<sup>1</sup>Information contained in a letter to the writer from H. D. Jordan, Director of the West African Rice Research Station, Rokupr, Sierra Leone, dated May 25, 1964.



The domestic market is somewhat complex, for many of the people in the uplands, particularly those among the Mende tribes, prefer the red-skinned upland varieties of Oriza glaberrima (126). This has been one of the reasons that Sierra Leone farmers have been reluctant to shift to swamp rice (50, p. 94). At the same time many people are getting used to the rices imported from abroad, which they now prefer (56). Despite several drawbacks, the over-all picture of the domestic market for swamp rice is encouraging. People in Sierra Leone are consuming a larger quantity of rice per person than before, and the percentage of persons not growing their own food is increasing.

The most important factor in the domestic market situation is the present government policy toward improving agriculture so that Sierra Leone will be self-sufficient in food, and, as mentioned previously, the Government does not desire to import rice.

A draft white paper prepared by the Sierra Leone Government concerning natural resources policy was published shortly before independence was achieved in 1961. It is a statement assessing the potential prospects in the fields of agriculture, forestry, fisheries, and veterinary development. In the introduction the following excerpt appears:

It is considered that such a statement is necessary if local farmers and fishermen are to be expected to increase their productivity and so make their all-important contributions to a rapidly expanding economy, and if foreign investment is to be encouraged.

For it is only by creating conditions in which primary producers can enjoy an increasingly higher standard of living, that the general level of prosperity of the whole country can be raised.

By embarking upon a policy which will place greater emphasis than heretofore on productivity, marketing, and storage, and by making it possible to speed up the adoption by subsistence farmers of improved and up-to-date farming methods, Government hopes that the importance of land, which it is pledged to conserve and improve for future generations, will soon become apparent to all.

It is also hoped that by placing this greater emphasis on production and marketing, Government will prove that active participation in farming, fisheries, and forestry can be more rewarding both spiritually and financially than the present dubious attraction of 'white collar' work, or the dubious attractions of the diamond areas.

Furthermore, by this change of emphasis, Government hopes that the purchasing power, and thus the standard of living, of the subsistence farmer and fisherman will be significantly raised (101, p. 1).

The paper goes on to explain how these goals will be achieved.

Extension services will be increased, and credit will be granted for expansion of farms so that a cash economy will be developed in place of a subsistence one. The Government will try to provide storage facilities, cooperatives, and better transportation so that the agricultural workers will not lose their incentive through lack of marketing facilities and the resultant low prices (126). Cooperatives run by the farmers themselves will be encouraged to facilitate the distribution of foodstuffs. Three rice cooperatives for marketing were

established on the Scarcies rivers before the Second World War, but they were managed by outsiders (56).

In addition to the fact that the Sierra Leone Government encourages the production of more swamp rice in Sierra Leone, there are other benefits for the farmer who grows rice. Because it does not absorb moisture as readily as other cereals, rice possesses a storage advantage in the humid tropics (50, p. 98). Mills, large or small, for mechanical milling are relatively easy to establish (14). Not only is rice transported with facility, either bagged or in bulk, but also its monetary and food values are high enough to warrant long-distance shipment from producing to consuming centers.

Foreign markets. The foreign marketing picture is not so bright as the domestic one at the present time, if one considers only the traditional markets. Rice on the world market has seen some changes in the past few years. So far, the total volume of demand in international trade has been maintained, since the progress in some areas has been balanced by the growing deficits in others; however, there has been no significant growth in over-all trade. The production of paddy outside mainland China is rising at an average rate of two percent per year (85, p. 7). The increase has been concentrated in the Far East.

The general drive in recent years toward self-sufficiency among Asian rice importers has led some major exporters to adopt a

policy of reducing their dependence on rice as an export crop. One of the features of the present situation is the threat of an accumulation of surpluses of rice in Japan, formerly the world's largest importer. Because of these recent trends in Asia, it would be wise for Sierra Leone not to count on Asian countries in her search for world markets.

Africa should be considered as a possible future market area for Sierra Leone. Starchy staples will continue to be the backbone of the African diet for many years, but Bruce F. Johnston, an authority on African staple foods, feels that the present positions in the importance of the staple food products in Africa will alter (50, p. 215). Several factors will undoubtedly cause this change: differences in prices (due to farm techniques and transport); government encouragement of particular crops (subsidies and development schemes); growth of per capita income, allowing more latitude for consumer preference; and expansion of animal feeding (more demand for staples for feed) (50, p. 215-216).

Cereals rather than roots and tubers are needed for better nutrition (50, p. 161). The nutritional aspects of rice have not in the past been considered by the Africans. As people become more educated they will probably change from the low-protein roots and tubers and ask for grains. A notable improvement in the health of the people has been observed in the new southern rice areas of Sierra Leone,

where the people formerly ate cassava and some fish instead of rice. Increased awareness of the benefits of proteins should enlarge the African market for grains. Will rice be preferred?

In African cities, food expenditures claim a large share of total income, and starchy staples occupy a very important part in food purchases (60, p. 267-268). Rice seems to be more acceptable to most West Africans in the cities than maize (50, p. 145). Rice is usually more expensive than the other staples in West Africa, and it is becoming a mark of prestige in the cities to be able to afford rice. In addition, rice is the only cereal which is ready for consumption without further processing, except for boiling, after the husk is removed in the milling (79, p. 1264). These facts could increase the market potential of rice as a cash crop, especially in those areas of Africa where rice is not the traditional crop.

Sierra Leone has a good port for international shipping -- an excellent harbor at Freetown. Because rice is easily stored, there are few handling problems in shipment. However, rice is not homogeneous and varieties are not interchangeable. This is a difficult factor with which to contend, because rice is shipped in the form it is used and, unlike wheat, cannot be mixed. A good case is thus made for the adoption of the plan in Sierra Leone to cut down on the number of rice varieties grown in the country; benefits would accrue both in milling and in shipping if the number of varieties were kept to

a minimum.<sup>1</sup>

Fluctuations on world market. Fluctuations on the staple-food world market are detrimental to the selling country, especially if that country produces but one main crop. At present, international organizations such as the World Bank, International Monetary Fund, GATT (General Agreement on Tariffs and Trade), and the Food and Agriculture Organization of the United Nations are working on plans for buffer funds, price supports, trade agreements, and diversification. They hope to help stabilize prices on the world market so that they will not fluctuate so widely, or if they do at times, that the countries involved will not be adversely affected. If such plans materialize, this should make the international trade of foodstuffs more attractive to countries such as Sierra Leone. Her comparative advantage in the production of swamp rice could be exploited more readily on the world market, and the fear of disastrous price fluctuations would have been reduced. This is an important part of the eventual changeover of an underdeveloped agricultural country to a modern economy (115).

Common market. Opinions differ, however, on the best methods for building a strong economy in such an underdeveloped country as Sierra Leone. Aside from international price agreements or

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<sup>1</sup>In Ceylon 80 percent of the rice grown is of one variety. The West African Rice Research Station is conducting research to reduce the number of varieties in Sierra Leone.

buffer funds, other economic developments could see the emergence of a common market in West Africa wherein each country would produce those products in which it had a comparative advantage and would trade among its neighbors (25). Sierra Leone could, of course, produce rice and exchange it for other necessities produced by members of the common market.

International meetings. The Rice Study Group meeting of the Food and Agriculture Organization of the United Nations in Trivandrum, India, in 1947 saw a need for international action to expand rice production. It proposed that research be done on suitable machinery, common pests, statistics, prevention of waste in transit and storage, and the stabilization of the world rice market through international trade agreements and national and international rice reserves (29, p. 1).

Another example of international cooperation and research was the Third Special Meeting of the International Rice Commission in Bangkok in 1955 which proposed further study of various methods to reduce instability in the world trade of rice. They recommended study of the following: (a) national stocks and an international buffer stock, or a combination of the two; (b) a multilateral contract; (c) an export quota scheme (26, p. 23). They stated that stability should not mean a freezing, either of quantities, prices, or trade patterns. It should mean recognizing long-term trends and being able to smooth

out the fluctuations (26, p. 21). They also stated that governments would need to consult frequently on the economic aspects of the rice industry. These problems, submitted a decade ago, are still being discussed. Because of their complexity there is no simple solution.

Sierra Leone will be affected by the results of such international meetings and is fortunate to have a representative of the West African Rice Research Station attend a number of these meetings. The station works closely with the International Rice Research Institute in the Philippines, with the F. A. O. , the International Rice Commission, and other similar institutions (56). International cooperation is beneficial for Sierra Leone in two ways: (1) it helps the country solve its own local problems through learning how others solved similar problems; and (2) it is concerned with the overall international problems such as the world market conditions.

#### Summary of Market Conditions, and Recommendations

Because of the complexity and uncertainty of the world market, N. A. Cox-George, a British economist, recommends that the emphasis in Sierra Leone should be changed from an external market economy (exports) to an internal market economy (20, p. 305). He believes both should be retained, but that the emphasis has been misplaced. As recently as 1946, Child's Plan ( a program of development for Sierra Leone written by an Englishman) emphasized



exports and a mercantilist philosophy; the internal economy was not even mentioned.

An internal economy development could emphasize growing more food at home and reducing the importation of foodstuffs. Processing of home-grown foodstuffs would be done in Sierra Leone. Surpluses could be exported, especially rice (20, p. 305-306). Specialization could be encouraged so that the transition from a subsistence economy to an advanced economy might proceed more rapidly. People would need to be encouraged to provide goods and services for each other in their own country and to expand their local markets. A large internal market for their product would be opened up to swamp rice farmers as people specialized and some of the farmers now growing their own rice moved into industry.

As N. A. Cox-George, writing in Finance and Development in W. Africa: the Sierra Leone Experience, said, "Along with a shift to an internal economy should come a further shift from customs duties to income taxes. Then there is not such a reliance on external trade" (20, p. 306). The income tax would be one means of furnishing the necessary capital for development. Diversification is also important. Sierra Leone is classified as having a semi-diversified export economy (109, p. 168); her principal exports are palm kernels, iron ore, and uncut diamonds. Rice could be added to this list in the future.

## Transportation and Milling

Transportation. At the present time marketing is hampered by inadequate transportation in Sierra Leone. The railroads are very old and in need of rejuvenation. They serve only a few areas of the country since they were not planned to develop the economy of the country as a whole. Because the railroads have been losing money for many years and are in need of repair, many persons believe the country should concentrate on the building of all-weather roads (7). The present roads are mostly unpaved, too narrow, and too few, and they become impassible at times during the rainy season. With a good system of all-weather roads crisscrossing the country, marketing would be easier, the people would have more incentive to grow extra rice, and trucks could be used rather than the railroads. The Government realizes the necessity of better transportation and marketing facilities and has already begun a program of road improvement in the provinces (7).

In the case of rice, an important phase of transportation is from the swamps to the mills, especially those mills that have adequate storage space for processed rice until it can be shipped to the cities. Time is an important element after harvesting, for if the rice becomes even slightly damp, it will start to ferment; storage in a dry place as soon as possible is absolutely essential. It may be

necessary to use boats to a greater degree than at the present time. Because many of the lands which may be developed for rice cultivation in the future are quite remote, the problem of storage will have to be solved.

Since it would be impossible to build all-weather roads in areas that are flooded part of the year, animal power would be helpful for bringing rice out of the swamps that cannot be reached by boats. The people in Sierra Leone, however, have had no experience in using cattle in the farming economy. The tsetse fly is the greatest enemy of cattle in West Africa, causing them to become sick. If the tsetse fly can be controlled, the Government would be interested in introducing cattle into the south and other parts of the north (the Fula tribes have cattle in the northeast) so that the people can learn to use them for farming and transportation (101, p. 7).

