

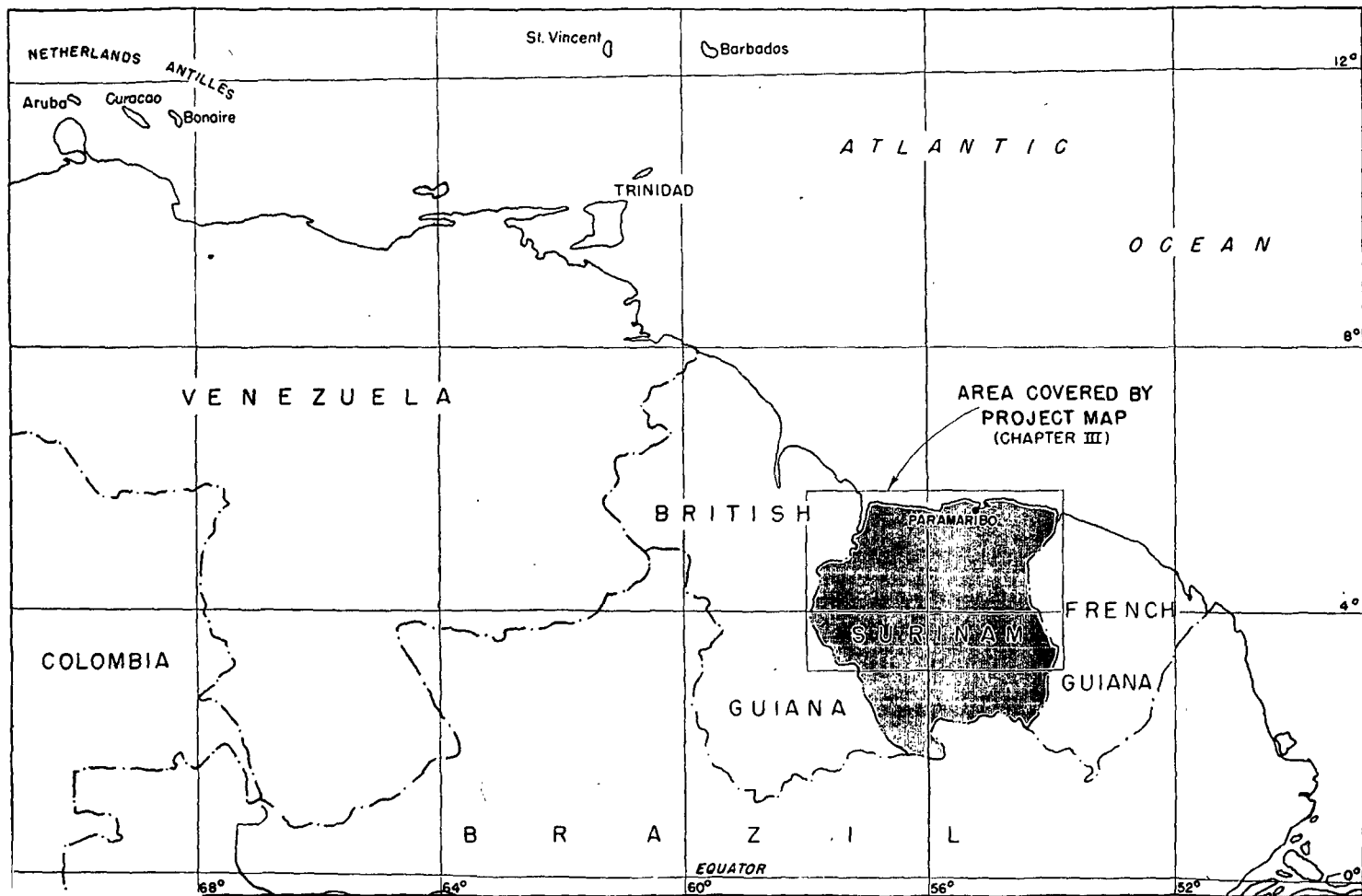
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Report No.: 11112 Type: (PUB)
Title: SURINAM - RECOMMENDATIONS FOR
Author: WORLD BANK
Ext.: 0 Room: Dept.:
OLD PUELICATION 1954

SURINAM

Recommendations for a Ten Year Development Program



SURINAM

Recommendations for a Ten Year Development Program

REPORT OF A MISSION

organized by the

INTERNATIONAL BANK FOR RECONSTRUCTION AND
DEVELOPMENT

at the request of

THE GOVERNMENTS OF THE NETHERLANDS AND OF SURINAM

published for

INTERNATIONAL BANK FOR RECONSTRUCTION AND
DEVELOPMENT

by

THE JOHNS HOPKINS PRESS

1952

THE JOHNS HOPKINS PRESS • BALTIMORE 18

Geoffrey Cumberlege, London
Oxford University Press

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Printed by the Monumental Printing Company
Baltimore, U. S. A.

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RECONSTRUCTION AND DEVELOPMENT
WASHINGTON 25, D. C.

OFFICE OF THE PRESIDENT

May 6, 1952

Hon. L. A. H. Peters
Minister for Union Affairs and
Overseas Parts of the Realm
The Hague, Netherlands

Hon. J. Klaasesz,
Governor of Surinam
Paramaribo, Surinam

Gentlemen:

I take pleasure in transmitting to you, as representatives of the Netherlands and Surinam Governments, the Report of the Mission to Surinam, which was organized by the International Bank for Reconstruction and Development at the request of your two Governments.

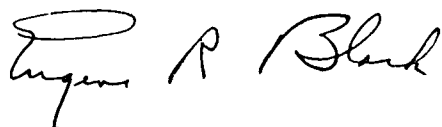
It is the Bank's hope that the impartial analysis contained in the Report and the many recommendations advanced by the Mission will prove of value in the task now in process of formulating a Ten Year Development Program for Surinam. You will understand, of course, that, since the Executive Directors and management of the Bank have not had the opportunity to review the Mission's recommendations in detail, they are transmitted to you as the views of the Mission rather than as positive recommendations of the Bank. We believe, however, that the Mission's Report lays the foundation of a sound program for the further development of Surinam and, there-

fore, that it is deserving of the most careful consideration by the Netherlands and Surinam Governments.

The Bank will follow with interest the action taken in connection with the Report. At any appropriate time the Bank will be prepared to discuss with the Netherlands and Surinam Governments the program that emerges from study of the Report and to consider how the Bank can best help in the execution of that program.

It is my sincere hope that the Report may be of positive and lasting benefit to Surinam.

Sincerely yours,

A handwritten signature in cursive script, reading "Eugene P. Black". The signature is written in dark ink on a white background.

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT
WASHINGTON 25, D. C.

May 6, 1952

Mr. Eugene R. Black, President
International Bank for Reconstruction
and Development
Washington, D. C.

Dear Mr. Black:

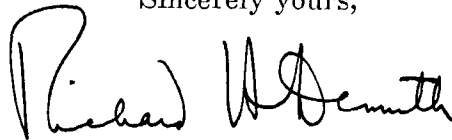
I take pleasure in submitting herewith the Report of the Mission to Surinam, organized by the International Bank at the request of the Governments of the Netherlands and Surinam.

As Chief of the Mission, I am glad to assume full responsibility for the findings and recommendations contained in the Report. In fact, however, the Report is a joint product of the entire Mission and my colleagues have asked me to state that they all concur in its contents.

I would like to take this opportunity to express, on behalf of the Mission, our gratitude for the wholehearted cooperation which we received from the Governments of the Netherlands and of Surinam in all phases of our study. We could not have wished for a more cordial atmosphere in which to work.

It is our sincere hope that our Report may prove of value in furthering the economic development of Surinam and in improving the standard of living of its people.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Richard W. Smith".

Chief of Mission

PREFACE

THIS IS THE REPORT of a Mission to Surinam, organized by the International Bank for Reconstruction and Development at the request of the Governments of the Netherlands and of Surinam. The assignment of the Mission, as agreed to by the two Governments and the Bank, was to undertake an economic survey of Surinam and, on the basis of that survey, to make suggestions concerning the development plans being formulated by the Surinam Planning Bureau.

Two members of the Mission (the agricultural and forestry experts) were nominated by the Food and Agriculture Organization of the United Nations, which also undertook to pay a portion of their salaries and expenses; the other four members of the Mission are members of the Bank's regular staff. The Mission arrived in Surinam on October 28, 1951, and the last members left that country on November 28, 1951.

The Mission's Report consists of two parts: the main report, which contains the major findings and recommendations of the Mission; and a series of Technical Appendices. The Technical Appendices cover the following subjects: (1) Agriculture (including cattle, fisheries and dairy products); (2) Forestry; (3) Industry, Mining and Power (excluding the Brokopondo Project); (4) The Brokopondo Project; (5) Transportation; and (6) Marketing.

TABLE OF CONTENTS

<i>Chapter</i>	<i>Page</i>
INTRODUCTION	xix
Purpose and Scope of This Report	xix
The Preliminary Report of the Planning Bureau	xix
The Brokopondo Project	xxi
 I BASIC FEATURES OF THE SURINAM ECONOMY	 1
Geographical Features	1
The People	3
Productive Resources	5
Industrial and Public Utility Facilities	11
Political Relationship with the Nether- lands	12
 II ECONOMIC HISTORY AND PRESENT ECONOMIC SITUATION	 14
Economic History	14
Current Economic Situation	16
Recent Developments	16
Budgetary Situation	18
Balance of Payments	19
Money Supply	21
National Accounts	22
The Labor Problem	24
Program Goals	26
 III RECOMMENDATIONS FOR A PUBLIC INVESTMENT PROGRAM	 31
Preliminary Observations	31
Size of the Program	31

<i>Chapter</i>	<i>Page</i>
Relationship of Program to Existing Public Developmental Expenditures.	33
Undisbursed Resources of Prosperity Fund	33
Price Assumptions	34
Assumptions as to the Private Sector .	34
Need for Flexibility	35
Tabular Presentation of Recommended Program	36
Explanation of the Recommended Pro- gram	42
Sector Allocations	42
The Agricultural Sector	44
The Forestry Sector	55
The Transport Sector	58
The Social Sector	65
Rate of Disbursement and Foreign Ex- change Requirements	69
Investment in the Private Sector	71
 IV ADMINISTRATION AND FINANCING OF THE PRO- GRAM	 73
Proposal for a Development Board . . .	73
Financial Arrangements	74
 V ANTICIPATED RESULTS OF THE PROGRAM . .	 76
Production and National Income	76
Investment	79
Budgetary Situation	80
Balance of Payments	83
Labor Supply	85
 VI SUPPLEMENTARY MEASURES NECESSARY FOR SUCCESS OF THE PROGRAM	 90
Fiscal Policy	91

<i>Chapter</i>	<i>Page</i>
Monetary Policy and Banking Facilities	92
Exchange Policy	93
Treatment of Foreign Private Capital	94
Vocational Training	96
Agricultural Marketing	98
Transportation	99
Statistics	100

Technical Appendix No.

1 AGRICULTURE	103
Physical Setting	104
Types of Farm Labor and Their Regional Distribution	112
The Rise and Fall of the Plantations	114
Chief Plantation Crops	115
The Future of the Plantations	118
Small Farms	120
Crops	124
Livestock	138
The Projects	140
Saramacca (River) Polder	140
Kwatta Reorganization	140
Groningen Reorganization	141
Tout Lui Faut Reorganization	142
Coronie Expansion	142
Saramacca Canal	144
Para	144
Wageningen	145
The Lelydorp Plan	148
Slootwijk	154
The Fisheries Project	156
Cattle Breeding	157
Agricultural Research and Extension Work	159

<i>Technical Appendix</i>	<i>Page</i>
2 FORESTRY	163
Forest Resources and the Timber Indus- try	163
Forest Resources	163
Forest Administration	164
The Timber Industry	165
Potential Markets	169
Recommendations	171
Forest Inventory	172
Forest Access Projects	173
Logging Engineering	178
Technical Research	179
Market Research and Trade Promotion	182
Reforestation	184
Industrial Modernization and Expan- sion	184
The Forest Service	187
Anticipated Results of the Program . .	189
3 MINING, INDUSTRY AND POWER	193
Mining	193
Bureau of Mines	195
Industry	196
Labor	200
Protection of Industry	201
Power and Gas	201
4 THE BROKOPONDO PROJECT	204
Conclusions	213
Recommendations	213
5 TRANSPORTATION	214
The Present Transportation System . .	214
Motivation of Transport Investment Pro- gram	220

<i>Technical Appendix</i>	<i>Page</i>
Appraisal of Transport Investment	
Needs	224
Recommended Program of Transport	
Investment	241
Other Recommended Action	245
6 MARKETING	247
Marketing of Rice	247
Marketing of Citrus Fruit	253
Export Marketing of Other Crops	256
Internal Marketing of Local Produce	256
Conclusions and Recommendations	259

LIST OF TABLES

<i>Table</i>	<i>Page</i>
I Population Composition, 1950	3
II Bauxite Exports, 1938-1950	9
III Budgetary Situation, 1942-1950	19
IV Balance of Payments, 1947-1950	20
V Probable Behavior of National Accounts, 1938 and 1947-1950	22
VI Detailed Breakdown of National Accounts for 1950	23
VII Recommended Allocation of Program Funds Among Major Sectors of Economy . . .	37
VIII Recommended Allocation of Program Funds Within Agricultural Sector	38
IX Recommended Allocation of Program Funds Within Forestry Sector	39
X Recommended Allocation of Program Funds Within Transport Sector	40
XI Recommended Allocation of Program Funds Within Social Sector	41

MAPS

Surinam	II
Surinam, Location of Projects . . . <i>facing</i>	72

LIST OF ABBREVIATIONS

Sf.	Surinam Guilders
Df.	Dutch Guilders
Stichting	Foundation for the Development of Mechanical Agriculture in Surinam

EXCHANGE RATE

1.88 Surinam Guilders	= 1 U. S. Dollar
1 Surinam Guilder	= 53 U. S. Cents
1 Surinam Guilder	= 2 Dutch Guilders
1 Million Surinam Guilders	= 530,000 U. S. Dollars

SURINAM

Recommendations for a Ten Year Development Program

INTRODUCTION

A. PURPOSE AND SCOPE OF THIS REPORT

THIS REPORT is designed primarily to offer suggestions which the Mission hopes may be of assistance in the formulation of a Ten Year Development Program for Surinam, now being prepared by the Surinam Planning Bureau.¹ Chapters I and II of the Report contain a brief description of the economic background against which the present programming efforts must be viewed. The remaining chapters set forth the Mission's conclusions and recommendations.