Milling. Government policy in Sierra Leone has been to establish four or five large rice mills in the country rather than many small mills such as are found in Nigeria (21). At the present time the milling capacity is greater than is the drying capacity (14). The mills are located at Mambolo in the Scarcies area, at Kissi near Freetown, and at Torma in the Bonthé area in the south (Figure 8, p. 116). There are four rice driers, one at Mambolo, two at Kissi, and one at Torma. Large German equipment was being installed at

Kissi in 1963 which would include one complete parboiling, drying, and milling unit (21).

One disadvantage of centralization is the possibility of a breakdown in the machinery. With only one mill in the north and one in the south, this presents a serious problem for these areas. Production by the mill at Torma is the most efficient, for there are fewer varieties of rice used in that area (126). As for the future, it would be advantageous if there were two mills in the south and two mills in the Scarcies area in the north (21). The earlier-mentioned proposal to cut down on the number of rice varieties would also lead to more efficiency.

### Capital Investment

Large capital investment in stationary equipment is not required for the growing of swamp rice in Sierra Leone. Much of the work, including the clearing of mangrove lands, empoldering, and drainage of permanently-flooded swamps, is done by hand. Only in the grasslands is machinery used extensively, and then only for plowing at the beginning of the season.

In the past the effect of much of the advisory work done by the Department of Agriculture was nullified because the farmer lacked capital, know-how, and incentive (126). It is now proposed to meet these problems by providing the farmers with credit, along with

increased extension services and better marketing facilities. It is hoped that this much-needed credit will enable the farmers to develop a cash economy.

In the Sierra Leone White Paper on Natural Resources Policy (written in 1961), the Agricultural Credit Scheme is set forth. Parts of it appear as follows:

### Agricultural Credit Scheme

#### (a) General

The provision of credit capital to farmers is normally the function of banks in countries which are advanced agriculturally. In Sierra Leone, however, where most farmers are unable to offer that degree of security which is reasonably demanded by the banks, the duty of promoting such credit capital to farmers must fall to Government. Government therefore intends to supply credit capital to farmers to enable them to undertake either individual or collective specific schemes, which are considered to be economically viable. Priority will be given to applications from already established co-operatives or farming associations, local government agricultural institutions, and individuals, who on past performance have shown the energy and intelligence to successfully apply the advice given to them by the Department of Agriculture.

Credit capital will be provided the successful applicants in the form of capital equipment (e. g. machines, buildings, etc.) and provision of services (e. g. initial bush clearance by heavy machinery).

The chief criteria for the consideration of any project will be the project's economic viability (i. e. whether the project is likely to be commercially profitable), and its technical feasibility, having regard to the need to follow the tenets of good husbandry.

... rice is among a long list of agricultural projects which are considered eligible for loans....

(b) Administration

The Director of Agriculture will administer the scheme. He will receive advice on applications from Agricultural Credit Boards, one being established in the Colony area and one in each Province.

(c) Conditions attached to loans

Government intends that:

(i) Loans will only be granted in respect of projects which are technically feasible and stand a good chance of being commercially profitable;

(ii) An applicant for a loan must obtain the written consent of the Tribal Authority that the land he proposes to develop can rightfully be farmed by him, before the Board considers his application;

(iii) Loans will bear interest at the rate of one per cent above the current London bank rate;

(iv) Repayment of loans will begin, subject to the Minister of Natural Resources' discretion, one year after a national "production day", which will be specified in every loan agreement, having regard to the type of crop involved;

(v) The Minister of Natural Resources will be empowered to extend the period of repayment of any loan, and to its writing-off in the event of unusual circumstances, such as droughts and floods.

(d) Security for loans

The Government intends to accept as security for a loan the land offered for any project, the Tribal Authority acting as trustees for the land. (For example where an agricultural project fails through the fault of the farmer, the Tribal Authority would, it is envisaged, be empowered to replace the defaulting farmer by another, so that the project could be continued).

## (e) Allocation of costs to farmers

The cost of establishing an assisted project will be eligible for credit under the scheme. Such costs will include the surveying, clearing and preparation of the land, the erection of stores and farm buildings, rent for the use of clearing machinery, (which would include an element for the cost of fuel and drivers' wages), upkeep of the farm or plantation until it came into production, and labor costs, including allowances to the farmer.

## (f) Allowances to farmers

Agricultural Credit Boards will be given the authority to recommend to the Director of Agriculture cases where they consider that a small allowance should be paid to a farmer developing his land under the credit scheme, until such time as the project comes to fruition (101, p. 4-5).

A credit scheme such as this would give farmers the substantial assistance needed for further agricultural development in Sierra Leone (126). It would also allow scope for small-scale efforts by individuals. A loan scheme would foster the interest in empoldering (58, p. 1); likewise, capital assistance would make possible development of the potentially valuable southern mangrove swamps (56).

In addition to the credit plan put forward by the Government, there is, of course, the rice-purchasing scheme presently in operation, which is also necessary to encourage the growing of more swamp rice in Sierra Leone (7).

### Political Problems

#### Land Tenure

Except for the portion of Sierra Leone included in the former

Colony, land ownership in the new nations has remained almost entirely vested in the tribal authorities. The official government policy has been to recognize that the land in the former Protectorate is communally owned by the tribes, and it is therefore difficult for anyone to obtain freehold land (125). In the Colony area, where private ownership developed, many of the Creoles do own land, but people from the Colony have not been able to buy land in the Protectorate. Large commercial agricultural ventures maintained by outside capital have not been important in the economy of Sierra Leone (7).

A few exceptions to communal land ownership in the Protectorate occur in the northern coastal areas, where there is the most advanced system of land tenure outside the former Colony area. Land is claimed by the person who first cultivated it, and thus, traditionally, the cultivator uses land that essentially belongs to him (56). In the newer lands there are often arguments over who cultivated the land first.

A "pledging" system is in operation in many of the northern areas, under which a person can pledge his land to someone else for a sum of money and use the land until the money is repaid. Such a mortgaging system is risky for subsistence farmers, for they have very little cash available at the end of the year; however, owing to the demand for rice, most farmers in Sierra Leone have been able to get out of debt and redeem their farms (56).



Because of the difficulty in acquiring cheap labor, the rice farms in the north tend to be small and run by individual families, although some larger parcels of land are owned by prominent families. In spite of the fact that strangers are allowed to farm part of these holdings, such an arrangement is usually permitted for only a year or two (57, p. 5).

"Shakehand" is another practice used in order to obtain farm land (126). One may go to a chief and ask for land, giving him money for this favor. This practice was especially prevalent in the uplands, where strangers would come to use land for a year or two. The amount of money asked by chiefs became too large, however, and the practice has dwindled.

As mentioned earlier, some people in swamp rice farming areas live in a village and travel many miles to their farms. Due to their absence for months at a time, infringements upon their unsupervised fields are frequent.

In the southern grasslands and mangroves individual land ownership does not exist. Most schemes for swamp rice in the south have been carried out on unused lands, and to date there has been little trouble about ownership. The people of a chiefdom, with the chief's permission, farm the land and pay for their own plowing (126).

Especially in the north at the present time, litigation is a serious problem, disputes having increased with the decline of tribal

power (57, p. 5). Even now, some developed land is not being used because of legal disputes. Recently, a large waterlogged swamp at Makot on the Great Scarcies River (Figure 8, p. 116), which had been completely reclaimed, stood unallocated and unused for a long time because of a failure to decide the ownership problems beforehand (56). At least 10 or 12 years of secure possession are needed in order for people to develop their land (126).

A system which lacks the capacity for adjustment and which is no longer in accord with a stage of political and economic development will inevitably contribute to instability and insecurity . . . .

On the other hand, a system which will bring rewards to a cultivator for his efforts will promote self-reliance, self-help, thrift, and independence (49, p. 6).

Some reformers feel that absentee ownership is to be avoided; there should not be an intermediary involved with the farmer. Unscrupulous practices sometimes develop under such an arrangement, or the farmer gets hopelessly in debt and loses his incentive. Laws are needed in Sierra Leone to prevent this practice and to specify how a person may obtain land in the future.

#### Gravity of the Land Tenure Problem

Although there are possible solutions, the land tenure problem in Sierra Leone is a major and perplexing issue for those who hope to develop more lands for swamp rice. In theory, solutions sound

feasible; they could come through new laws specifying how people may obtain land, by breaking down old customs of landholding in the various tribes, and by educating the people to the advantages of owning one's own land or joining cooperative ventures. These solutions would, of course, take a long time, and in the interim new problems could develop, especially in terms of human greed and an inability of people to look at the long-run benefits, making the situation even more complex.

At the present time the most that can be expected in the north is that an agricultural officer will select from aerial surveys the lands deemed suitable for rice. He must ascertain ownership and determine whether the owners wish to develop the lands with the assistance of a loan, or whether they are prepared to grant security of ten years or so to a tenant who will be willing to develop them (58, p. 2). The names of those willing to develop land are submitted to the local chief, who either confirms or denies that they are responsible people who will use the loan for its proper purpose (58, p. 2). The Agricultural Officer must use persuasion and demonstrate successful examples in order to arouse the interest and secure the cooperation of the people (126). In the south the chief must be consulted to find out whether tribal lands can be used for mechanized rice farming.

The problem of land tenure is so great in Sierra Leone that the Government has asked the United Nations' Technical Board to provide

an expert on land tenure to examine this whole problem and to make recommendations (101, p. 8). Mr. H. P. Galfetti, a rice trader on the Scarcies rivers for 35 years, in a letter to the writer declares that "land tenure is too complicated a problem to find an equitable solution in the near future. "

### Size of Development Schemes

To encourage private incentive, some of the new African governments prefer to promote individual land tenure in place of the tribal land holdings which are so traditional over much of the continent. Small individually-operated farms have been successful in the Scarcies area in Sierra Leone.

It is likely that further development in the north will be accomplished through small schemes. Three acres is the optimum size of a farm for one family in this area because of the necessity of transplanting the rice shoots. In addition, land tenure litigation and a limited number of workers make large schemes infeasible, since it would be difficult to make all the arrangements and commitments necessary in the planning of a big project. Especially in the saline mangrove areas where empoldering will be necessary, large-scale pilot schemes are not recommended because manpower is lacking (51, p. 7). Laborers would have to be induced to come to the area, and since the local people are hostile to strangers as settlers, large

schemes would most likely fail.

The southern grasslands present a different picture. There, it has been found advantageous to establish cooperatives, since the plowing projects on these lands must be at least 200-300 acres and can be as much as 2,000 acres (126), and -- most important -- government plowing is done only for cooperatives, not for individuals.

If it is considered by planners that a unit of cultivation much larger than can be allocated to a single family is desirable for promoting agricultural development, then a form of joint operation is tried, usually a cooperative. Under such a plan, however, it is important to emphasize incentive by giving each family some kind of recognized status. This is difficult to do, and very little is known about methods to achieve such a goal. Each area will have to develop its own viable program under capable leadership (126).

In the long run, perhaps individual land ownership and cooperative plowing and marketing schemes would prove to be the most desirable methods for Sierra Leone. Incentives for individual enterprise would be provided, yet the benefits of cooperatives would be made available. Nevertheless, whatever evolves in Sierra Leone will take a long time. Tribal ownership will not be erased quickly in the Protectorate area. The chiefs hold the greatest power in the Government, and somehow they will have to be persuaded that individual ownership will lead to greater production and monetary rewards and

raise the standard of living of the people. Cooperative farming is not only more likely to be successful among somewhat sophisticated farmers who have previously developed good attitudes toward work, but it is also considered to be an advanced stage of farming development reached after an interval of individual ownership and responsibility.

### Government Plans for Education

The villagers of Sierra Leone have not changed much since reports of several seventeenth and eighteenth century Europeans detailed the natives' way of life and their appearance (67, p. 38). Each village consists of clusters of 30 or 40 huts; most of the people are still illiterate and disease-ridden, and a belief in the supernatural dominates their lives. The biggest change is that the British stopped the constant tribal warfare. Only the capital city and a few other centers have been strongly influenced by British customs, laws, and economic practices and by the teaching of missionaries.

Superimposed upon this situation is the fact that in the last two decades some of the native men have been away in the army, at the diamond mines, or in Freetown working. They return to the villages with new ideas -- usually an awareness of cash and that it buys goods -- and inspired with thoughts of party politics and nationalism (83, p. 297). They tend to question even the tribal authority.

The whole era is confusing to the African, and understanding

and wise counsel are necessary to make this period of change a productive one. Sierra Leone is among the most fortunate of the new African countries in one respect -- her government is a stable one because of a gradual transition to independence accompanied by trial elections under British supervision and the training of capable Government personnel. Under the direction of the new Prime Minister, Albert Margai, there is reason to predict that a government of maturity will evolve. His late brother, Sir Milton Margai, the country's first Prime Minister, handled the early transitional years as well as could have been expected.

Even under a stable government, however, the problems of changing a society are immense. It is likely that the present political leaders, with the help of foreign aid, could modernize their transportation, communication, and industry, and yet at the same time leave the majority of their people controlled by a traditional society (77). Engineers, technicians, building contractors, and industrial experts can modernize in a relatively short time, but the changing of peoples' attitudes involves much more time. Real economic progress is impossible until there is a desire for it. Not only must the legal and political systems be favorable, but also the people must know that progress is possible and desirable (108, p. 13). Successful economic development depends on adequate knowledge (4, p. 197).

It is doubtful that the old institutions in Sierra Leone can bring

the village people from tribalism to modernism (77). Colonial administration did not provide for basic changes in the villagers' way of life; being only a superimposed system of economic exploitation, it prepared but a few persons in the larger cities for the modern world.

Dr. Ernest F. Neal, an expert on rural development in underdeveloped countries, believes that a new approach is needed in the country of Sierra Leone to set forces in operation that will eventually bring about the desired change (77). If the innovations are radically different from those institutions already in practice and are quickly introduced, there will be opposition. K. B. S. Baldwin, writing about an agricultural project in Nigeria, agrees with Dr. Neal and says "inevitability of gradualness" in change must be accepted. Otherwise, he says, authoritarian method such as those used by Russia and China would be necessary to obtain quick spectacular results (4, p. 154).

One approach for education in Sierra Leone has been suggested; it is based on experience from the Danish Folk Schools, from Berea College in the Kentucky mountains, and from Tuskegee Institute in the Deep South (77). These institutions made a sharp break with existing educational institutions and became responsive to the needs of the communities from which their students came. They prepared the students to return to their communities as agents of change; they were independent of church and state control; and their physical growth



was largely the product of student and faculty manual labor (76, p. 6). The underlying principles of these institutions will be applied to Sierra Leone, modified to meet African conditions, for it is necessary to blend scientific knowledge with folk knowledge, to develop leaders and programs fitted to the culture (128, p. 122-125).

The Agency for International Development (A. I. D.) program has drawn up plans based on the above-mentioned schools and will administer the program in selected villages. In trying to help the Africans make the crossover from tribalism to modernism, the A. I. D. is confronted with three large problems: communication, motivation, and the new institutions and experiences needed for change (77). This is also true of other agencies in Sierra Leone who are trying to help -- The Peace Corps, CARE, and similar groups.

Research in communication, one of the problems mentioned in changing a culture, will be conducted by the University of Illinois and a land-grant college to be established at Njala, Sierra Leone (Figure 8, p. 116). The University will study present communications and experiment with radio and television; it hopes thus to be able to reach the older people and obviate the necessity of their learning to read at their age. Teachers of the younger people will be oriented toward blending practical vocational skills with knowledge of the English language and the outside world. Education of the type that encourages experimentation will no doubt bring the most progress (108, p. 13).

Agricultural training. One method of instilling motivation for economic progress is through education. The African peasant farmer now accepts European cloth, a tin roof instead of thatch, and the use of cash where it has been introduced (7). Agricultural methods are so much a part of life and religion that it is hard to change them (24, p. 240-241). They will change, however, if the people can be shown that better methods are possible (126).

An agricultural college complex has been proposed for Sierra Leone, which would be patterned after the land-grant colleges of the United States and would meet the need of elementary school graduates. From the beginning, agricultural research and extension would be included. The University of Illinois will be affiliated with the Agricultural College of Sierra Leone and will set up the schools. The West African Rice Research Station will also become part of this complex, but will retain its own identity as a research center. It will provide lecture courses and will train research students in Sierra Leone.

Present problems are connected with the transfer of staff members from the Department of Agriculture of Sierra Leone and the setting up of a new accounting system, establishing new policies, and reaching agreement on many minor points. Such a venture is a radical change, and the implementation of new ideas doubtless will be accompanied by many disagreements before satisfactory compromises are reached. The African wants to be helped, but he also desires to

be independent and wants his views to be respected.

Youth training. The agricultural college complex is an excellent plan for the future development of the country. However, the biggest problem in education for the next ten years will be the non-English-speaking youth (77). Hampton Institute in the State of Virginia is setting up a program in Sierra Leone to answer the needs of this group, a program based on the Institute itself. This school for Negroes was established in 1868 by the American Missionary Association and planned as "education for life"; it emphasized agriculture, home economics, and trades, and the students performed much of the manual labor. In Sierra Leone the program will not require English reading or writing. It will teach the skills of agriculture, mechanics, and home economics -- one skill at a time to each student -- for three months. While at the school some of the boys will work on building the school, others will grow the food for the students, and the girls will prepare the food. English and Public Health will also be included in the teaching, but mastery of these is not required for graduation. Upon completing the course, students will return to their villages where representatives of the Extension Service will continue to work with them. The young people participating in the program are to be nominated by their chiefs, and the first such school will be at Kenema (Figure 8, p. 116).

The setting up of this school and others like it is a practical

plan. It attempts to make basic changes in the entire society through education. And it will do so in an orderly way over a sufficient period of time so that the people will grow to understand why change is necessary for the modern world and that change can be beneficial. It is to be hoped that the experiment will be encouraged and that the Government will not become impatient if progress is slow.

Extension services. These are as important as new kinds of schools (126). Their effectiveness (and also that of agricultural research) can be greatly increased if extension workers will devote as much effort to learning from African farmers as they do to teaching them (4, p. 186). Traditional village education through extension also consists of trial plots, agricultural experiments, and much talking (7). A new idea must first have the support of the chief if it is to succeed (125). There will be disappointments and frustrations with this type of education just as with the new schools, and much patience will be necessary.

A recent extension plan for Sierra Leone based on a "Master Farmers Program" has not been a success. It was an effort to improve the quality of swamp rice in the country by making available to the farmer a quantity of pure seed, and it failed for reasons due partly to a lack of capable supervision; but the main reason for failure was that the Master Farmer, who grew the pure seed for the other farmers, had to sell it immediately after the harvest so that

he would have time for instruction in its planting. The ordinary farmer, however, did not wish to buy this seed until the next sowing time. Most of the pure seed produced by the Masters has thus gone into commercial channels and not to other farmers.

The Rice Research Station at Rokupr has therefore proposed an alternate scheme -- which has been accepted by the Government -- for a large increase in seed distribution in 1966, which is designated by the Food and Agriculture Organization of the United Nations as International Rice Year. It is hoped that the F. A. O. will provide a man to run the scheme, and the Rice Research Station has planned that sufficient seed will be available that year to provide every farmer with at least 30 pounds -- sufficient to plant at least half an acre (56). The initial multiplication of seed will be started at the rice station in 1964 in order to have enough seed available in 1966.<sup>1</sup>

People must be taught through extension to do many things for themselves, because they cannot afford to hire others to do them (58, p. 5). Empoldering is a good example, and an Extension Officer or other Department of Agriculture or College staff member must be available to advise on the layout of empolders and to give other technical advice. Because the Rice Research Station and the colleges will

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<sup>1</sup>Information contained in a letter to the writer from H. D. Jordan, Director of the West African Rice Research Station, Rokupr, Sierra Leone, dated May 25, 1964.

now be working together on extension, there should be improved methods and help for the Department of Agriculture.

The West African Rice Research Station has had promising results experimentally in the last few years in their trials of double-cropping of rice. They have bred a new rice which is suitable for this work and hope to have it ready for release to farmers in the next two years. Along with this development is the imminent arrival of a team of Chinese rice experts from Taiwan, who will settle at Mange (Figure 8, p. 116) and demonstrate their techniques of rice cultivation, including double cropping.

Mission schools and Peace Corps. In addition to extension work in the villages, the agricultural college complex, and the village school for the non-English-speaking youth, mission schools and the Peace Corps have been established. The Government of Sierra Leone has given financial assistance to mission schools to help spread literacy (23, p. 299). Missions can provide grass-roots experience and aid other educational plans. The Peace Corps has sent American teachers to Sierra Leone to teach in the secondary schools. They were requested by the Government and are teaching the older children in English (70).

### Political Leadership

Qualified and honest leadership is requisite to inspire people to

make changes and sacrifices necessary for economic progress (108, p. 15-16). While, on the whole, the Sierra Leone Government has been effective and stable, the existence of graft in connection with the marketing of rice has been demoralizing to the people (34, 71). After Sierra Leone achieved its independence, the original British plan to have the Government buy and sell rice in the country was modified to allow franchises to Lebanese traders, who were to act as middlemen for the Government. Instead of continuing the forthright policies of buying and selling begun by the British, these traders manipulated the market. False shortages, high prices, and uncertainty arose; it was sometimes impossible for a city dweller to buy rice at all.<sup>1</sup>

A crisis was reached in 1962, and a law was passed in Parliament in 1963 forbidding any but nationals of Sierra Leone to trade in rice. Because the Sierra Leone Government failed to consider alternatives or to foresee the consequences of such a law, the market became even more chaotic. The Lebanese traders were particularly affected, and the main retail outlets in Freetown, such as Kingsway and P. Z. s, could not buy and sell any rice. As a consequence, the ordinary public suffered. In the area of the Scarcies rivers there

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<sup>1</sup>Information contained in a letter to the writer from R. W. McMillen, Manager, Elder Dempster Agency, Ltd., British shipping firm in Sierra Leone, dated May 26, 1964.

was no way for the farmers to sell their rice, for the non-Sierra Leoneans were the only ones who had the capital to engage in giving credit and buying and selling rice. The new law even prevented Lebanese from cultivating rice in their own gardens.

A compromise has now been reached whereby the non-Sierra Leonean can cultivate local rice. He can also buy rice for a year but cannot sell it to anyone except the Government. This enables the rice growers on the Scarcies rivers to bring their rice onto the market once more. During this year (1964) enactment of legislation is planned which will permit a stable situation.

Eventually, it is hoped that a workable solution will emerge, but the mistrust which arose because of the incident made the people suspicious of their new government. As a result of the rice-buying scandal, evidence of graft in the Government was uncovered and made public. The Lebanese traders were able to buy the privilege of acting as middlemen for the Government and thus could make a huge profit for themselves.

The people of Sierra Leone cannot be expected to desire progress if it leads to situations where only a few people make a profit. The temptation to accept graft in return for granting favors and franchises must be overcome by a sense of duty to one's country. In a new government the results of greed and selfishness could prove disastrous. It remains to be seen if the small elite who are capable



of governing Sierra Leone will be able to resist similar temptations for graft in the future. The opportunities occur often because so many of the people are still illiterate.