It is the Mission's understanding that, after the present Report has been received, a definite Ten Year Program will be formulated and the International Bank may be requested to help finance a part of that program. Discussion of such possible Bank financing is not within the scope of this Report.

B. THE PRELIMINARY REPORT OF THE PLANNING BUREAU

The starting point of the Mission's investigations was a preliminary report of the Surinam Planning Bureau, submitted to the Bank in August, 1951, setting

¹The Planning Bureau is an agency of the Surinam Government established for the purpose of formulating proposals for a development program; it is financed by a grant from the Prosperity Fund. The Prosperity Fund is an organization established by the Netherlands Government to promote the economic and social development of Surinam; it has been financed by a grant of 40 million Dutch guilders from the Netherlands Government, payable in annual installments of Df. 8 million during the years 1947 to 1951, inclusive.

forth a provisional list of projects to be included within the Ten Year Program. At the time of the Mission's visit to Surinam in October-November, 1951, this provisional program was still in a very fluid state. Some of the projects included within the program were firm, in the sense that a definite decision had been made to proceed with them on the basis of preliminary work already accomplished. Many other projects, on the other hand, had not yet been worked out in detail and remained subject to substantial modification or even abandonment. In a number of instances, too, the ultimate size of a particular project to be carried out during the ten-year period of the program was wisely left undetermined, pending the results of experimental work on a pilot project basis.

Since active work on formulation of the provisional program commenced only in May, 1951, the flexibility of the program at the time of the Mission's visit was not only understandable but inherently desirable. A number of changes had been made in the program between the time of its original submission to the Bank in August and the time of the Mission's arrival in Surinam; a number of additional changes were made, frequently in consultation with members of the Mission, during the period of the Mission's field work.

The Mission believes that it would be of little value to go back at this stage to the provisional program as originally formulated and submitted to the Bank or to confine the recommendations in the Report to comments on that program. We believe that work on the definitive Ten Year Program is likely to be facilitated more if, instead of commenting on the projects as outlined in the original program, we base our recommendations on the plans of the Surinam Government as presented to the Mission, and as developed in consultation with the Mission, during our stay in the country. Accordingly, we

have used these plans as the basis of the recommended public investment program presented in Chapter III of this Report; in those instances where the recommended program deviates in any substantial way from the present plans of the Government, as we understand them, the reasons for the proposed change are given.

C. THE BROKOPONDO PROJECT

One major project included in the provisional program—a proposal to erect hydroelectric generating facilities at Brokopondo on the Surinam River in order to provide power for the production of aluminum ingot from Surinam bauxite—is excluded from consideration in our Report, although it is discussed in Technical Appendix 4. As indicated in the Technical Appendix, there appears to be no technical reason why power cannot be produced at Brokopondo at a cost enabling it to be sold at a low enough rate to permit the economical production of aluminum. The economic justification of the project, however, depends entirely on whether an agreement can be reached with an aluminum producing company for the company to erect aluminum producing facilities in Surinam and to purchase, pursuant to a firm long-term contract, most, if not all, of the power to be generated at Brokopondo. The conclusion of such an agreement is certainly possible; whether it will in fact occur, however, depends primarily on a business judgment by potential aluminum producers which the Mission has no basis for predicting.

The Mission believes that examination of the feasibility of the Brokopondo project should be pushed forward vigorously. To this end, we suggest in the Technical Appendix that the Netherlands and Surinam Governments, after having determined their respective interests in the project, jointly designate a single indi-

vidual or agency as in charge of the project on their behalf, and furnish that individual or agency, as necessary, with experienced technical, financial and legal advisers. We make this suggestion in the belief that the appropriate next step in the attempt to translate the Brokopondo project from an idea into a reality is for a representative of the two Governments interested in the project to explore its business aspects thoroughly with the potential aluminum producing companies.

Because the Brokopondo project is still uncertain to materialize, because it is a project which, to secure financing, will necessarily have to be fully self-liquidating in character, and because, at best, it is not likely to come into operation for several years, we believe that it should not at this stage be considered as an integral part of Surinam's general development program. It is for this reason that we do not include the project in our recommended Ten Year Program or make further reference to it in this Report. Obviously, if the project materializes, some changes will be necessary in the Ten Year Program, particularly to take account of the labor which will be required for the construction of the power and aluminum producing facilities and of the additional income which will be generated when the facilities come into operation.

CHAPTER I

BASIC FEATURES OF THE SURINAM ECONOMY

A. GEOGRAPHICAL FEATURES

SURINAM, located on the north shore of South America between British Guiana and French Guiana, covers an area of some 142,882 sq. kilometers (55,155 sq. miles). The whole country is within the tropics, extending roughly from the second parallel to the sixth parallel north of the equator.

Although Surinam is about five times the size of the Netherlands in area, it has a population of little more than 200,000 people, equivalent to about 2% of the population of the Netherlands. Most of the population is concentrated within a narrow strip extending along the coast of the Atlantic Ocean. This coastal strip consists primarily of low lands, traversed by many large rivers, some of which flow from south to north and some from east to west. Apart from the coastal concentration at Coronie, most of the centers of population and areas under cultivation are situated along the lower reaches of the rivers.

Inland from the populated coastal strip, the country is covered by forest interspersed with savannahs; it is for the most part unexplored. This inland country slopes gradually upwards towards the Brazilian border; in the southern part of the country there are mountain ranges varying in height from 500 to 1200 meters. The sparse population of the interior consists of a few thousand

Bush Negroes (descendants of African slaves) and some Indians. Apart from some lumbering and gold mining operations, the interior areas contribute nothing at the present time to the economic life of Surinam. Except for the extension of logging operations, it seems unlikely that this situation will change for many years, until after the large areas near the coast which still remain unexploited have been brought under development.

Since Surinam is not located on any of the main international shipping routes and has only a small volume of foreign trade (except for bauxite), the country has not enjoyed the indirect benefits which flow from an active international commerce. In recent years, international air services have been established with direct connections to Europe, North America and Brazil, as well as to various Caribbean points; the air services, by providing closer and quicker communications between Surinam and the outside world, have been, and should in the future increasingly be, a stimulant to economic activity within the country.

Internal communications are greatly facilitated by the outstanding river system, which permits cheap inland water transport for the movement of practically all goods within the country. The major rivers, several of which are interconnected by natural or artificial canals, are deep and broad enough to be navigable for ocean-going freighters and ore-carriers, although their payloads are limited by sandbars across the mouths of the rivers. The rivers remain generally navigable throughout the coastal areas. Where the land slopes upwards, roughly 60 to 120 kilometers from the coast, a series of rapids makes further navigation inland impossible for anything but small craft.

The inland waterway system is supplemented by a

few reasonably good main roads, totalling about 400 km. in length. The principal highways are the roads from Paramaribo to Coronie (approximately 140 km. long) and from Paramaribo to the Zanderij airfield (approximately 50 km. long). In addition, there is an old, poorly equipped railroad running from Paramaribo south along the Surinam River to the fringes of the inland area.

B. THE PEOPLE

The population is a heterogeneous mixture of many different racial groups. The composition of the population in 1950 is shown in the following table.

TABLE I
POPULATION COMPOSITION—1950

	<i>Number</i>	<i>Percent</i> (excluding Bush Negroes and Indians)
Creoles	82,408	42.1
Hindustani	66,829	34.1
Indonesians	38,165	19.5
Chinese	2,849	1.5
Other (Dutch principally)	5,390	2.8
	195,641	100.0
Bush Negroes		±22,000
Indians		± 3,700

The reasons for the mixed nature of the population are historical. When Surinam was first settled in 1650, the settlers found a land abundant in promises but devoid of population. During the ensuing two centuries, there-

fore, Dutch plantation owners brought a large number of slave laborers into the country, about 315,000 in all. Because of poor health and working conditions, the death rate among the slaves was very high and only about 31,000 remained when slavery was abolished in 1863. As late as 1900, the total population of the country was less than 70,000. After the abolition of slavery, the plantation owners sought to secure labor by contracting for workers from India and Indonesia; more than 30,000 immigrants were brought in from each of these countries. However, most of the immigrants have abandoned the plantations and have settled on small farms. The three major racial groups — Creoles, Hindustanis and Indonesians — keep their own identities to a very large extent; there is not much intermarriage and they tend to confine their social activities to members of their own group. There is, happily, no racial discord; all the groups live harmoniously side by side.

Health standards are remarkably high compared to those in most underdeveloped areas. The literacy rate is also high (about 70%), primarily as a result of the introduction in 1876 of compulsory education for children between the ages of seven and twelve.

The population (excluding Bush Negroes and Indians, as to whom no reliable statistics are available) has grown rapidly since 1900 and continues to grow at an increasing pace. The average birth rate is now estimated at about 3.6%, while the death rate is estimated at about 1.3%.¹ The population, in other words, is growing at the rate of 2.3% per year; by the end of the Ten Year Program in mid-1962, it is estimated that the population will have

¹Not all groups grow equally fast. Hindustanis lead the Creoles in growth. The death rate of the Indonesians is relatively high.

grown to about 260,000 people, or by about 33% over 1950, not allowing for possible immigration.²

A large part of the population lives in Paramaribo, the capital of Surinam and the only town of any real size in the country. In 1950, the population of Paramaribo was estimated to be 80,000, or 41% of the total. Most of the dwellers in the town are Creoles (perhaps 70% of the total), Europeans and Chinese. There are very few Creoles engaged in agriculture, except in Coronie. Most agricultural activities are carried on by the Hindustani and Indonesians.

The active labor force in 1950 (excluding Bush Negroes and Indians) may be classified roughly as follows:

Agriculture	35,000-40,000
Industry, trade and government.	15,000-20,000
Mining	3,000

The number of skilled and semi-skilled workers included in the labor force is low. There are perhaps 3,000—5,000 workers unemployed or underemployed in Paramaribo. Most of the agricultural labor can be fairly described as underemployed.

C. PRODUCTIVE RESOURCES

Surinam has three principal productive resources—agricultural land, tropical forests and mineral deposits (primarily bauxite). Each deserves brief description:

²The distribution of the anticipated additional population is, of course, impossible to forecast. However, based on experience in other countries, and on the character of Surinam's development plans, it seems likely that the population of Paramaribo and of the district towns and villages will increase proportionately more than the remainder of the population. For purposes of the program recommended in Chapter III, we have assumed that the population of Paramaribo will increase by 40%, or 32,000 people, by mid-1962.

(1) *The Land.* Surinam's agricultural potentialities are substantial. In the coastal strip there are large areas of soils of high fertility; the rainfall is good and well distributed; there is no serious hurricane threat and serious dry spells are uncommon. As a result of these favorable soil and climatic conditions, the land under cultivation in the coastal area has proved, over the years, to be extraordinarily productive. Almost all types of tropical products have been produced: sugar, coffee, cacao, citrus, bananas, coconuts, oil seeds, rice, soya, groundnuts, root crops and vegetables.

Practically all of this agricultural production has come from the rich clay soils of the so-called "young coastal plain." To secure production from these soils, substantial capital investment has been necessary for drainage, irrigation and clearing. Much of the arable land in the young coastal plain has had to be empoldered; some of these polders, particularly those formerly used as plantations, have fallen into disuse and need to be reclaimed before the land can again be effectively used. In other sections of the young coastal plain, the extension of agricultural production depends primarily on the construction of new polders.