A government also has the responsibility not to be locked in inaction. The Government of Sierra Leone permitted the intolerable situation of market manipulation during a rice shortage to continue much too long before taking measures to correct it (56, 71). Fortunately, the Government did become willing to try a new approach and modify an existing predicament.

## CHAPTER V

## SUMMARY AND CONCLUSIONS

Summary

One-half of Sierra Leone's imports consists of food products, and included among them is rice. In order to raise capital for industrialization and to free agricultural labor for manufacturing, Sierra Leone desires to improve its agriculture and to cease importing food. It hopes to be able to raise more food with a smaller force of people and to become efficient enough in agriculture so that it can export surplus foodstuffs. Would expanding the existing swamp rice culture in Sierra Leone help accomplish these goals?

Because of the large amount of rainfall and hilly terrain, land cleared for cultivation is subject to serious erosion in Sierra Leone. Swamp rice is an excellent crop for such physical conditions. It is grown in reclaimed mangrove swamps, on coastal grasslands, and in inland swamps, and does not cause erosion as does upland rice.

Adequate land (at least 450,000 acres) is available for future development of swamp rice farms. The climate is suited to rice growing. No fertilizer is necessary on the coastal areas, because silt is brought down each year during the flooding season from the highlands. Good yields are obtained from inland swamps and boli

lands with an application of a super-phosphate fertilizer. Double cropping is possible in some areas which are not reached by salt water, especially along the Little Scarcies River in the north and in inland swamps. The natural tidal flooding twice daily in the mangrove regions provides excellent irrigation and drainage. Indo-China floating rices grow well on the deeply-flooded grasslands.

Physical problems. The physical problems connected with the further expansion of a swamp rice economy are not an important stumbling block if money is made available to overcome them. Capital investment will be required for the reclaiming of the southern mangroves and the clearing of grasslands, the building of empolders to keep out salt water, the drainage of permanently-flooded swamps, and small dams or bunds for flood control on some of the rivers. The amount of money needed is moderate compared to some other kinds of agricultural or industrial development, because much of the labor is done by hand and because natural irrigation occurs in Sierra Leone.

Land tenure. The problem of land tenure is a very serious one. Land tenure laws and policies must be forthcoming before a significant expansion in swamp-rice farming can occur. Litigation over land ownership is especially prevalent in the north where the farms are small and owned by individual families. In the south most schemes have been developed on unused land, and there have been few disputes.

These lands are owned communally by the tribes, and the chief gives permission for rice farms. Cooperatives are set up in these areas, for the plowing projects must be at least 200-300 acres and can be as much as 2,000 acres.

Two distinct patterns of land tenure are emerging in Sierra Leone, individual land ownership and cooperative ownership. They are each based on former customs and on the size of farms cultivated. It remains to be seen if individual incentive will dwindle on the cooperative grasslands' schemes; it is still high, because the yields have been much greater with mechanical plowing, and everyone has received substantial benefits. But will this feeling of optimism endure? It is unlikely that it will when progress becomes less strongly marked. By some means individual incentives must be retained if the cooperatives are to continue in favor. In the long run, perhaps individual land ownership along with cooperative plowing and selling will be the best answer.

Marketing through cooperatives. The cooperative movement eliminates middlemen in the marketing of rice. The rice cooperative in the south sells its rice directly to the government mills. On the contrary, since the mills do not take less than 50 bags from one seller, in the north it is necessary to have traders who buy from the farmer and sell to the mills. The middleman in this case is a convenience, but since he is in a position to extend credit his employment

often leads to constant indebtedness by the farmer. Unless the Government can control unscrupulous policies, the middleman will cause a decrease in incentive. This is another problem to be faced in the north, and as a solution perhaps cooperatives run by the farmers themselves will emerge.

Since it is the Government's policy to provide adequate marketing facilities in order to increase the production of swamp rice in Sierra Leone, there should be no problem in maintaining enough mills and driers as time goes on.

Labor supply. The present labor supply in the swamp-rice farming areas is inadequate for further land development. Not only are newcomers not wanted in local areas, but the rigors of swamp farming discourage others from wishing to settle there. School children are now consumers instead of farm laborers; the educated young people prefer not to farm, but instead they go to the cities. Education and propaganda regarding farming as an honorable profession will not solve this problem alone. High wages and prices are the best way to encourage people to farm rice. It is predicted that incentives to earn cash will continually increase as new habits and wants are formed through education and by an enlargement of the exchange economy.

Government rice schemes. The Sierra Leone Government initiated a rice-buying-and-selling scheme several years ago in order to

promote swamp rice production. The Government bought raw paddy for the same price it sold milled rice and paid for all the parboiling, drying, and milling. This price corresponds with that paid for imported rice. At the same time, mechanical plowing was introduced in the southern grasslands. These two schemes contributed greatly to the increase in swamp rice production from 1955 to 1963. Unfortunately, the Government Mills are now buying upland rice as well as swamp rice, and the price has been lowered. There have been fewer rice imports since 1962, and the price of local rice has not kept pace with the price of rice on the world market. It is estimated that swamp rice production is not increasing in 1964 but is barely maintaining itself. Unless the price is high enough, production will no doubt decline. People will not use the new credit scheme and borrow money for reclaiming unused land or build empolders unless they can be assured of continuing high prices.

Prices and wages. Much controversy is occurring among experts in economics, politics, natural resources, and social reforms over prices and wages in Sierra Leone. There are those who do not see that unless agricultural prices and wages rise along with those of industry and services in the cities, the economy of the country as a whole will remain stagnant, since the agricultural segment would lack purchasing power if prices for farm products remained at a low level. This is a vital problem because 80 percent of the people

in Sierra Leone are farmers (7). If persons prevail in the Government who will initiate higher wages and prices in agriculture, then the country has a better chance of increasing swamp rice production and probably expanding its economy.

Plans for education. Not only should prices remain high to give people incentive to develop new lands, but the people should be educated to know why it is necessary to change to a modern economy. The plans for education in Sierra Leone are excellent. Folk schools in the villages for the non-English-speaking youth, radio and television for illiterate adults, Peace Corps teachers in the secondary schools, and an agricultural college complex have all been organized. Problems will arise, however, if the plans are not efficiently carried out. They must not be rushed and modified or diluted too much. It is hoped that a sense of urgency will not prevail but that the needed changes will be gradual and permanent, resulting in the emergence of a new culture which will reflect the African's and yet borrow from other cultures certain customs and institutions which will be helpful.

Extension services will be increased. The people need to be taught to do many things for themselves. The West African Rice Research Station has become part of the Agricultural College complex and will take part in research and extension and provide lectures and internships. It will retain its identity as an international rice research center and will continue to work with other similar institutions.

Transportation. Transportation development will be important in Sierra Leone if swamp rice production is to be increased. The Government policy embraces a plan to improve the road system in the Provinces, and this project has already been started. All-weather roads seem to be preferred to railroads for the future, but no final decision has been made regarding the fate of the outdated and decrepit railroad lines. Good roads are essential for the milling and marketing of larger quantities of swamp rice. If the tsetse fly can be controlled, animals may eventually be introduced in the swamps to provide labor power and transportation.

Market potential. The long-run market potential for swamp rice is favorable, especially within Sierra Leone itself and in Africa. Asia is no longer a good market. Many people in Africa are already turning to rice as a staple in their diet, even though at this time the cost is higher than for the other available starchy staples. People like the convenience of rice preparation, and also rice has become somewhat of a prestige food, especially in the cities. It is high in protein quality and could very well become a favored grain in the traditional root and tuber areas. Since the world population is increasing rapidly, no doubt the market for rice will also keep increasing, both in Africa and later in other parts of the world.

Small development schemes. Small schemes for rice development are recommended. Because of land tenure obstacles, the



necessity for trial plots, and the present limited extension services and labor supply, it is best to start with small undertakings and enlarge gradually. The local people involved must be thoroughly indoctrinated with the ideas inherent in a scheme if it is to be a continuing success. The attitudes of the people are much more important in the long run than technical know-how or adequate financing.

Full development should go along with rice schemes. More transportation, schools, and housing are needed before any large-scale increase in production will take place. More people will be needed in rice areas to develop them fully. This will be impractical until all the people involved are educated to the point where they know why such development is taking place. Thus the rice schemes are a part of over-all Government planning and are not independent, isolated schemes having little relationship to the rest of the economy.

### Conclusions

Greater swamp-rice production in Sierra Leone is feasible. Adequate land is available. Good climate and soil are assets. Improved transportation and milling, new and better rice strains, credit plans, and a Government Buying Scheme are already extent or imminent. But it cannot be too strongly emphasized again that success or failure of rice expansion depends on the people -- the leaders, the Government, private groups, and the farmers -- their attitudes,

the availability of an adequate labor supply, and whether the workers will be willing or able to live in the swamp areas. Along with land tenure, these are serious problems to be faced. Education, patience, and trial and error methods will be necessary in order to achieve any success. Even these might not suffice. In the long run, perhaps the most important factor will be high prices. They could provide the incentive for the people to develop new lands. Sierra Leone may have the resources, the stability of government, and the planning groups necessary for such a program. But will the country be able to overcome the obstacles of land tenure, an inadequate labor supply in the swamp areas, and opposition to higher wages and prices in agriculture? Selfishness on the part of the individual planners can handicap the entire program.

From the sources used in research for this thesis different points of view were expressed concerning the feasibility of growing more swamp rice in Sierra Leone. The scientists and physical resources experts seemed uncertain of many of the political and economic problems. Similarly, the politicians and economists appeared unconcerned about the physical problems. No evidence has been uncovered, either by interviews or in library research, that indicated anyone had made a survey of all the different aspects.

The writer believes this study indicates that, despite the problems, an increase in swamp rice is and will continue to be an

effective measure in the economic development of Sierra Leone as long as the Government maintains the country's present policy of becoming self-sufficient in the production of food.