Experiments are now in progress to determine whether it is technically and economically feasible to open up to cultivation a whole new area, comprising perhaps a million and a half hectares, lying just south of the young coastal plain and known as the "old coastal plain." Because the level is slightly higher in this area, empoldering is not in general required there and consequently the investment to clear new lands and provide them with drainage is much less than in the young coastal plain; on the other hand, because the soils are sandier, the use of fertilizers is necessary and special care must be taken to

preserve the organic matter in the top layer of the soil. If the experiments on the old coastal plain prove successful, they may greatly affect the future course of agricultural development in Surinam.

For reasons discussed at some length in Chapter II, the agricultural area presently under cultivation comprises only 30,000 hectares, which amounts to a little more than 1% of the cultivable land and only a fraction of the area under crop 200 years ago. The value of total agricultural production in the country in 1950 (including cattle and fish) is estimated at Sf. 21 million, of which Sf. 3.3 million was exported. Intensive efforts are now under way to expand and improve the cultivated area.

(2) *The Forests.* Surinam's forest resources are also substantial. Of the six million hectares of land north of Latitude 4 which have been the subject of an aerial survey and which are accessible without excessive difficulty, 75% is covered with timber of many tropical species. The eight million hectares south of Latitude 4 are similarly forested. The allowable annual cut for the northern area alone has been estimated at two million cubic meters, while the cut in 1950 was only 130,000 cubic meters.

The forests of commercial importance are of two broad types, swamp and dry land. In the swamp forests are found a number of hardwoods, among them Baboen (Banak) and Possentrie (Possumwood), both valuable for plywood, and Krappa (Andiroba), the Surinam mahogany and leading lumber wood. The dry land forests contain a wide variety of tropical woods ranging from the hard toredo-resistant Basra Locus (Angelique) and Manbarklak, to relatively soft cedar and Simaruba (Bitterwood).

Cutting is carried out in the narrow fringe along the navigable rivers by 120 concession holders exploiting 1.25

million hectares, and by Bush Negroes who have cutting rights outside of the concession areas and above the rapids. About 60% of all logs are cut in concessions. Whether working for concession holders or on their own account, about 3,500 to 4,500 Bush Negroes, using very primitive hand-logging methods, produce 75% of all the logs. Only 25% of the production is mechanized. There are substantial possibilities for increasing and improving production through the use of additional logging equipment.

Most of the logs are transported by water to Paramaribo, where there are 16 sawmills and a new and highly efficient plywood factory. The total value of timber and plywood production in 1950 is estimated at about Sf. 4 million, of which export products accounted for approximately Sf. 2.5 million; exports of plywood amounted to over 70% of the total. Given a greater and steadier flow of logs from modernized logging operations, there appear to be substantial possibilities for expansion of the existing wood products industries and for the creation of some new ones, particularly the production of hardboard.

In past years, balata tapping was another important industry, but it is now in decline. The value of balata exports, which reached Sf. 1 million in 1929, dropped to around Sf. 550,000 by 1950.

(3) *Mineral Resources.* Surinam's bauxite deposits are among the best in the world. The grade of ore is high; in the case of the major deposits there is little overburden; and the deposits are located so close to navigable rivers that the ore is loaded onto sea-going vessels at or near the mine sites. Proven reserves of high quality bauxite which may be economically mined and shipped

have been estimated at 50 million tons. There are additional known deposits of bauxite which have not been proven because of their inaccessible location and there may well be other deposits in areas not yet fully explored.

Bauxite mining, which is carried on by the Surinam Bauxite Company (a subsidiary of Alcoa Mining Company), and by the Billiton Mining Company, a large Dutch concern, is a relatively new industry. Before 1938 exports of bauxite never reached 400,000 tons; the striking increases since that time are shown in Table II.

TABLE II
BAUXITE EXPORTS, 1938—1950

<i>Year</i>	<i>Quantity</i> (1000 Tons)	<i>Value</i> (Million Surinam Guilders)
1938	378	3.83
1939	504	5.29
1940	615	6.35
1941	1,094	10.20
1942	1,228	10.40
1943	1,663	12.30
1944	664	4.90
1945	690	5.60
1946	853	8.50
1947	1,798	17.80
1948	2,166	21.90
1949	2,129	25.40
1950	2,084	25.60

At the time of the Mission's visit, 1951 exports were estimated at 2.6 million tons. Exports in 1952 are likely to exceed three million tons; in 1953 and the years immediately following, they are not likely to be lower than

three million tons and may substantially exceed that figure.

The importance of bauxite mining to the Surinam economy is shown by the following facts: In 1950, bauxite exports constituted 80% of total exports, the value of bauxite production constituted 19% of the value of all production, and government revenues derived from bauxite mining and transportation amounted to about 32% of total budgetary receipts. About 3,000 workers are engaged in bauxite production; their wages, in 1950, amounted to about 10% of the total wage bill of the country. Also, in 1950, the bauxite mining companies transferred profits abroad to the extent of Sf. 5 million; at the same time they financed a substantial expansion of capacity largely, and perhaps entirely, through the reinvestment of earnings.

Mining activities in addition to bauxite are not substantial. Considerable capital was at one time invested in the production of gold but, after a brief boom at the end of the 19th century, gold production declined rapidly. In 1950 the total value of all gold mined was about Sf. 300,000. Surface investigations by mining engineers indicate that there are also some deposits of diamonds, copper, cobalt, platinum, quartz, low grade iron ore and perhaps other minerals. Whether any such deposits are commercially exploitable, however, remains undetermined. So far as the Mission is aware, no substantial mining concessions have yet been granted for any minerals other than bauxite and gold.

Although Surinam has no coal or petroleum resources for fuel, it does have large reserves of timber suitable for making charcoal and also substantial hydroelectric power potentialities (see Technical Appendix 4).

It should be noted that, in the case of all three of

Surinam's principal productive resources, substantial capital investment is necessary for profitable exploitation.

D. INDUSTRIAL AND PUBLIC UTILITY FACILITIES

Because of the small size of the local market, the industrial development of the country has necessarily been confined either to small factories producing for domestic consumption or to industries producing primarily for export. In view of Surinam's few natural resources, export industries have, to date, been limited almost exclusively to the processing of forest and agricultural products.

The wood products industry is the largest in Surinam. It consists of a modern, efficient plywood factory, employing about 700-750 workers, whose 1951 production is estimated at 10,900 cubic meters; 25 sawmills (16 in the vicinity of Paramaribo); and about 20 small planing and millwork plants.

The major activity in the field of agricultural processing is rice milling. At the time of the Mission's visit, an oil extraction plant was under construction, designed to extract oil from copra. This plant will have capacity to process eight million coconuts per year.

Articles manufactured for domestic consumption include bricks, cigarettes, matches, rum, sugar, soft drinks, cattle feed and some wearing apparel and shoes. A brewery is to be constructed. Except for the gold- and silver-smiths, handicrafts are practically nonexistent.

The only electric power facilities of any real importance are in Paramaribo, Moengo and Paranam. The Paramaribo facilities are owned by a private Dutch com-

pany, which also owns the gas works. The load at Paramaribo has reached a peak of about 5,000 kw. and is increasing at the rather high rate of about 15% per year. If the rate of increase continues, as may fairly be expected, additional generating facilities will be needed within three years.

The mining communities at Moengo and Paranam are served by electric facilities owned by the Surinam Bauxite Company and by the Billiton Mining Company. Facilities elsewhere are confined to small generating units providing power to a very limited market. The generators in all the plants are driven by diesel engines operating with fuel imported from Trinidad.

The gas plant in Paramaribo is about 40 years old and makes gas for domestic use from imported coal. The plant is rather small, making about 1.5 million cubic meters per year. Production costs are high, primarily because of obsolescence. The market for gas has been almost constant during the past three years and will probably diminish in the future unless steps are taken to reduce costs through modernization.

It is anticipated that whatever expansion of electric facilities or of the gas plant may prove necessary will be financed out of revenues or through private sources.

E. POLITICAL RELATIONSHIP WITH THE NETHERLANDS

Surinam is a part of the Kingdom of the Netherlands. Although the Queen of the Netherlands appoints the Governor of Surinam, who serves as head of the Government, the country has its own parliament, Minister-President, and cabinet.

Surinam has enjoyed virtual political autonomy in domestic affairs since early 1950. It has its own monetary and exchange control system, central bank and foreign exchange reserves. Through a monetary agreement with the Netherlands, it is linked to the European Payments Union. The Netherlands Government retains responsibility, in consultation with the Government of Surinam, for conducting the foreign affairs and maintaining the defense of the country.

The present political structure is provisional. Its final status will be the subject of a round-table conference scheduled to be held in The Hague in the spring of 1952.

CHAPTER II

ECONOMIC HISTORY AND PRESENT ECONOMIC SITUATION

A. ECONOMIC HISTORY

SURINAM's present-day development problems can be properly understood only when viewed in the perspective of Surinam's past economic history. That history can be divided into two quite distinct phases: *first*, the prosperous plantation period, extending from the first permanent settlement of the country in 1650 to roughly 1863, when the slaves were liberated; and *second*, the period from roughly 1863 to the last decade, a period which saw the decline of the plantations without the emergence of other economic activities of comparable importance.

During the first of these two periods, Surinam was a plantation colony producing for the European market and dependent entirely on slave labor. The plantations were very prosperous for their owners and the colony was a major source of income to Holland. The value of exports consistently exceeded the value of imports by 30% or more. In 1820 there were no less than 416 plantations in Surinam, classified as follows: coffee, 176; sugar, 122; cotton, 72; and mixed, 46.

With the abolition of slavery in 1863, plantation agriculture entered upon a period of progressive decline. A number of factors contributed to the retrogression. It became difficult to keep the liberated slaves, and after them the Hindustani and Indonesian contract laborers,

on the plantations; many of them preferred to engage in small farming operations on their own. Such labor as could be attracted to the plantations had to be provided with better working conditions and higher wages. In contrast, when the Suez Canal was opened in 1869, European entrepreneurs gained direct access to the East, where cheap labor was available in great quantities. The Surinam plantation owners found it virtually impossible to compete with the new East Indian estates. Not only were wage rates about 50% higher in Surinam but also, because of the great volume of shipping which developed between Europe and the East Indies, in contrast to that between Europe and Surinam, freight rates for Surinam producers became more and more disadvantageous. Capital requirements also became increasingly difficult to meet as Surinam profits declined and East Indian investments grew more profitable. Finally, Surinam suffered a series of disastrous plant diseases which several times wiped out entire crops. As a result of all these factors, most of the plantations were gradually abandoned.

During the period since 1900, a general shift has occurred from plantation agriculture towards small-scale farming in the form of the cultivation of small strips of land, each farmed by the individual owner, or tenant, and his family. These small farms have encountered some of the troubles of the plantations, particularly poor drainage, marketing difficulties, and a persistent shortage of capital and credit. On the other hand, the small farmer has in many respects been in a stronger position than the plantation owner, in that he has had no labor problems, he grows his own food and, since he sells part of it to neighboring communities, he is not entirely dependent on exports. While in 1900, 90% of all agricultural products

were grown on plantations and 10% on small farms, these proportions were completely reversed by 1950.

Although some other economic activities developed during this period, none of them, until recently, assumed major importance. The gold mining boom at the turn of the century was not of long duration. For a time, there was substantial production of balata, but this also dwindled quickly. Bauxite production commenced in 1922 and grew gradually in importance up to the outbreak of World War II; since 1940 it has played an increasingly dominant role in the economy. The production of timber and wood products has also become of substantial importance recently.

It has already been pointed out that, during the period of plantation prosperity before 1863, Surinam had a consistently large trade surplus. This situation changed markedly after 1863; ever since that time Surinam has had trade deficits which have come to assume substantial proportions. Moreover, because government expenditures for educational, medical and other social services were maintained and even increased despite the low level of production, the budget was constantly in deficit; during the period from 1931 to 1940, for example, government expenditures exceeded revenues by an average of 40%. These budgetary deficits were covered by contributions by the Netherlands Government, which also served to cover the major part of the trade deficits.

B. CURRENT ECONOMIC SITUATION

1. RECENT DEVELOPMENTS

Several new factors have come into operation within the last decade, and particularly within the past few

years, which have substantially changed the Surinam picture. As a result of these factors, Surinam is emerging from its long period of economic stagnation, and, in the opinion of the Mission, the development efforts now being made are likely to meet with considerably more success than those previously undertaken.

First, there has been a substantial improvement in the Government's revenues, and in the country's balance of payments position, as a consequence primarily of greatly increased bauxite production, and to a much lesser extent of increased production of rice and wood products. Second, there has been an increased inflow of capital investment, in part of public capital from the Netherlands made available for Surinam's development through the Prosperity Fund,¹ in part of private capital invested in a number of different productive enterprises. Third, and not least important, there has been available to Surinam, since the independence of Indonesia, an increased number of competent Dutch technicians of various kinds, most of them with long years of tropical experience in the East.

The spectacular rise in bauxite production and exports has already been noted. This rise seems likely to continue at least until 1953, and there is no reason to believe that the anticipated 1953 level of exports will decline in the years immediately following; the rise may in fact continue. A substantial amount of foreign capital has also been invested in forest exploitation and in the wood products industries and, in the opinion of the Mission, additional investment in this sector may reasonably be anticipated since export prospects, especially for ply-

¹See footnote, page XIX.

wood and hardwoods, appear promising.² Agricultural production has also been stimulated by capital investment in the construction of new polders and in the improvement of drainage and irrigation on old agricultural lands. Projects already underway and in preparation should accelerate this development.³

2. BUDGETARY SITUATION

The improvement in the budgetary situation in the last few years resulting primarily from the improvement in output is indicated in Table III, which shows the Government's revenues, current expenditures and extraordinary expenditures (mostly capital investment) for the years 1942 to 1950, inclusive.

The excess of extraordinary expenditures over budgetary surpluses during the period 1946-1950, about Sf. 1.85 million, was partially met by drawings on deposits with the government-owned Postal Savings Bank, which

²The Mission believes that as much as double the present plywood production could be marketed abroad. Particularly in the United States, there is strong interest in tropical hardwoods, and the U. S. defense programs are taking large quantities of lumber. Cuba, the Netherlands, and the Netherlands Antilles would also seem to be natural markets for Surinam hardwoods, although at present Surinam is supplying only a small percentage of their requirements. The durable Surinam woods ought also to be able to compete in the world market for railway sleepers, which are in steady demand in countries with little or no timber resources of their own. Less profitable than other timber products, but desirable from the standpoint of utilizing more species in the mixed tropical forests, would be the production of box, case, and crating material from light softwoods.

³The Prosperity Fund, financed by the Netherlands Government, deserves much of the credit for the recent improvements in agriculture. From 1947 to the middle of 1951, the Prosperity Fund spent Sf. 12.5 million for development purposes, a large part of which was devoted to soil improvement, irrigation, drainage, agricultural credit and other agricultural improvements.

TABLE III
BUDGETARY SITUATION, 1942 THROUGH 1950
(Million Surinam Guilders)

	1942	1943	1944	1945	1946	1947	1948	1949	1950
Current Revenues	10.96	16.88	13.03	11.45	12.58	16.74	21.44	27.00	26.83
Current Expenditures	10.85	16.95	13.11	11.53	11.06	16.03	17.17	21.90	24.45
Balance	+0.11	-0.07	-0.08	-0.08	+1.52	+0.71	+4.27	+5.10	+2.38
Extraordinary Expenditures	n.a.	n.a.	n.a.	n.a.	1.46	2.00	2.18	4.48	5.71

increased Sf. 1.07 million from the end of 1946 to the end of 1950, and by an emission of notes of about Sf. 0.13 million. The balance did not have to be covered because budgeted expenditures only became actual after a lag which enabled the Government to draw upon revenues of later years.

It should be noted that, in addition to the expenditures of the Government of Surinam reflected in Table III, other expenditures in the public sector were financed by the Prosperity Fund in 1947 and following years in an amount averaging about Sf. 3.5 million per year. Moreover, military expenditures, in an amount averaging Sf. 2.2 million per year, were defrayed by the Netherlands Government.

3. BALANCE OF PAYMENTS

Up through 1950, the balance of payments remained in deficit, as shown in Table IV. In 1950, trade receipts amounted to Sf. 31.4 million and total current receipts amounted to Sf. 35.1 million. Imports, on the other hand, amounted to Sf. 39.3 million and total current payments to Sf. 49.4 million. The current deficit of Sf. 14.3 million (of which perhaps Sf. 3 million represented abnormal

inventory accumulations due to the Korean war) was covered by contributions of the Netherlands Government to the Prosperity Fund, payments of the Netherlands Government for military expenses in Surinam, some private capital inflow and increases in the liabilities of Surinam in a bilateral account with the Netherlands.⁴

Despite the continuance of a current deficit, changes in the composition of trade indicate that the balance of

TABLE IV
BALANCE OF PAYMENTS, 1947 THROUGH 1950
(Million Surinam Guilders)

	1947	1948	1949	1950
<i>Receipts</i>	26.1	34.5	41.6	35.1
Exports	24.6	30.3	34.1	31.4
Invisibles	1.5	4.2	7.5	3.7
<i>Payments</i>	35.2	44.3	48.0	49.4
Imports	31.0	36.2	36.1	39.2
(Of which capital				
goods)	n.a.	(9.7)	(11.6)	(12.8)
Invisibles	1.2	1.5	3.7	3.2
Bauxite Profits	2.4	5.1	6.7	5.4
Other Business Profits	0.6	1.2	1.0	0.6
Private Transfers	n.a.	0.3	0.5	1.0
<i>Current Balance</i>	-9.1	-9.8	-6.4	-14.3

payments situation is in the process of improving. The share of foodstuffs and other consumer goods in the total value of imports declined from 77% in 1929 to 56% in 1950; at the same time, the share of capital goods in-

⁴This account, which was created in 1949, was to be cleared regularly by transfers of gold and dollars. Since its creation the liabilities of Surinam have increased considerably and no clearing has been effected. The Mission was informed that the final settlement of balances now outstanding is soon to be discussed by the two Governments.

creased substantially. The expansion of productive facilities made possible by the additional imports of capital goods should permit increasingly higher output levels in the future. As indicated by Table IV, current deficits in recent years have been roughly equivalent to the value of capital goods imports. On the export side, a shift is noticeable from agricultural, labor-intensive exports, which represented more than 60% of the total in 1929, towards bauxite exports, which now account for 75% of trade receipts.

Over 80% of all Surinam exports go to the United States; 40% of imports come from the EPU area, primarily from the Netherlands.⁵ Surinam is thus a dollar earner, while accumulating liabilities in Netherlands guilders.

4. MONEY SUPPLY

Money supply increased more than nine times from 1940 to 1944. From Sf. 2 million at the end of 1939 it rose to Sf. 18.8 million by the end of 1943. It has since remained roughly at that level. Such fluctuations as have occurred are accounted for by periodic withdrawals and deposits by the mining companies. Money supply by the end of 1950 was Sf. 17.1 million.⁶

Legal reserve requirements, which are required to be held in gold or bullion, are 30% of the demand deposits and the notes held or issued by the Surinamsche Bank. For several years past, reserves have exceeded legal requirements; at the present time they are about 50% of the money supply.

⁵It should be noted that this direction of trade is encouraged by the import licensing system, under which only trade with the dollar area is restricted.

⁶Sf. 11.0 million in notes, and Sf. 6.1 million in demand deposits.

5. NATIONAL ACCOUNTS

The improvement which has taken place in Surinam's economic situation as a result of recent developments is indicated by Tables V and VI, showing (a) the probable behavior of the national accounts in 1938 and in 1947 through 1950, and (b) a more detailed breakdown for

TABLE V

PROBABLE BEHAVIOR OF NATIONAL ACCOUNTS, 1938 AND 1947-1950

(Million Surinam Guilders)

	1938	1947	1948	1949	1950
Net National Income (factor cost)*	24.4	59.8	68.3	75.1	72.9
Indirect Taxes	3.7	13.4	15.6	18.4	19.4
Depreciation	0.6	2.5	2.8	3.4	4.0
Gross National Product.....	28.7	75.7	86.7	96.9	96.3
Net Imports	3.9	9.1	9.8	6.4	14.3
Total Available Resources	32.6	84.8	96.5	103.3	110.6
Consumers' Expenditures	23.9	59.1	62.5	61.6	63.6
Government Purchases of Current Goods and Services.....	5.6	16.1	17.4	22.0	24.1
Gross Capital Formation.....	3.1	9.6	16.6	19.7	22.9
Gross Expenditures	32.6	84.8	96.5	103.3	110.6

*In the presentation in Table V, Net National Income (factor cost) includes income accruing to residents plus reinvested earnings of foreign owned corporations (about Sf. 3.5 to 4.5 million in 1950).

1950. The information available for the construction of the national accounts is neither complete nor entirely reliable; the tables should, therefore, be regarded simply as indicative of probable trends and orders of magnitude.

The volume of gross output probably increased by 85% from 1938 to 1950. This was accompanied by an increase of population of 30%. Per capita gross real income therefore probably increased by 40% in this period, to at-

tain the high level of about Sf. 500, or US\$ 265, in 1950. The consumption level is also high relative to most underdeveloped countries, and the rate of gross investment (estimated at Sf. 22.9 million in 1950, only slightly less than 24% of gross production) appears more than suffi-

TABLE VI
DETAILED BREAKDOWN OF NATIONAL ACCOUNTS FOR 1950
(Million Surinam Guilders)

	<i>Income</i>		<i>Expenditures</i>	<i>Savings</i>
<i>Personal Income</i>	63.7	<i>Personal Expenditure on Consumer Goods and Services</i>	63.6	+ 0.1
<i>Undistributed Corporate Income</i>	8.5	<i>Gross Private Domestic Investment</i>	13.2	- 4.7
Depreciation	4.0	Mines	7.6	
Reinvested Earnings	2.7	Increase in Inventories	3.0*	
Mines	1.8	Other	2.6	
Private	1.8			
<i>Government Revenues</i>	24.1	<i>Government Expenditure on Goods and Services</i>	33.8	- 9.7
Direct Taxes	7.4	Salaries	13.1	
Indirect Taxes	11.0	Goods	11.0	
Other Revenues	8.4	New Works and Maintenance	9.7	
(Minus pension payments and capital contributions)	-2.7			
<i>Domestic Gross National Product at Market Prices</i>	96.3**			
<i>Net Imports</i>	14.3			+14.3
<i>Total Available Resources</i>	110.6	<i>Total Gross Expenditure at Market Prices</i>	110.6	0

*This increase in inventories was abnormally large due to the Korean war; most of it should be regarded as an exceptional and non-recurrent factor.

**Includes reinvested earnings of foreign-owned corporations.

cient to maintain this level, given a continuation of the present rate of population growth.

Nonetheless, serious problems remain. Present levels of consumption and investment have been made possible only because of the financial assistance which Surinam has been receiving from the Netherlands in the form of

disbursements by the Prosperity Fund and the accumulation of liabilities in the bilateral account already mentioned, which have served both to cover the balance of payments deficit and to finance a substantial part of the capital expenditures in the public sector. For Surinam to become independent of such assistance in the future, while still maintaining its present consumption and investment levels, will require a considerable increase in both production and exports.

Personal savings available to finance an increase in production are very limited as shown by the national accounts⁷ and by data on the movements of savings deposits. This may be due in part to the peculiar social and ethnic structure of Surinam. Most Indonesians earn so little that they probably cannot save at all. Creoles of the low income group tend to spend the whole of their earnings in the support of their families and unemployed friends. The Hindustani seem to be the steadiest source of personal savings. Much of the investment not financed out of the net inflow of foreign capital seems to have been met by the plowing back of profits by local or foreign-owned enterprises. Surinam will not have a firm foundation to build for the future until personal savings and reinvested earnings are increased to the point where they can finance the major part of the country's investment requirements.

6. THE LABOR PROBLEM

The wage and salary level in Surinam is relatively high compared with most other underdeveloped coun-

⁷The low level of savings for 1950 shown in Table VI (Sf. 100,000) may be due in part to inaccuracies in the statistical data, in part to the fact that unusually large purchases were made in that year as a result of fears that the Korean war would cause shortages.

tries.⁸ To a large extent this appears to be due to the effect upon the general level of compensation for industrial and construction workers of the high wages paid by the bauxite mines and by the Government. In the case of agriculture, the wage rates for labor are similarly affected by the income level of the small farm owners.

In the urban and mining districts, the high wages paid by the Government and mines provide a limited group with incomes high enough to enable them to support a number of unemployed and underemployed dependents. This support is given readily, because of a strong tradition of family solidarity. In the agricultural community, first-class land and farms are not plentiful, but the cultivation of second-rate land often permits farmers to obtain a total income exceeding the best wages which can be offered to plantation labor. Furthermore, the stigma attached to plantation work creates a preference for free farming even when less remunerative.

As a result of these factors, labor is relatively well sheltered from the economic pressures which would normally be created by the fact that some of the potential industrial labor force is not employed and that there is considerable underemployment of workers in agriculture. The workers appear to enjoy a strong position in dealing with employers and, in most cases, manage to bargain for wages higher than would be warranted by their marginal productivity in conditions of competition.

Plainly, any substantial further development of the country is likely to result quite rapidly in an increased

⁸Plantation workers earn Sf. 1.25 to 1.5 per day; unskilled workers earn Sf. 2.5 per day in Paramaribo, and about Sf. 3 per day in the bauxite mines and construction jobs in the districts; semi-skilled workers earn above Sf. 4 per day; skilled mechanics' and tractor drivers' wages reach Sf. 7 to 8 per day.

demand for labor and a consequent further strengthening of the workers' bargaining power. Because of this situation, Surinam will find it difficult to sell on world markets, at competitive prices, articles whose production is highly labor-intensive. The development of the country must rather be in the direction of relatively highly capitalized production, where the productivity of the workers can be great enough to justify their level of wages. This will require, in addition to capital investment, vigorous efforts to create a more highly skilled labor force.