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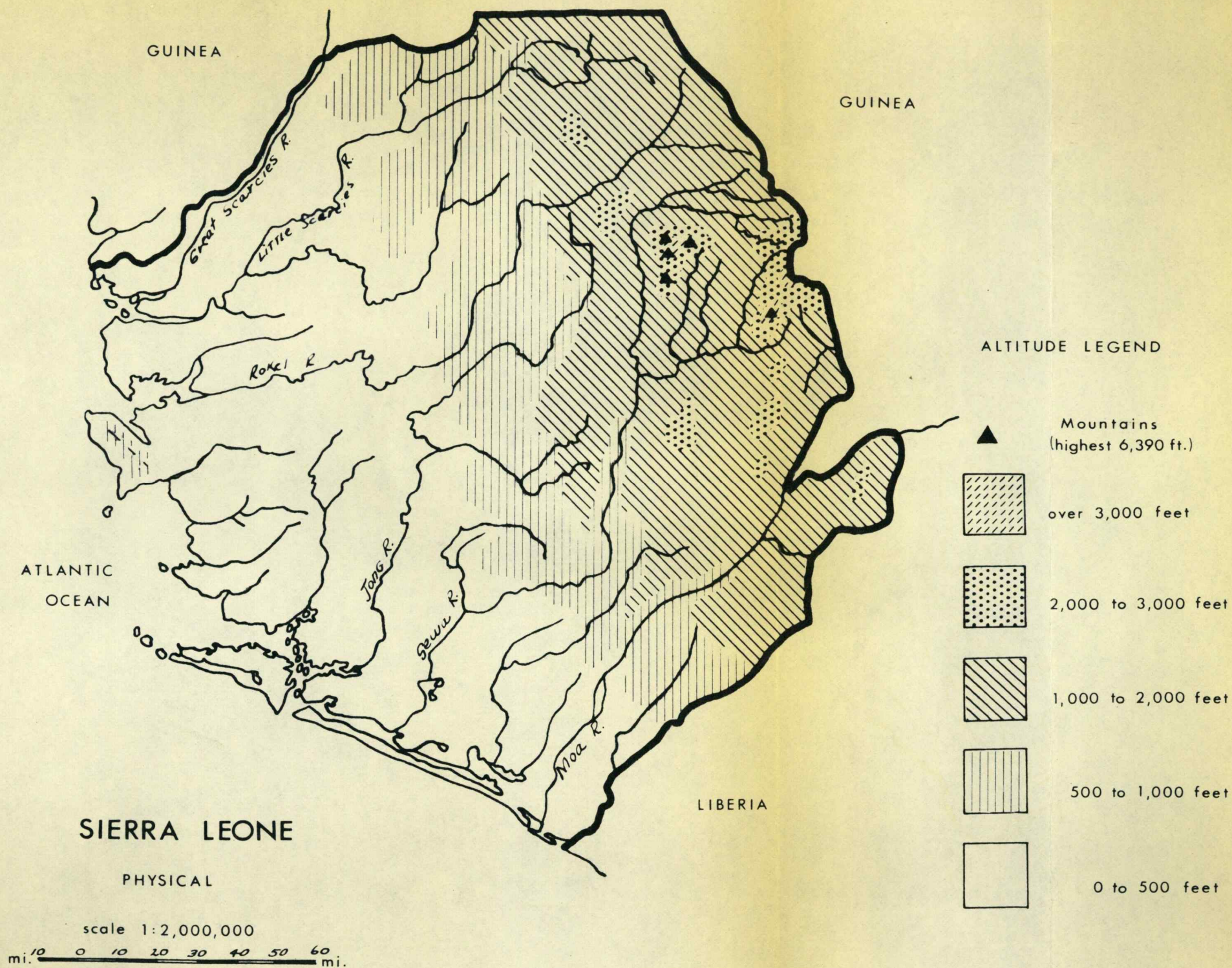
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## APPENDIX

Figure 1



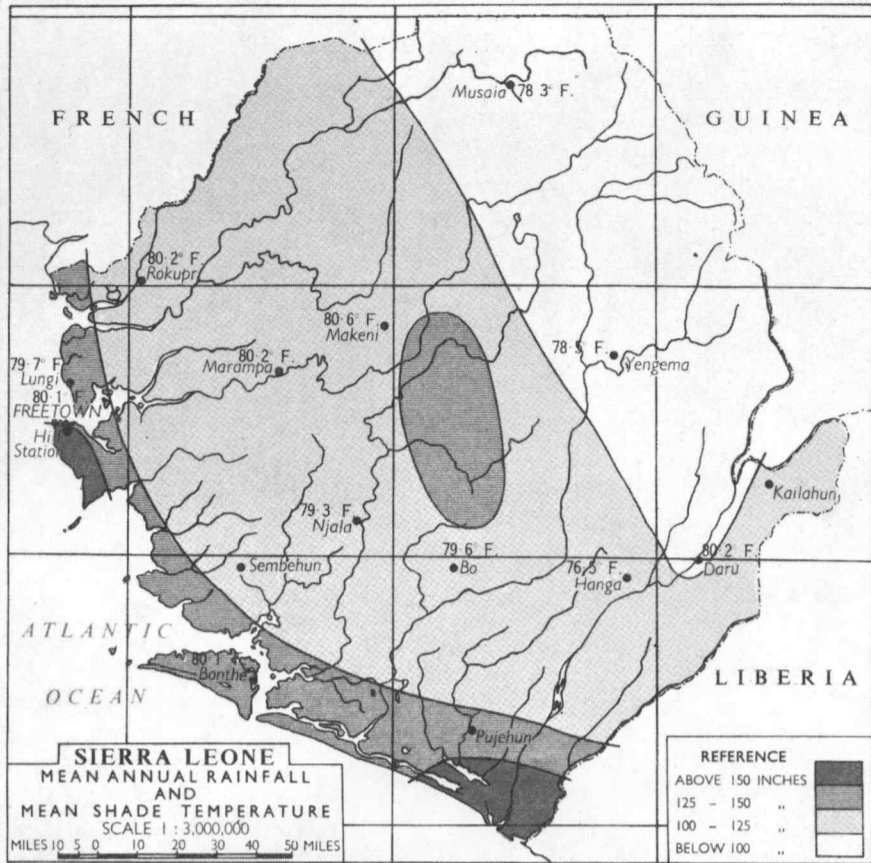
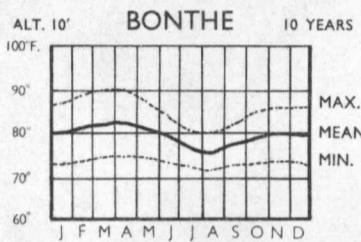
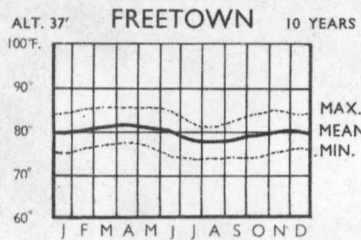
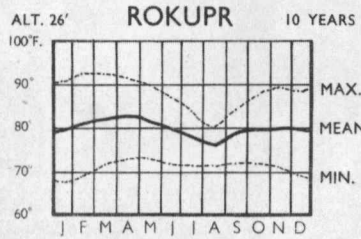




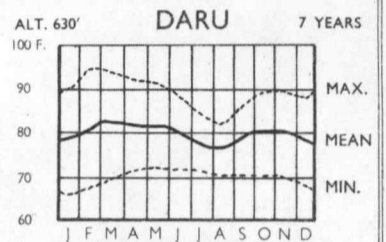
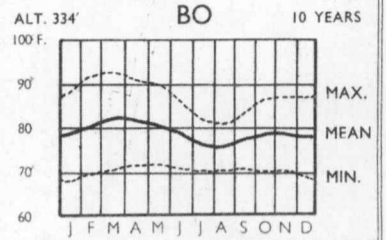
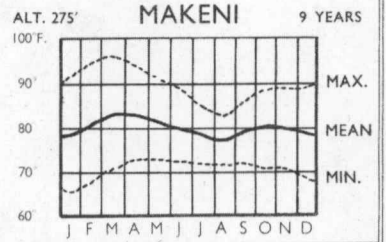
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mi. 0 10 20 30 40 50 60 mi.

# CLIMATE

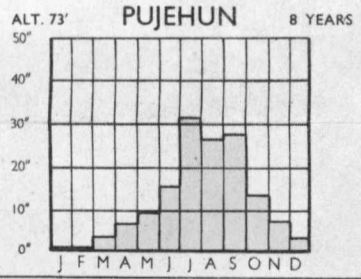
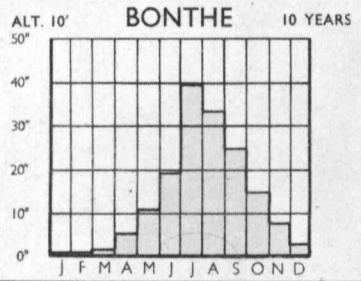
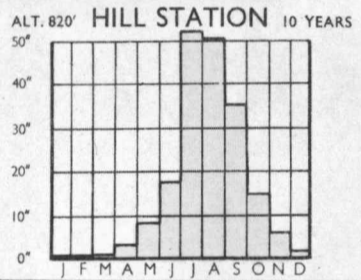
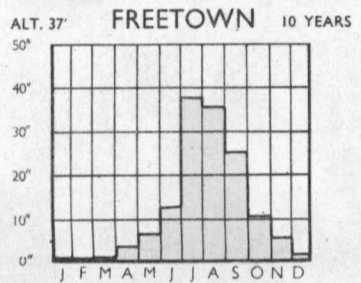
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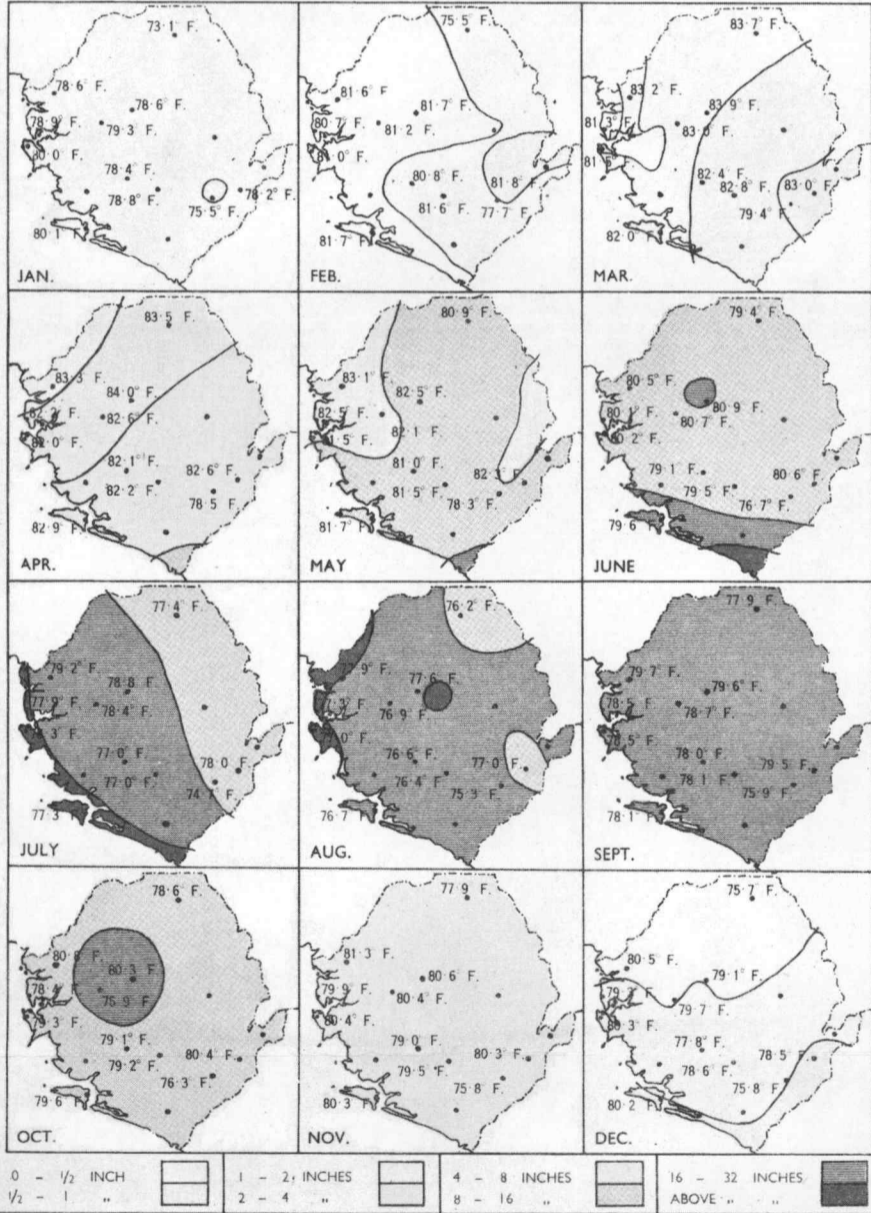
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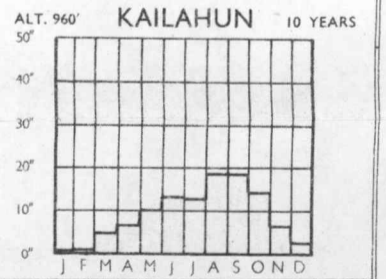
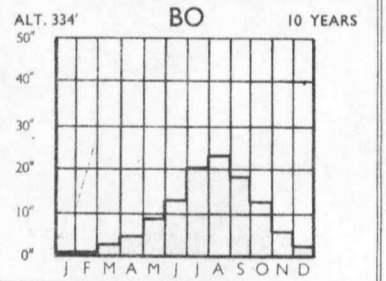
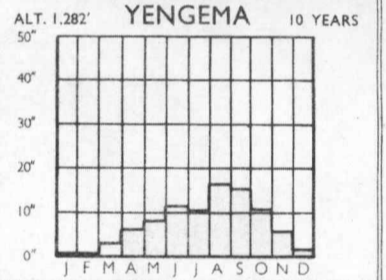
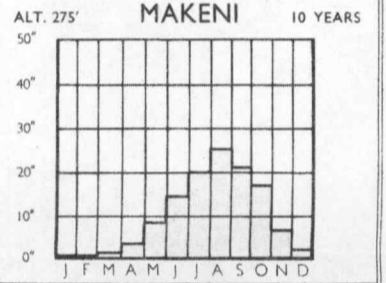
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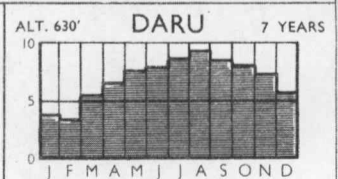
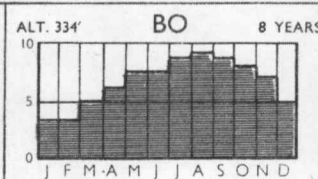
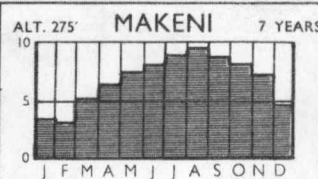
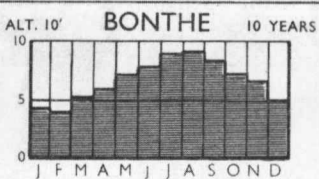
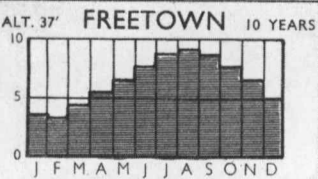
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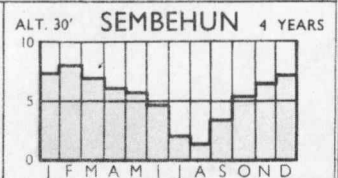
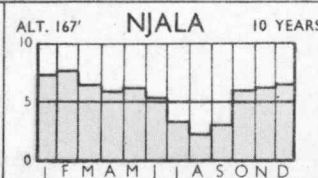
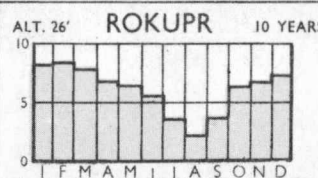
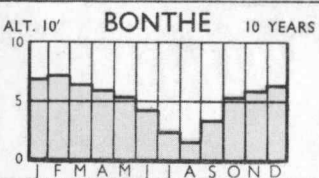
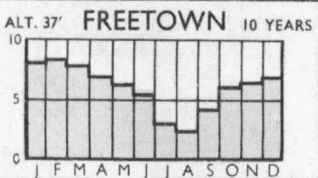
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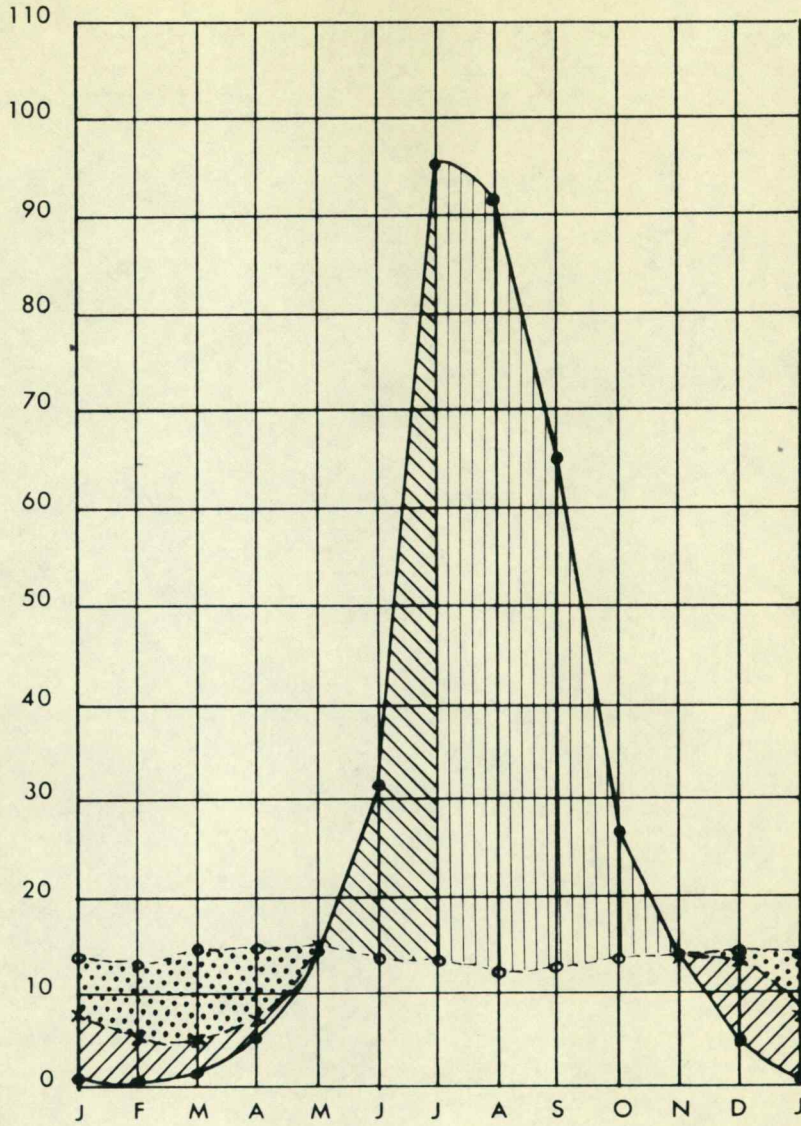
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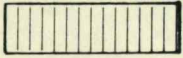




## MEAN DAILY SUNSHINE (HOURS)



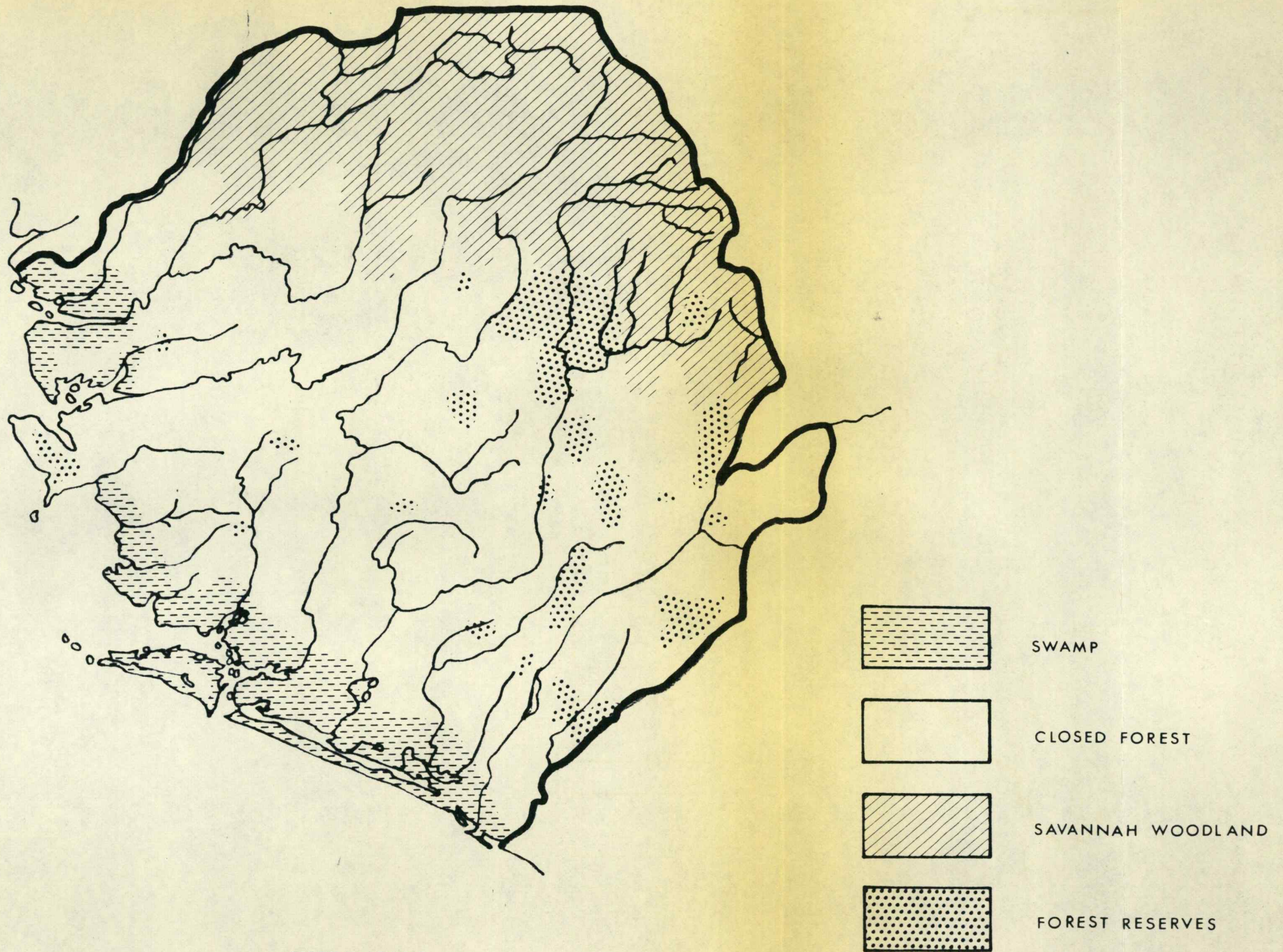
WATER BALANCE OF FREETOWN, SIERRA LEONE  
(centimeters)



- x---x---x Actual evapotranspiration
- o---o---o Potential evapotranspiration
- Precipitation
-  Water deficiency
-  Water surplus
-  Soil moisture utilization
-  Soil moisture recharge