The labor problem is of particular significance in the agricultural sector. In the opinion of the Mission, the old-style plantation agriculture, dependent as it has always been on large numbers of unskilled, low-paid workers, cannot be revived. Rather, agricultural development in the future is likely to be primarily either in the form of small farms, improved with drainage and irrigation facilities, which individual families can care for themselves with the aid of light equipment, or else in the form of quite highly mechanized larger farms, some of which may perhaps be run to a large extent on a co-operative basis. Only on farms such as these is the productivity of agricultural workers likely to be sufficient to support consumption standards high enough to keep labor on the land.

C. PROGRAM GOALS

The Governments of the Netherlands and of Surinam are aware of the major problems involved in the current economic structure of Surinam. The creation of the Planning Office, the initial work on the proposed Ten Year Program and the request for a Bank Mission are manifestations of their desire to formulate a long-term eco-

conomic program designed to solve these problems and increase the welfare of the country.

The Mission believes that the major objectives of the development program can be summarized as follows:

(a) To put an end to the country's dependence on external subsidies and grants, and to reduce its dependence on other capital inflows, by the end of the program (mid-1962).

(b) To accomplish this while still maintaining at least the present per capita consumption level for the anticipated increased population.⁹

(c) To be in a position, by the end of the program, to maintain a level of gross investment, without extraordinary external assistance, sufficient to support or raise the then per capita consumption level.

(d) To maintain the availability of social services at least at their present per capita level.

Projection of the national accounts indicates that these objectives could probably be accomplished in conditions of price stability by increasing the gross national product to around Sf. 135 million by mid-1962, or by roughly Sf. 40 million above the 1950 level of Sf. 96.3 million. This projection has been made on the following basis:

(a) As already noted, by the end of the program period in mid-1962 the population can be expected to reach 260,000 people, an increase of about 33% over 1950.¹⁰ Maintenance of the present level of per capita consumption expenditures for this increased population would

⁹As indicated in Chapter V, we believe that this minimum target can be exceeded and that, in fact, it should be possible to increase the per capita consumption level by about 1% per year.

¹⁰It is assumed that emigration will not exceed immigration during the program years.

imply an increase in the total of such expenditures by roughly Sf. 21 million over the 1950 level of Sf. 63.6 million.

(b) To maintain per capita consumption expenditures at this level after the end of the program would, we estimate, require annual gross investment of about Sf. 21-22 million. Although this estimate may appear low compared to the estimated 1950 level of Sf. 22.9 million, gross capital formation in 1950 appears to have substantially exceeded the amount needed for simple depreciation and maintenance of the existing capital stock and for accumulation of the additional stock necessary to take care of the increase in population.¹¹ Moreover, analysis indicates that, in all likelihood, the capital stock available in 1950 could have supported a higher level of production.¹²

¹¹Gross capital formation in 1950, as already noted, was only slightly less than 24% of gross income, while it may be estimated that the requirements of depreciation and maintenance were roughly 9%, and the requirements for new capital 8-9%, of gross income. Also, as previously indicated, 1950 was marked by exceptional increases in inventories.

¹²It has been estimated that the value of the capital stock in 1950 (at replacement cost) was about Sf. 375 million. The ratio between invested capital and gross value of production was about 3.9 to 1. This relatively high ratio is explained by many peculiarities in the structure of Surinam's economy. Among others, about one third of the capital is invested in bauxite and gold mining, and in a highly capitalized type of agriculture. In both cases, ratios of investment to income are bound to be large. However, there already was excess capacity in mines which probably could have produced 30-50% more bauxite with the available equipment. Also, capital stock in other sectors was and is far from being fully utilized; most industries in Paramaribo work on a one-shift basis, and capital investment in trade and most services is used at a low percentage of theoretical capacity. Most shops are closed most of the afternoon; restaurants, clubs, theaters, athletic fields are seldom crowded; people engaged in the professions normally work, and thus use their capital stock, only in the morning. Even discounting the increases in human productivity which are very likely to result during

The 1950 level of investment was made possible largely as a result of an inflow of foreign capital; local savings in that year (including reinvestment by foreign-owned enterprises) amounted to only about Sf. 8.5 million.¹³ If Surinam is to reduce her dependence on foreign capital by the end of the program—that is, if investment is to be financed primarily out of local savings—such savings will have to increase to around Sf. 20 million a year by mid-1962, or by about Sf. 11.5 million above the 1950 level.¹⁴

(c) In all probability, some increase in current government expenditures will also be necessary during the program period. However, since the present administration is large relative to the size of the population, there is no need for any great increase in government personnel. For reasons indicated at more length in Chapter V, we estimate that by the end of the program period, current government expenditures may be roughly Sf. 5.5-7.5 million above the 1950 level.

If the foregoing estimates are accurate, it appears

the program years from improvements in technical education, health and education and increased investment, it may reasonably be expected that a much better ratio of investment to output could be obtained. It is postulated here that over the years 1952 to 1962 it will fall to approximately 3.5-3.6:1. If this decrease in capital income ratio can be obtained, it follows that gross investment in the period 1950-1962 need not exceed Sf. 17 to 22 million on the average.

¹³They may have averaged Sf. 10 million in 1948-1950.

¹⁴This increase in local savings can only be obtained gradually. Its realization by the end of the program period would imply an increase in the amount of savings of about 8% to 10% per year from 1950 to mid-1962, which should not be unduly difficult to achieve. On the assumption that this rate of increase does occur, total local savings over the program period would aggregate roughly Sf. 150 million, as compared with estimated total investment requirements of about Sf. 210 million. The gap of Sf. 60 million would have to be covered through foreign capital.

that gross national income at the end of the program period will have to be around Sf. 38-40 million above the 1950 level to cover the increases in consumption expenditures (about Sf. 21 million), in local savings (about Sf. 11.5 million), and in current government expenditures (about Sf. 5.5-7.5 million) which we believe are implied in the achievement of Surinam's development objectives. The major economic goal of the proposed Ten Year Program, therefore, must be to enable Surinam to produce and market, either at home or abroad, the additional volume of goods and services necessary to realize an increase in gross national income of this order of magnitude by mid-1962.

CHAPTER III

RECOMMENDATIONS FOR A PUBLIC INVESTMENT PROGRAM

IN THIS CHAPTER the Mission sets forth its recommendations for public investment during the period of the Ten Year Program. In order for these recommendations to be properly understood, certain preliminary observations seem necessary.

A. PRELIMINARY OBSERVATIONS

1. SIZE OF PROGRAM

When formulating a program for a period as long as ten years, it is impossible to predict with accuracy the total amount of capital, from both domestic and foreign sources, which will be available for public developmental expenditures. Accordingly, the Mission believes that Surinam would be well advised to adopt a program divided into two parts: *first*, a minimum program of the most essential projects in an amount for which financing is already assured or should readily be available and which is within the country's probable technical capacity to handle; and *second*, a supplementary program, including projects of a somewhat lower priority, to be carried out if and to the extent that funds prove to be available and the country's technical capacity to execute them is demonstrated.

The minimum program might appropriately, in our judgment, call for expenditures in the neighborhood of

Sf. 100 million over the ten year period. As is indicated later in this Report, a program of this size, effectively administered, should be able to achieve Surinam's basic developmental objectives. It should also be within Surinam's financial means, on the assumption made by the Surinam Planning Bureau, that the Netherlands Government will help to finance the program by making available a long-term loan equivalent to Sf. 40 million. The remaining Sf. 60 million could, we believe, be financed by budgetary contributions to the extent of at least Sf. 4 million a year, or a total of Sf. 40 million, leaving a gap of perhaps Sf. 20 million to be filled by additional external financing.

If more than Sf. 100 million prove to be available, as we believe is likely, the additional resources should be utilized to increase the rate of developmental expenditures to the extent permitted by the country's technical absorptive capacity. This could be done by speeding up the minimum program so that, instead of requiring ten years for its completion, it would be completed in a shorter period, and also by adding desirable projects to the program. For this reason we recommend, in addition to the basic Ten Year Program, a Supplementary Program providing for developmental expenditures of Sf. 30 million. The projects included in this Supplementary Program are, in the judgment of the Mission, somewhat less urgent than those in the Ten Year Program; some of them, in particular housing, are relatively easy to expand or contract depending on the amount of resources which prove in fact to be available.

For the reasons already given, we urge that the proposed ten-year period of the program not be regarded as inflexible or, indeed, as anything more than a guidepost.

In our judgment, the ultimate objective should be to carry out the projects included within both the Ten Year and Supplementary Programs as rapidly as the availability of resources and technical skills permits.

2. RELATIONSHIP OF PROGRAM TO EXISTING PUBLIC DEVELOPMENTAL EXPENDITURES

The recommended Ten Year and Supplementary Programs are intended to cover practically all developmental expenditures of the type now being made by the Surinam Government out of budgetary resources. The only exceptions of which we are aware are expenditures for such items as cars, busses and trucks, which should not amount to more than about Sf. 500,000 per year. Apart from expenditures of this type, we assume that the only provision for capital outlays which the Surinam Government will have to make in its annual budget during the period of the Program is its contribution to the Ten Year and Supplementary Programs. In fact, however, we believe that in the later years of the Program the Government will have sufficient resources, and will find it desirable, to make additional developmental investments beyond those contemplated in the Program.

3. UNDISBURSED RESOURCES OF PROSPERITY FUND

Several of the projects included within the recommended Ten Year Program have received allocations from the Prosperity Fund. As of the end of 1951, a substantial part of the resources so allocated remained undisbursed. Accordingly, in order to present a full picture of the resources expected to be available for the projects within the recommended program, we show in our tabular presentation of the program not only recom-

mended allocations from program funds but also allocations from the Prosperity Fund estimated to be still available for disbursement at the end of 1951.

4. PRICE ASSUMPTIONS

Our public investment recommendations are based on the assumption that export, import and internal prices will remain stable over the period of the program. In the opinion of the Mission, relative internal price stability can be achieved provided appropriate fiscal measures are adopted. The assumption that there will be no external price fluctuations is taken in the absence of any better hypothesis; the actual course of prices for Surinam's exports and imports over the next ten years is, of course, impossible to predict. If major changes should occur in the terms of trade, the program would have to be revised accordingly.

5. ASSUMPTIONS AS TO THE PRIVATE SECTOR

We have included in the public investment program only those investments which, if they are to be made at all, must be made by the Government. We assume that the bauxite mining companies will continue to finance all of their necessary capital expenditures out of their own resources. We also assume that private savings will continue to be invested in agriculture at at least the present rate; in fact, private agricultural investment is likely, we believe, to increase considerably as a result of the additional income which the farmers should realize from the new lands, improved drainage and irrigation facilities, additional credit and better transport provided for in the public investment program. Finally, we assume that such industrial expansion as may be anticipated will, for the

most part, be privately financed; credit facilities for such industrial expansion, to the extent of Sf. 400,000-600,000 per annum, are expected to be available from the Herstelbank and other banks. However, to cover the eventuality that existing credit facilities may not be sufficient to meet all appropriate industrial development requirements, we have made provision in the recommended Ten Year Program for an allocation of Sf. 4 million for the support of private enterprise. It would be the Mission's expectation that this provision for additional long-term credit would be utilized primarily for expansion of the wood products and logging industries.

6. NEED FOR FLEXIBILITY

Our recommendations for the proposed Ten Year and Supplementary Programs are presented in the first instance in the form of a recommended allocation of funds as between the different sectors of the economy and then, within each sector, as between various proposed projects. We wish to emphasize, however, that the particular list of projects included within the program, and the proposed allocation for each project, must be regarded as highly tentative and extremely flexible.

There are certain projects, of course, on which a definite decision to proceed has already been or can readily be made. Clearly, too, there is need for an early decision on the projects to be carried forward during the first year of the program. But most of the proposed investment expenditures should remain subject to change, within the general framework of the program, as experience may indicate to be desirable. There are many reasons for this. Some types of agricultural projects included within the program, for example, may prove un-

expectedly productive, or may run into unanticipated difficulties. Actual costs may vary considerably from the cost estimates on which the program is based. Price stability, which we have assumed, may in fact be impossible to maintain. The investment of foreign private capital may differ greatly, both in amount and direction, from what we presently expect. Because of these and many similar factors, frequent and perhaps even drastic adjustments may be necessary in any investment program which is adopted. An essential element of such a program, therefore, is provision for an administrative mechanism charged with keeping the progress of the program under constant review and with modifying it, or recommending its modification, as circumstances indicate to be desirable (see Chapter IV).

We present our recommendations for public investment, then, not in the thought that they should lead to the adoption of a program which would serve as a fixed list of prescribed investments for the whole ten-year period, but rather to a program which would provide a starting point for public investment in the first year and a guide and framework for investment decisions in subsequent years. For the reasons we have stated, we would expect many adjustments in the proposed project allocations over the period of the program. On the other hand, we would not anticipate major changes in the general targets of the program or in the areas of emphasis for public investment.

B. TABULAR PRESENTATION OF RECOMMENDED PROGRAM

In Tables VII to XI, the Mission's public investment recommendations are presented in tabular form. Table

TABLE VII
 RECOMMENDED ALLOCATION OF PROGRAM FUNDS
 AMONG MAJOR SECTORS OF ECONOMY
 (Million Surinam Guilders)

<i>Sectors</i>	<i>Ten-Year Program</i>	<i>Pros- perity Fund*</i>	<i>Supplemen- tary Pro- gram**</i>	<i>Total</i>
Agriculture	51.70	3.65	10.00	65.35
Forestry	5.20	---	1.00	6.20
Transport	17.80	1.38	2.60	21.78
Support of Private Enterprise	4.00	---	---	4.00
Social Sector	16.80	1.25	16.40	34.45
Administration	4.50	---	---	4.50
<i>Total</i>	100.00	6.28	30.00	136.28

*Funds already allocated to projects within the program, but not expected to be expended by the end of 1951.

**To be carried out if and to the extent that funds are available.

TABLE VIII
 RECOMMENDED ALLOCATION OF PROGRAM FUNDS
 WITHIN AGRICULTURAL SECTOR
 (Million Surinam Guilders)

<i>Projects</i>	<i>Ten-Year Program</i>	<i>Pros- perity Fund*</i>	<i>Supplemen- tary Pro- gram**</i>	<i>Total</i>
Reconditioning Old Farm Areas (Kwatta, Tout Lui Faut, Groningen, Im- provement Saramacca Pol- ders, Improvement Old Nickerie Polders, Comme- wijne)	10.00	---	---	10.00
Opening New Areas for Small and Medium Farms (Co- ronie, Para, New Polders in Nickerie, New Polder in Saramacca)	6.30	1.20	---	7.50
Wageningen	18.00	---	---	18.00
Lelydorp	0.90	2.10	---	3.00
Slootwijk	0.20	0.20	---	0.40
Fisheries	1.10	0.15	---	1.25
Cattle Breeding	2.00	---	---	2.00
Drying and Storage Facilities	2.00	---	---	2.00
Research	3.50	---	---	3.50
Agricultural Credit	3.00	---	---	3.00
Bureau of Rural Development	1.20	---	---	1.20
Reserve Fund	3.50	---	10.00	13.50
<i>Total</i>	51.70	3.65	10.00	65.35

*Funds already allocated to projects within the program, but not expected to be expended by the end of 1951.

**To be carried out if and to the extent that funds are available.

TABLE IX
 RECOMMENDED ALLOCATION OF PROGRAM FUNDS
 WITHIN FORESTRY SECTOR
 (Million Surinam Guilders)

<i>Projects</i>	<i>Ten-Year Program</i>	<i>Pros- perity Fund*</i>	<i>Supplemen- tary Pro- gram**</i>	<i>Total</i>
Forest Inventory	1.16	---	---	1.16
Forest Access				
A. Swamp Forests	1.00			
Equipment	0.35			
Canals	0.33			
Mechanical Logging				
Experiment	0.11			
Clearing Waterways	0.21			
B. Dry Land Forest Belt	1.50			
Equipment	0.60			
Roads	0.90			
C. Communications and				
Transportation	0.17			
<i>Sub-Total</i>	2.67	---	0.40	3.07
Logging Engineering	0.27	---	---	0.27
Technical Research	0.53	---	0.20	0.73
Market Research and Trade				
Promotion	0.45	---	0.20	0.65
Reforestation	0.12	---	0.10	0.22
Management Plans		---	0.10	0.10
<i>Total</i>	5.20	---	1.00	6.20

*Funds already allocated to projects within the program but not expected to be expended by the end of 1951.

**To be carried out if and to the extent that funds are available.

TABLE X
RECOMMENDED ALLOCATION OF PROGRAM FUNDS
WITHIN TRANSPORT SECTOR
(Million Surinam Guilders)

<i>Projects</i>	<i>Ten-Year Program</i>	<i>Pros- perity Fund*</i>	<i>Supplemen- tary Pro- gram**</i>	<i>Total</i>
Improvement of Existing Roads (Paranam — Dom- burg; Local Stretches of Main Roads; Farm-to- Market Roads)	7.15	....	....	7.15
Construction of East-West Highway (Garnizoenspad to Saramacca; Coppe- name Ferry; Coronie-Wag- eningen-Nickerie Road) ..	2.81	....	....	2.81
Inland Waterways (Arra- wara Creek; Saramacca Canal; River-Coastal craft	1.62	0.13	....	1.75
Construction Equipment and Machine Tools	1.40	....	....	1.40
International Airfield***	1.50	....	....	1.50
Airstrips	0.10	....	....	0.10
Beekhuizen Ocean Port	2.25	1.25	2.60	6.10
Railway Motive Power***	0.75	....	....	0.75
Telephone Service	0.22	....	....	0.22
<i>Total</i>	17.80	1.38	2.60	21.78

*Funds already allocated to projects within the program but not expected to be expended by the end of 1951.

**To be carried out if and to the extent that funds are available.

***Contingent items.

TABLE XI
RECOMMENDED ALLOCATION OF PROGRAM FUNDS
WITHIN SOCIAL SECTOR
(Million Surinam Guilders)

<i>Projects</i>	<i>Ten-Year Program</i>	<i>Pros- perity Fund*</i>	<i>Supplemen- tary Pro- gram**</i>	<i>Total</i>
Housing	---	---	15.00	15.00
Health				
Hospital in Paramaribo....	3.50	1.25	---	4.75
Leprosaria	1.00	---	0.20	1.20
Other	0.68	---	.10	0.78
(District Hospitals, Asylum, Institute for Tropical Diseases, In- stitute for Cured Lep- ers)				
Education				
Primary Schools	3.50	---	1.00	4.50
Technical School	0.35	---	---	0.35
Normal School	0.20	---	---	0.20
Domestic Science School....	---	---	0.10	0.10
General Welfare	0.85	---	---	0.85
(Community Houses, Play- grounds, Internates)				
Water Supply				
Paramaribo	1.35	---	---	1.35
Districts	0.92	---	---	0.92
Town Improvement				
Paramaribo—				
Sewage, Drainage and Streets	3.50	---	---	3.50
Market	0.45	---	---	0.45
Nickerie	0.50	---	---	0.50
<i>Total</i>	16.80	1.25	16.40	34.45

*Funds already allocated to projects within the program, but not expected to be expended by the end of 1951.

**To be carried out if and to the extent that funds are available.

VII presents our recommendations for the allocation of program funds as among the major sectors of the economy; Tables VIII to XI present our recommendations for the allocation of program funds as among projects within each major sector. The reasoning behind the recommendations contained in these tables is explained in the following section of the Report.

C. EXPLANATION OF THE RECOMMENDED PROGRAM

I. SECTOR ALLOCATIONS

The suggested allocation of program funds among the various major sectors of the economy does not deviate greatly from the general pattern followed by the Surinam Planning Bureau in its preliminary work. Just over 50% of the funds (Sf. 51.7 million) is proposed to be devoted to agricultural development, since it is in this sector that public investment is expected to result in the greatest increase in production. The allocation of Sf. 5.2 million to forestry is intended to cover all priority projects in that field; as already indicated, we assume that this public expenditure will be complemented by substantial private investment in both the logging and wood products industries. Should private capital available for these two industries be less than anticipated, financial assistance could be provided from the Sf. 4 million of program funds reserved for "Support of Private Enterprise."

The transport allocation is designed to cover all projects considered by the Mission to be of a priority character from the standpoint of contributing to increased output; although there are many other desirable trans-

port projects, we believe that most of them must be deferred until after the more directly productive, and therefore more urgent, investment requirements have been met.

Similarly, we have included in the social sector only those public investments, aggregating Sf. 16.8 million, which we believe cannot reasonably be deferred. Some social investments, as, for example, the construction of a new general hospital and the improvement of vocational training facilities, are clearly urgent. It is also important that existing facilities be maintained and expanded to the extent required to prevent any decline in the present level of social services. Since, however, the level of social services is already high for a country in Surinam's present stage of development, we have considered that most investments designed to improve those services should be given a somewhat lower priority than investments essential to achieve the economic targets. In the Supplementary Program, however, we have provided for an additional allocation of Sf. 16.4 million for social investment (of which Sf. 15 million is for housing) which we believe should have high priority in the Supplemental Program allocations.

We have omitted from our recommendations any allocation of program funds for mining or for the proposed aerial survey of the southern half of Surinam. In the case of mining, the project contained in the provisional program provides in essence simply for an expansion of current services performed by the Bureau of Mines. In our judgment, expenditures for this purpose should be financed out of the current budget rather than out of program funds. In the case of the aerial survey, the omission reflects our conclusion that the proposed project is not, at the present time, of a priority nature.

2. THE AGRICULTURAL SECTOR

(a) *The Land Improvement Program.* As has already been noted, 90% of Surinam's agricultural production now comes from small family-sized farms. Most of these farms have poor drainage and irrigation facilities; most of them are also too small to permit maximum productivity by the farmer and his family. Because of this situation, it is the opinion of the Minister of Agriculture, in which the Mission fully concurs, that the output of the existing agricultural labor force can be greatly increased by reconditioning old farm areas, opening new farm areas, and redistributing both old and new lands in such a way as to increase the size of individual farm units. To accomplish this requires public investment, since drainage and irrigation can properly be provided only on a regional, rather than on an individual farm, basis; similarly, the most promising areas for new farms must be empoldered before they can be opened to cultivation.

Recent experience in Nickerie indicates the possibilities of this approach. In the past few years, new polders have been constructed there and individual farm families installed on four and eight hectare farms, roughly twice the size of those previously cultivated by them. The result has been a striking increase in output. With the aid of light equipment, the farmers in the new polders have been able not only to cultivate larger areas but to increase yields per hectare substantially; they have frequently been able to grow two crops per year instead of the one crop to which the unimproved farms in the same area are limited.

The Ministry of Agriculture has prepared preliminary plans for a number of land improvement projects,

involving both the construction of new polders and the reconditioning of old areas; collectively, these projects are referred to as the "Land Improvement Program." Although very few of the projects have yet been worked out in final form, present proposals call for reconditioning almost 13,000 hectares of old lands and opening up more than 19,000 hectares of new land. The total investment required is estimated at Sf. 17.5 million (of which Sf. 1.2 million will come from the Prosperity Fund) and the anticipated increase in annual production at almost Sf. 12 million. The additional production will be in a variety of crops (principally rice, soya beans and tree crops, such as coconuts, citrus fruits and bananas) and also in milk and meat.

The Mission believes that this land improvement program is sound in conception and should be pushed forward as rapidly as possible. Not only should the program result in substantial additional output, but it should result directly in improving living standards for large and important elements of the population. Accordingly, we have made provision in the recommended investment program for the full estimated cost of this development. We have, however, made no attempt to allocate funds as among the different projects within the land improvement program because of the still preliminary state of the planning for many of the projects. We suggest that definitive allocation of funds as among these projects be deferred until the planning phase is further along and more actual experience has been accumulated.

(b) *The Wageningen Project.* Apart from the land improvement program, the other major undertaking in the agricultural sector is the Wageningen Project. This project, originally conceived by Professor Eysvoogel, contemplates highly-mechanized cultivation of rice, or

of rice and soya beans, on a tract of virgin land near Nickerie which is to be cleared, empoldered, provided with irrigation and drainage facilities and subdivided into a number of large farms.

The planning for the project has gone through several stages. The original scheme of the Eysvoogel Mission contemplated the reclamation and empoldering of some 50,000 hectares (eventually to be extended to perhaps 200,000 hectares) and proposed as a first step the construction of a 5,000 hectare polder. This first polder was to be subdivided into 64 farms, each of which was to be cultivated by a carefully selected Dutch farmer and his family, who would be brought to Surinam for that purpose and given appropriate training in mechanized rice farming. This scheme was accepted in principle by the Netherlands and Surinam Governments and its execution was entrusted to a nonprofit organization established by the two Governments entitled the "Foundation for the Development of Mechanized Agriculture in Surinam" (hereafter referred to as the "Stichting"). An ECA allocation of about \$1.5 million was also obtained for the project.

Subsequent study of the scheme convinced the Stichting that it would be more economical, and socially more desirable, to proceed, as a first step, with a 15,000 hectare, 210-farm project rather than with the proposed 5,000 hectare, 64-farm project. Although this change would increase the total estimated cost of the project from approximately Sf. 12.7 million to approximately Sf. 33.3 million, it was estimated that the investment per farm would decline from approximately Sf. 197,500 to approximately Sf. 158,500; this estimated cost includes not merely preparation of the farms themselves but also such community undertakings as a central machine park,

central workshop, warehouses, power station, rice processing plant, harbor facilities and urban settlement. From a social standpoint, too, it was believed that a community of 210 Dutch families would be sounder than a community of only 64 Dutch families. The change was approved by the Board of the Stichting, after which the Netherlands Government agreed to extend loan guarantees for the additional investment required on condition that appropriate methods of financing be devised and foreign participation be secured. Detailed plans have been worked out accordingly, construction of the village of Wageningen, the urban nucleus of the project, is underway, and a start has been made on the main drainage canal for the first polder. However, several important features of the project are still to be decided on the basis of experiments now being conducted in the Prince Bernhard Polder, including the most desirable rotation of crops, the best strain of rice for mechanized agriculture, and the most appropriate size for the individual farm units.