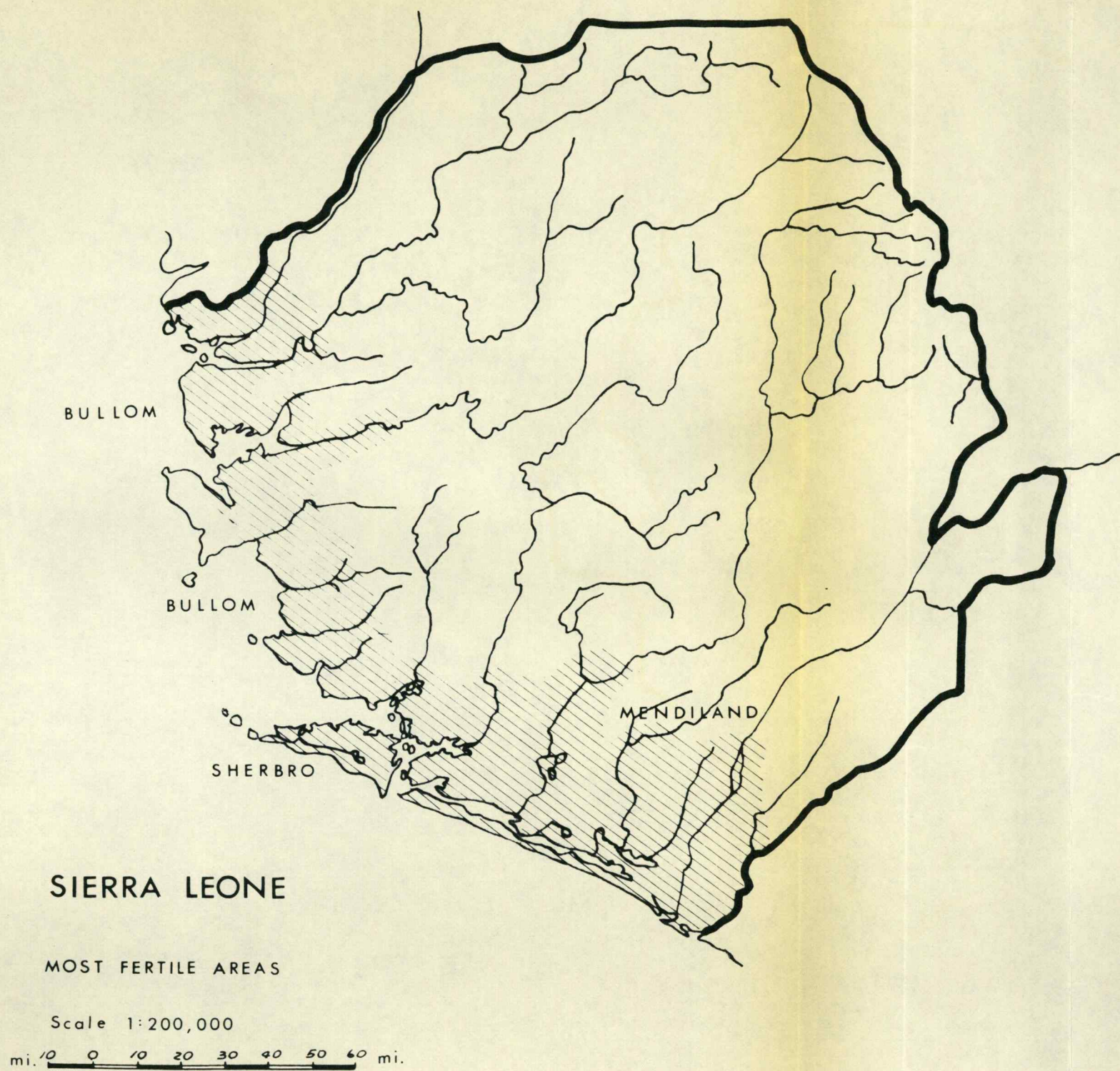
(57, P. 38)

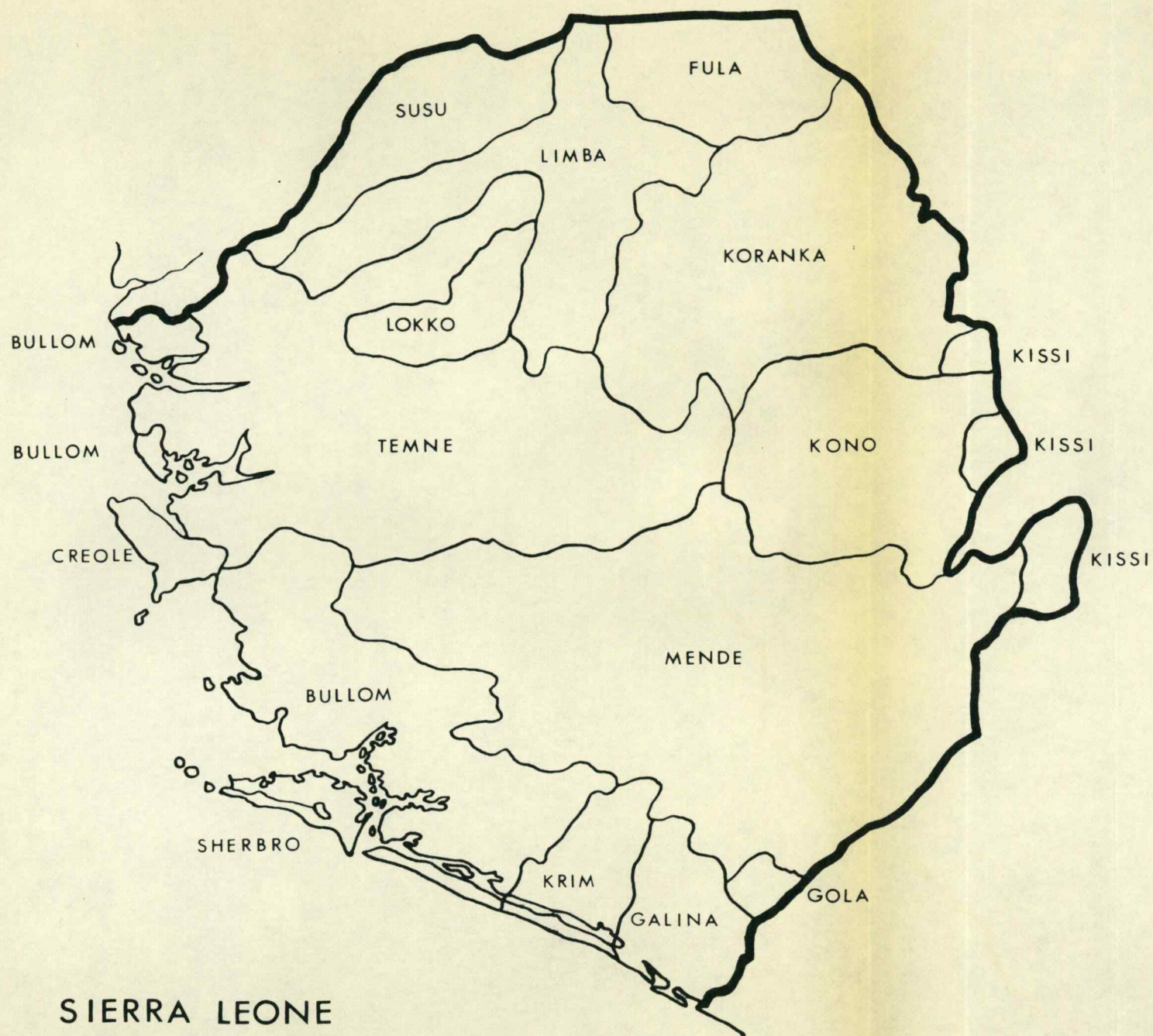
Figure 5



SIERRA LEONE  
**VEGETATION**  
scale 1:2,000,000  
mi 0 10 20 30 40 50 60 mi

Figure 6



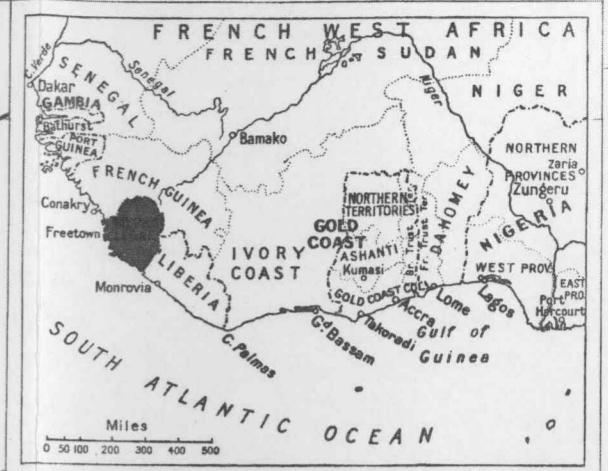


SIERRA LEONE

TRIBAL

scale 1:2,000,000

mi. 0 10 20 30 40 50 60 mi.



Scale of Miles

10 5 0 10 20 30

REFERENCE

- Boundaries, Inter-Territorial ..... + + + + +
- Provinces ..... - - - - -
- District ..... - - - - -
- Railways ..... = = = = =
- Motor Roads ..... - - - - -
- Ferry ..... F
- Administered strictly as Colony ..... / / / / /
- District Administrative Headquarters are underlined in Red
- Heights in Feet