In the judgment of the Mission, the Wageningen project is a desirable development for Surinam. It can reasonably be expected that well-trained Dutch farmers, equipped with the most modern machinery, operating in an area where the soils are good and where the flow of water can be controlled all year round, and enjoying the benefits of expert technical assistance, will be able to produce large export crops of high quality at a cost enabling them to be profitably sold at world prices. The result should be a substantial improvement in Surinam's balance of payments and budgetary position. Moreover, the Wageningen project has already stimulated valuable research work in connection with mechanical agriculture and will, in all probability, do so increasingly. Certainly

the advanced techniques to be employed on the project should have an influence on Surinam agriculture far beyond the confines of the Wageningen settlement.

For a number of reasons, however, the Mission would urge that the Wageningen project be considered as still experimental and that, instead of making a firm decision at the present time to invest in Wageningen the full Sf. 33.5 million estimated to be required for the 15,000 hectare project, the investment commitment be limited to around Sf. 18 million, which should be sufficient, taking into consideration the funds already invested in the project, to open to mechanical cultivation between 7,000 and 10,000 hectares. On the basis of an investment of this magnitude, we estimate that the value of the annual production of rice, soya and beef should amount to about Sf. 5.5 million. At a later time, should experience demonstrate that the extension of Wageningen deserved top priority in the agricultural field, the investment could be increased out of funds expected to be available in the Reserve Fund provided for in the agricultural sector of the recommended program (see Table VIII).

The reasons for urging caution before committing funds for the full 15,000 hectare project are both technical and economic. As shown in Technical Appendix 1, the problem of weed killing has not yet been solved. Last year on the Prince Bernhard Polder, 52 hours of hand labor per hectare were spent in killing weeds, in addition to a further three machine/man hours. This alone would present a serious obstacle to proper cultivation of large farms by single families. The weed-killing problem will in all probability be solved in time, but it may take a few years before manual labor can be dispensed with. Furthermore, no high-yielding variety of rice has yet been developed which is appropriate for mechanical harvest-

ing. The only variety thus far developed which can easily be harvested by combines gives yields 20% to 25% lower per hectare than the variety which is now being grown on the smaller farms in Nickerie.¹ If Wageningen grows a better quality rice than Nickerie, however, this may partially offset the lower yield.

In the absence of experience, it is difficult to compare the economic advantages which may be expected from the Wageningen investment with those from other types of agricultural improvements. The estimated capital cost of a polder in Wageningen (Sf. 2,000 per hectare) is about four times the cost of a similar polder in Nickerie (Sf. 500 per hectare); on the other hand, the Wageningen investment includes industrial and community facilities and other social overhead items which are not computed in the cost of Nickerie polders. These facilities will be considerably more elaborate than those available at Nickerie; in addition, the Wageningen project involves heavy investment in mechanical pumping which is only a minor item at Nickerie. The gross value of production per hectare at Wageningen is still uncertain; because of the technical factors already mentioned, however, it seems likely to be no greater, and may well be less, than the gross value of production per hectare on improved small rice farms.

In view of the many unknowns, it would be futile to attempt to predict the relative profitability, in terms of total capital costs, of the Wageningen project as against the profitability, for example, of the land improvement projects. The latter, however, will certainly have a more

¹Hindustani and Indonesian farmers cultivating rice on four and eight hectare farms on the new polders near Nickerie obtain paddy yields of around 3,250 kg. per hectare. The estimated Wageningen paddy yield is 2,750 kg. per hectare.

immediate effect in raising the standard of living of the Surinam people; while the Wageningen project should also result in an improvement of living standards, it will do so indirectly and therefore more slowly.

Because, for the reasons stated, we believe that the Wageningen project should be regarded as still experimental, we suggest that it would not be wise for the Netherlands and Surinam Governments, at this stage, to commit themselves to as large an investment as Sf. 33.5 million for Wageningen—an investment which would represent roughly one third of all expenditures provided for in the minimum Ten Year Program. We recognize, of course, that the proposed reduction in the size of the project will result in an increase in the capital investment per farm and thus in a reduction of the individual farmer's profits. We are not convinced, however, that the increased cost per farm will be so great as to make the project uneconomical or unattractive to prospective Dutch immigrants. We are also of the opinion that, with the investment of Sf. 18 million which we have proposed, the Wageningen project, properly planned, can provide for the settlement of enough Dutch families to make for a healthy social environment. From the standpoint of Wageningen alone, the Stichting is probably right in urging the larger investment. However, in the Mission's judgment, the anticipated advantages to Wageningen from the larger project are not so great as to outweigh the expected advantages of other projects in the program which would probably have to be deferred or abandoned if the full Sf. 33.5 million were now allocated to Wageningen.

(c) *Other Projects.* (i) The *Lelydorp* Project is an experiment, being financed by the Prosperity Fund and executed by the Stichting, to determine whether it is

technically and economically feasible to open up to cultivation a vast area of land, comprising perhaps a million and a half hectares, known as the old coastal plain (see Chapter I). The principal advantage of this area over the young coastal plain is that most of the land does not need to be empoldered. On the basis of the experience at Lelydorp over the past year, the Mission is convinced that the experiment should be carried on. The area cleared at the end of 1951 was about 330 hectares. Although we believe that this area should be gradually expanded, there is no urgency about completing the entire original project of clearing 2,000 hectares so as to establish 125 farms of 16 hectares each. Because of the substantial potentialities of the experiment we have recommended that Sf. 900,000 of program funds be allocated to Lelydorp, in addition to the unexpended portion of the allocation of the Prosperity Fund which is estimated at Sf. 2.1 million as of the end of 1951. If the Lelydorp project proves highly successful, the scheme should, of course, be extended, either by use of funds available in the Reserve Fund provided for in the agricultural sector of the recommended program (Table VIII) or, if necessary, by a transfer of funds now earmarked for the land improvement program or for other agricultural projects.

(ii) The *Slootwijk* Project is also an experiment being financed by the Prosperity Fund and executed by the Stichting, designed to determine whether the deserted plantation lands, covering an area of roughly 30,000 hectares, can be brought back into profitable production. The experiment is being conducted on a relatively small tract. The Mission believes that it should be carried through and has therefore recommended an allocation of Sf. 200,000 of program funds to supplement an equal

amount still earmarked for Slootwijk in the Prosperity Fund.

(iii) The *Fisheries* Project is a plan to develop fish ponds in an area of 4,000 hectares adjoining the coast to the north of the Matapicca River. It is proposed that this area be developed at the rate of 450 hectares per year. Estimated output is 250 kg. of fish per hectare per year; in the judgment of the Mission, based on the preliminary results already obtained and experience in other countries, actual output is likely to be closer to 400 kg. per hectare. Even on the basis of the lower figure, it is estimated that the fish can be sold in Paramaribo at 40¢ per kg., which is less than half of the present price. Since protein production is low in Surinam and large quantities of salted fish are imported, this project has obvious merit. As part of the project, an urgently needed new fish market will be constructed in Paramaribo. We have recommended an allocation of Sf. 1.1 million of program funds for the project which, together with Sf. 150,000 expected to be forthcoming from the Prosperity Fund, should cover the entire estimated cost of Sf. 1.25 million. The total value of the additional production resulting from the project when it is completed has been conservatively estimated at Sf. 450,000 per annum.

(iv) The improvement of *cattle breeding* is an urgent necessity. There are at present about 30,000 cattle in Surinam, mostly native breed. Of these, 26,000 are kept for agricultural work and beef; only 4,000 are dairy cattle. Milk production is very low, averaging only three liters per day per cow; as a result, substantial quantities of milk and other dairy products have to be imported. The beef cattle are also small, giving only a little over 100 kilos of meat per head. The cattle-breeding project contemplates improvement of the stock by crossing and

selection, as well as by improvement of the pastures. It is hoped to double the production of milk in 10 years, although even the achievement of this objective will not provide enough fresh milk to meet all domestic consumption requirements. Also included within the project is a proposal to modernize the slaughterhouse in Paramaribo by adding a cold storage department and a bone-meal plant, which together are estimated to cost Sf. 450,000.

In the judgment of the Mission, the cattle-breeding project is not large enough nor has it yet been worked out with proper care. We recommend, therefore, that the Government promptly invite a cattle-breeding specialist to come to Surinam to advise on a revision of the program. After this has been done, execution of the project should be pushed ahead as a matter of priority. As an indication of the importance we attach to this project, we have included an allocation of Sf. 2 million for it in our recommended program, an amount which (even after allowing for the proposed slaughterhouse investment) is more than twice as large as the amount suggested by the Planning Bureau at the time of the Mission's visit. Until the project is revised, it is difficult to estimate the additional production which may be expected from it.

(v) *Drying and storage facilities* were not provided for in the provisional program as presented to the Mission by the Planning Bureau. In our judgment, however, existing facilities are already inadequate and will become increasingly so as agricultural production rises. If this situation is not remedied, the result will be an undue waste of agricultural products. We recommend, therefore, that plans be formulated for the construction of additional drying and storage facilities, and that an allo-

cation of roughly Sf. 2 million of program funds be provided to finance them.

(vi) *Agricultural research* has progressed rapidly during the past few years but, as indicated in Technical Appendix 1, the research program is still inadequate, particularly in the light of the substantial extension of agricultural production contemplated during the program period. We have accordingly recommended an allocation of Sf. 3.5 million to cover additional research and extension work.

(vii) The requirements for *agricultural credit* will grow greatly as new lands are opened to cultivation and the size of the average farm unit is increased. The land improvement program, in particular, will not achieve the results expected of it unless farmers are able to secure enough credit to finance the purchase of draft animals, hand tools and similar light agricultural equipment; they will also need larger crop loans in view of the anticipated production increases. The Mission estimates that short- and long-term credit available to agriculture should increase by at least Sf. 3 million within the next 10 years. Since it is doubtful that such an increase will be forthcoming out of private savings, we have recommended an allocation of Sf. 3 million of program funds for this purpose. We assume that these funds will be made available to the farmers through the facilities of the Popular Credit Bank or other appropriate banking facilities.

(viii) The Surinam Government proposes to establish a *Bureau of Rural Development* to formulate detailed plans for the projects included within the land improvement program. The staff of the Bureau is to consist of a director, a sociologist, a soil expert, a road and hydraulic engineer, a forester and an agricultural economist. The

services of other experts will be called for on an *ad hoc* basis as needed. Since this Bureau is designed specifically to carry out a part of the Ten Year Program and, at the present juncture at least, is not conceived of as a permanent government agency, we believe that the estimated cost of the Bureau is a proper charge against program funds. Accordingly, we have recommended an allocation of Sf. 1.2 million for this purpose.

We have already pointed out the need for flexibility in the administration of program funds. This need is particularly great in the agricultural sector because of the still provisional nature of many of the projects and because we believe that additional experience and research may well result in adjustments in the present priority evaluations of the projects. It is for this reason that we have suggested the creation of a Reserve Fund in the agricultural sector and have stressed in our discussion of many of the agricultural projects the desirability of examining the initial results before determining their ultimate scope.

3. THE FORESTRY SECTOR

(i) The Forest Service is now engaged in making a *forest inventory*, which will provide information as to the timber stand, the topography and the location of the wood species most in demand. Since this information is essential to any rational development of logging activities, we recommend that the forest inventory project be not only continued but accelerated so that it can be completed within the first five years of the program. To this end we have recommended an allocation of Sf. 1.16 million for the project.

(ii) The *forest access* projects are of two types. In the swamp forests, there are large areas between the rivers which can be made accessible for logging by digging canals through them from the rivers. The Forest Service proposes to provide access to these areas by locating and building the necessary main canals and by constructing and clearing main waterways; private loggers operating in the area would be expected to clear and dam the minor creeks and to build small feeder canals as they do at present from the rivers. Similarly, in the dry land forest belt, the Forest Service proposes to open up the better timber stands by constructing main access roads from the head of navigation on the rivers; it would be left to the private loggers to construct all necessary branch and spur roads leading from the main roads. In our judgment, these forest access projects have great merit. By opening up large new areas to logging operations, they will make possible a substantially larger and steadier flow of logs to the wood products industries; they should also result in substantial economies to the loggers. Accordingly, we have recommended an allocation of Sf. 2.67 million of program funds to these projects, to be supplemented, if possible, by an additional allocation of Sf. 400,000 from the Supplementary Program.

(iii) The other forestry projects, although we regard them as important, require relatively small investment. They include the creation of a *Logging Engineering* staff in the Forest Service, the formulation and execution of a program of *Technical Research* and of *Market Research and Trade Promotion, Reforestation and Management Plans*. These projects are described in detail in Technical Appendix 2. We recommend that, in the aggregate, they receive an allocation of Sf. 1.37 million of program

funds and, if possible, Sf. 600,000 from the Supplementary Program.