Figure 9

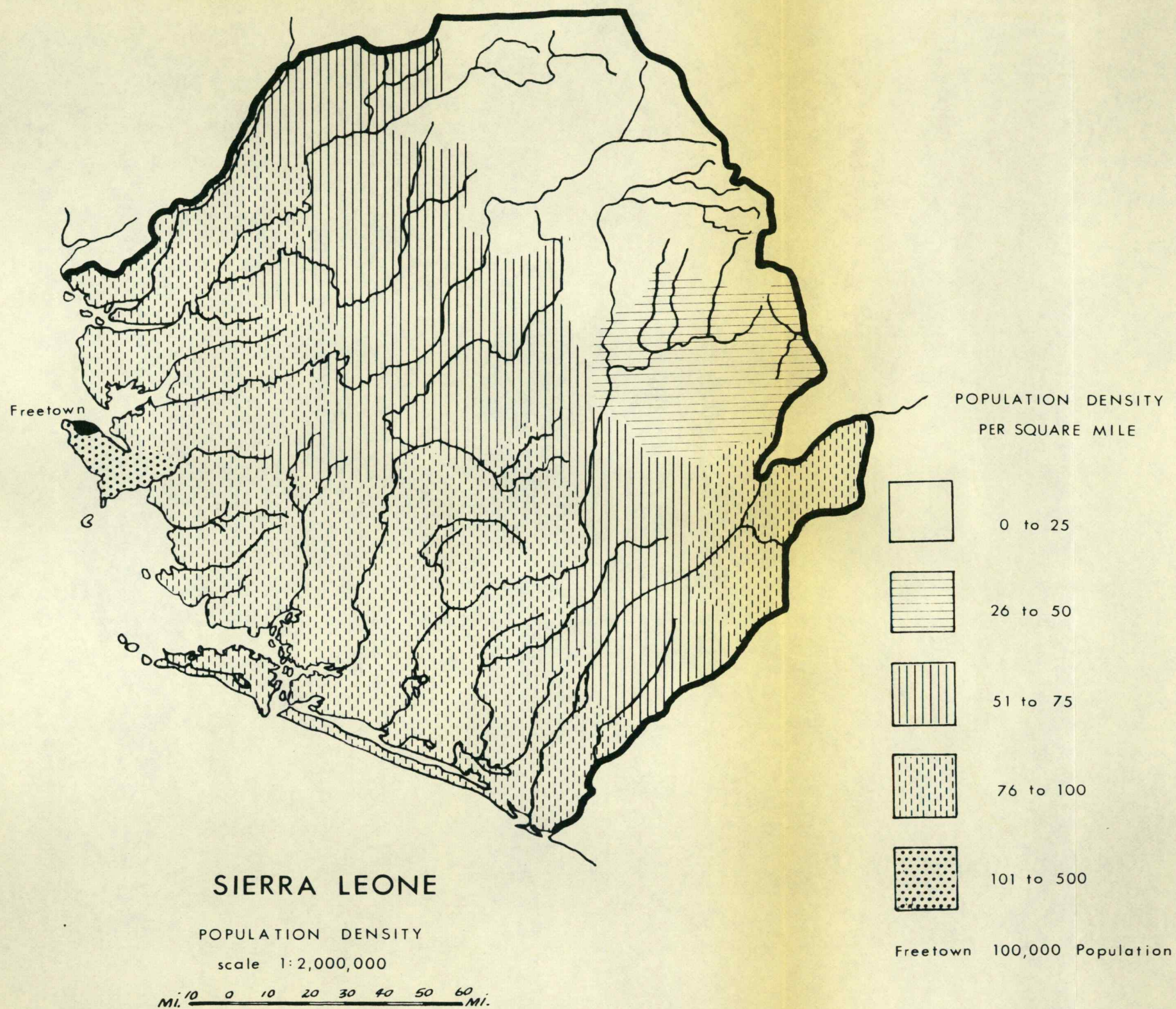
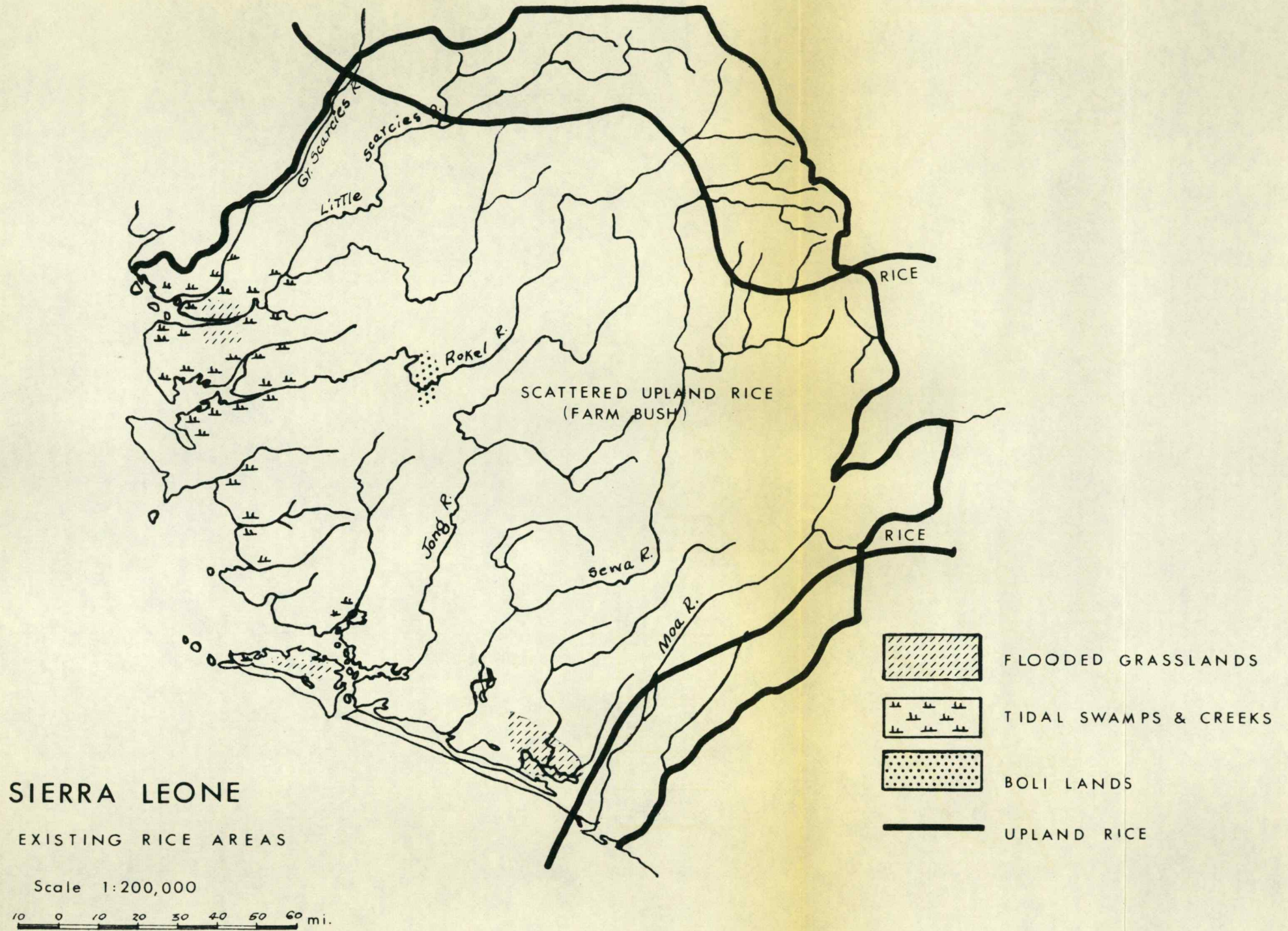




Figure 10





BUNDLES OF RICE SEEDLINGS READY FOR TRANSPLANTING

Figure 12



TIDAL IRRIGATION IN VILLAGE OF ROKUPR

Figure 13



A WOMAN SPREADING RICE TO DRY IN  
ROKUPR, SIERRA LEONE

Figure 14



BOY FRIGHTENING AWAY BIRDS FROM RIPENING RICE IN

ROKUPR, SIERRA LEONE

Figure 15

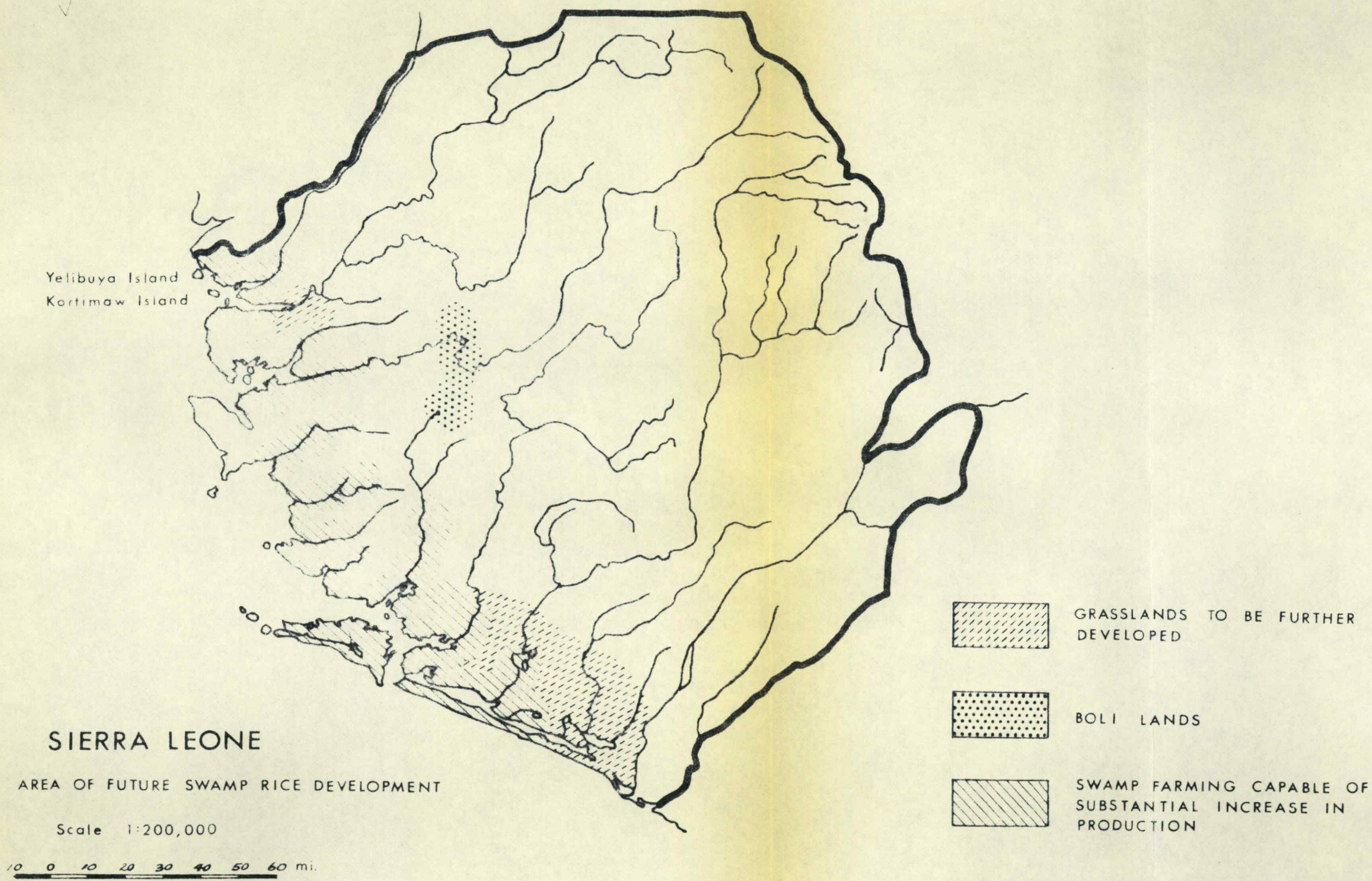
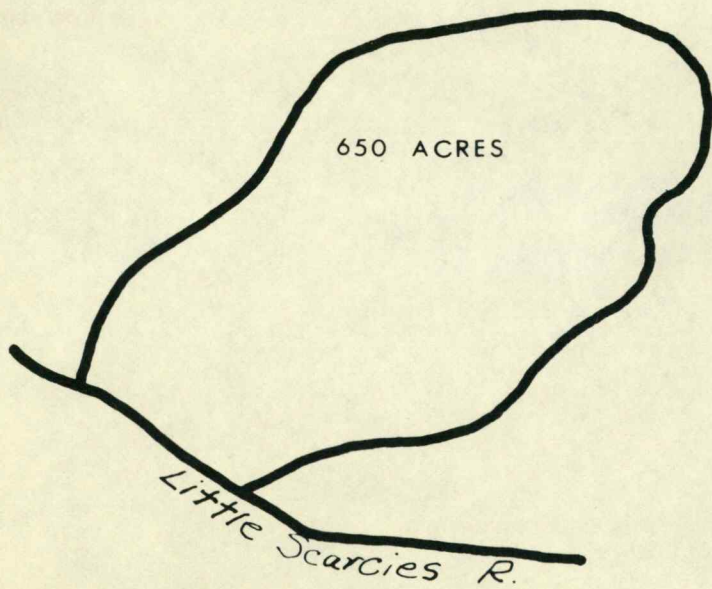


Figure 16

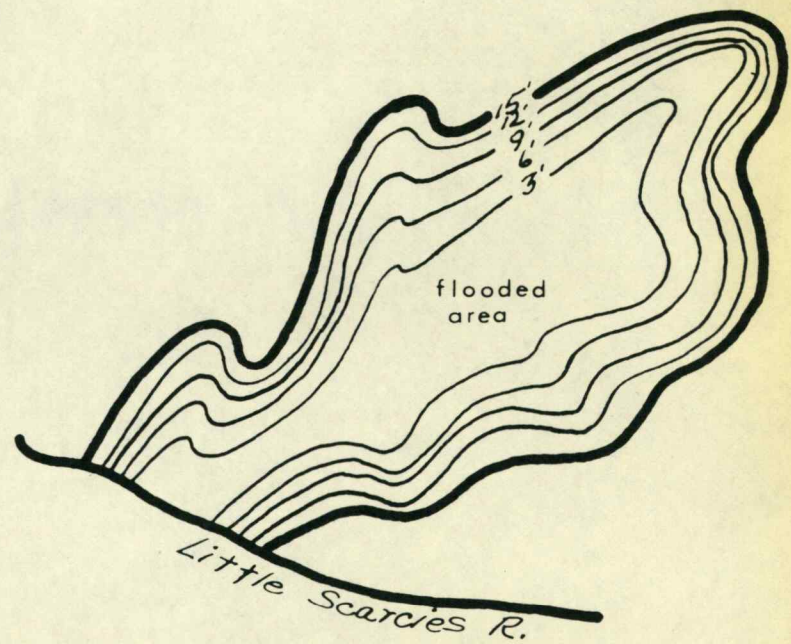
ESTIMATE IN 1930

Based on walks in the bush



LAND SURVEY IN 1954

One-fourth of land found suitable



TEPETUK SWAMP