(iv) As already noted, the Mission is convinced that there are substantial opportunities for Surinam to increase very considerably its production and exports of wood products, particularly in the form of sawn lumber, plywood and veneer, and fibreboard. This will, however, require large private investment in the modernization and expansion of both logging operations and the wood products industries. We estimate that private capital requirements for this purpose, over the period of the program, may come to around Sf. 12.5 million. Because we believe that it is important to Surinam to encourage private investment of this magnitude in the forestry sector, we have recommended that Sf. 4 million of program funds be reserved for "Support of Private Enterprise"; as already noted, this fund is intended primarily to help in financing the logging and wood products industries. Should private investment in the forestry sector prove adequate, the fund could, of course, be diverted to other industries or allocated to other purposes.

(v) As shown in Technical Appendix 2, the Mission estimates that, if the recommended forestry program is carried out and the requisite private investment in forest industries is forthcoming, the value of Surinam's timber products is likely to increase threefold over the 1950 level, from Sf. 4 million to over Sf. 13 million by the end of the program, a rise of more than Sf. 9 million. Included in this estimated increase are additional exports of something over Sf. 7 million, which would bring the total value of timber product exports during the last year of the program to about Sf. 10 million, as against approximately Sf. 2.5 million in 1950.

4. THE TRANSPORT SECTOR

As shown in detail in Technical Appendix 5, Surinam's existing transport facilities are fairly adequate for the present volume of traffic in the narrow sense that the natural network of navigable rivers, supplemented by some main roads, gives access to all the main economic zones now under exploitation. However, many of the facilities are in poor condition or of obsolete character, resulting in excessive freight rates. Prompt improvement and expansion of the transport system appears, therefore, to be an urgent need, both to permit the present volume of traffic to be moved at more reasonable cost and to take care of the greatly increased traffic anticipated as a result of the Ten Year Program. There is also need to provide some new facilities designed to link together dispersed productive regions and to remove them from their present isolation. The transport projects included within the recommended investment program to accomplish these objectives are the following:

(i) *Road Transport.* The major investment proposed by the Government in the transport sector is for the improvement of existing local roads, particularly the reconditioning of the Paranam-Domburg road (42 km.), the provision of better surfacing and drainage for certain local stretches (totalling 188 km.) of the main roads which serve the Commewijne, Saramacca, Coppename, and Nickerie districts, and the improvement of the entire mesh of country roads (totalling 204 km.) in the agricultural areas around Paramaribo. The roads to be improved traverse major productive areas from which Surinam gets the bulk of its food for domestic consumption and export. Better farm-to-market roads in general will enable a larger volume of goods to be moved more

efficiently and at lower cost, and improvement of the Paranam-Domburg road in particular will facilitate the bauxite mining operations near Paranam, besides benefiting the farmers in the area. An additional advantage of the project is that it should result in a substantial reduction of road maintenance costs. We have accordingly included in our recommended program an allocation of Sf. 7.15 million for carrying out the entire road improvement project. This proposed allocation is somewhat less than the cost of the project as estimated by the Government (Sf. 7.46 million). The reduction has been made for technical reasons explained in Technical Appendix 5.

We have also included in the recommended program an allocation of Sf. 2.8 million for the completion of an East-West trunk highway running all the way from Paramaribo, via Coronie and Wageningen, to Nickerie. Much of the route already exists; its completion requires only the construction of a 20-km. stretch from Garnizoenspad to the Saramacca River, the acquisition of a car ferry and the installation of ferry facilities at Coppename Point, and the construction of a new 68-km. road from Coronie, via Wageningen, to Nickerie. The Garnizoenspad-Saramacca connection is desirable in and of itself as a penetration road to open up new farming areas. The Coppename car ferry project is also of high priority since this relatively small investment will for the first time permit through motor traffic from Paramaribo as far west as Coronie. The extension of the highway from Coronie to Nickerie, via Wageningen, is not of equal economic urgency since the immediate traffic potential is not heavy; presumably for this reason it was not included in the provisional program. We recommend, however, that the project be carried out because of the stimulus which we believe it would give to the development of the entire

western coastal region of the country. Although impossible to measure, we are convinced that the existing isolation of this region acts as a serious deterrent to the realization of its substantial productive potentialities.

(ii) *Inland Waterways.* The provisional program includes two projects for improving the inland waterways system. The first is to deepen and widen the Saramacca Canal and enlarge the locks; the second is to clear the Arrawara Creek of the fallen trees and logs which presently clog it and perhaps to widen and deepen it at certain points. For reasons pointed out in Technical Appendix 5, we regard both projects as essential and as fully warranting the expenditure (estimated at Sf. 1 million, of which Sf. 0.1 million would come from the Prosperity Fund) necessary to carry them out.

We recommend a third inland waterway project which was not included in the provisional program, namely, the expansion and improvement of the river-coastal fleet of the state-owned Surinam Navigation Company (SMS). This expansion is necessary in view of the increased production expected to result from the Ten Year Program. Moreover, SMS's present barges are small and slow. After the Arrawara Creek and Saramacca Canal have been improved, it would be desirable for the Company to use larger craft capable of operating at lower cost. For SMS to be in a position to purchase the new craft, however, the Government will either have to make the Company a loan or provide it with additional equity capital. We have included an allocation of Sf. 750,000 in our recommended program for this purpose.

(iii) *Railroad Re-equipment.* Surinam's single railroad, the state-owned line running from Paramaribo to Kabel (133 km.), is of very limited utility. It carries little

freight and few passengers, its equipment is very antiquated, and its operating revenues amount to only 40-50% of its operating costs, with resulting annual operating deficits of Sf. 300,000 to 400,000, apart from additional deficits attributable to the use of the Beekhuizen works for the repair of railway rolling stock. The railroad is not at present an important transport facility, but it may become very significant if the proposed hydroelectric project at Brokopondo materializes. If the Brokopondo project does not go forward, expenditures on the railroad should be kept to a minimum pending its ultimate replacement by a highway utilizing the same right of way. If, on the other hand, the Brokopondo project does materialize, the railroad should be re-equipped by replacing the 50-year-old woodburning steam locomotives now in use by a few diesel-electric engines. Although this project does not appear in the provisional program, we have included in our recommended allocation a contingent item of Sf. 750,000 for the proposed re-equipment.

(iv) *Port Installations.* The existing port facilities at Paramaribo, the only general cargo port of any consequence, are inefficient and inadequate. With any large increase in traffic, such as the Ten Year Program contemplates, they would soon become seriously congested. Accordingly, the Government proposes, as part of the Program, to construct and equip new piers, warehouses, and sheds on the industrial waterfront at Paramaribo which would replace the present installations on the commercial waterfront further downstream. Compared with the existing port, the proposed new installations would be able to load and discharge more goods more rapidly and would have several times more storage capacity.

Two different plans have been drawn up for the new port. One provides for the construction of piers large and strong enough to bear warehouses; the other provides for smaller, lighter piers serving warehouses ashore. Although the first plan would permit of faster vessel turnaround, it would involve an investment of Sf. 6.1 million as against Sf. 3.5 million for the smaller project. In the opinion of the Mission, traffic requirements have not yet been studied thoroughly enough to permit the conclusion that the advantages of the first project justify its additional cost. Accordingly, we have proposed a firm allocation of only Sf. 3.5 million for the new port (including Sf. 1.25 million expected to be available from the Prosperity Fund) but have suggested that an additional Sf. 2.6 million might be made available from the Supplementary Program if public revenues permit and if further study demonstrates that the larger project should be carried out.

(v) *Airfield.* The provisional program includes a project to construct a new state-owned international airfield at Zorg en Hoop on the outskirts of Paramaribo to replace the Zanderij field which is located about 50 km. south of the town and is owned by a Surinam subsidiary of Pan-American Airways (PAA). Although Zanderij is not in first-class shape, particularly for handling the DC-6s operated by KLM, and is an hour's drive from Paramaribo, the Mission is convinced that an investment of roughly Sf. 3 million to construct a new airfield would not be economically justifiable. It recommends, instead, that the Government take whatever action may be necessary to assure that the condition of Zanderij is improved sufficiently to handle DC-6s properly. It has been argued that PAA is under obligation, by the terms of its concession, to undertake this work at its own expense; it may

do so voluntarily in any event, since it is reported that PAA plans itself to operate DC-6s in and out of Zanderij in the next few years. Even if it should prove necessary for the Government to exercise its right, reserved in the concession, to acquire Zanderij from PAA and improve it as a public property, the cost should not be more than half of a new airfield. We have accordingly not made any provision in our recommended program for Zorg en Hoop; we have, however, included a contingent item of Sf. 1.5 million for the acquisition and improvement of Zanderij, but we recommend that this course be followed only if repair of the field cannot be assured by any other means.

(vi) *Airstrips*. Private Dutch interests are prepared to operate a charter air service within Surinam, utilizing initially small two- or three-passenger planes, provided the Government constructs a network of minor airstrips, estimated to cost a total of only Sf. 100,000. Since the proposed air service would meet an acute need for a means of fast travel and rush freight, we regard the project as being of a priority nature and recommend that it be pushed forward promptly.

(vii) *Construction Equipment and Machine Tools*. The Government-owned Beekhuizen Works operates as a central pool of construction equipment for all public works projects and also as a central repair shop. The provisional program contemplates additions to this equipment pool to carry out the public works included in the transport section of the program. In estimating that Sf. 2 million will be required for this purpose, however, we believe that the Government did not make adequate allowance for the availability of the equipment already in the pool and may have envisaged a larger civil works program than is actually likely to be undertaken. We

estimate that the additional construction equipment required for the transport projects may not cost in excess of Sf. 1 million and have made provision accordingly in our recommended program.²

Because of the additional maintenance demands which will result from the Ten Year Program, we recommend an allocation of Sf. 400,000, not provided for in the provisional program, for new machine tools for the Beekhuizen repair shop.

(viii) *Telephones.* The Government telephone and telegraph bureau (LTT) has formulated a ten-year expansion program, providing for the extension of the existing telephone lines and cables of the Paramaribo district into further areas of the rural hinterland, and for building some new lines between outlying communities such as Nickerie-Wageningen, Coronie-Coppename Point, and Moengo-Albina. This program is intended as a first step toward substituting a nation-wide network of land lines for the present system of radio-telephone circuits for trunk calls. As yet, however, there has been no thorough technical survey of the kind needed to establish the economic merit of the proposed program; it is at least arguable that all of the essential objectives of the project might be realizable by much less costly means. In the provisional program presented to the Mission by the Planning Bureau, an allocation of Sf. 217,000 was proposed for telephones, a cut of two thirds from the investment suggested by LTT; no definite project for the investment of this Sf. 217,000 has, however, been worked out as yet. In the circumstances, while the Mission has

²This estimate does not include equipment for the new port which will presumably be constructed by a private contractor with his own equipment, nor equipment for Zorg en Hoop.

included in its recommended program a tentative allocation in the amount proposed by the Planning Bureau, it believes that the whole problem needs further study by the Government before any final decision is reached.

5. THE SOCIAL SECTOR

(i) *Housing.* There will be substantial need for new housing during the period of the program. Included within the anticipated increase in the over-all population is an estimated growth in the population of Paramaribo of roughly 32,000. Assuming an average occupancy of five persons per dwelling unit, 6,400 additional dwellings will be needed in Paramaribo to take care of this increase. Moreover, another 1,000 to 1,500 dwellings are likely to be needed by 1962 to replace existing houses which will have to be abandoned by reason of obsolescence. Even if the average cost per dwelling could be reduced to a level as low as Sf. 3,000 per unit through employment of more locally manufactured construction materials and the use of the latest building techniques, additional urban housing requirements over the period of the program are likely to run as high as Sf. 22-24 million. In addition, with the growth of towns and villages in the district areas, at least some investment will probably be required in district housing projects.

Private capital may reasonably be expected to finance a large part of the necessary housing investment; precisely how much private housing will be constructed, however, is impossible to estimate with any degree of precision. Because of the resulting uncertainty as to the extent of the demand for public funds for housing purposes, and because public investment in this field can easily, and should appropriately, be expanded or con-

tracted depending upon the availability of budgetary funds, we have recommended that provision for housing be made in the Supplementary rather than in the Ten Year Program; within the Supplementary Program, however, we believe that housing should have high priority. If public funds are available, an investment in housing of up to Sf. 15 million (the precise amount depending upon the extent of private house construction) would appear to be justified.

(ii) *Health*. The public health services are of high quality, particularly in Paramaribo. They are seriously handicapped, however, by the fact that the only public general hospital in the country consists of old and obsolete pavilions which are laid out inefficiently and are permanently overcrowded. There is no room for expansion of the present facilities to take care of the additional load which may be expected with the anticipated increase in the urban population. The Government accordingly proposes to construct a new general hospital at an estimated cost of Sf. 5 million, which, as we understand it, is to be in addition to a contribution of Sf. 1.25 million expected from the Prosperity Fund for a tuberculosis wing for the hospital. The Mission believes that the project is important and should be carried out; it seems to us probable, however, that the estimated investment is unnecessarily high and that it could be substantially reduced without sacrificing any essential facilities. We understand that the Government has requested the help of the Pan American Sanitary Bureau in reviewing and, if appropriate, revising existing plans for the hospital. We believe that a review of this kind is essential before the project is carried further. Pending the results of such review, we have suggested a tentative allocation of Sf.

3.5 million for the hospital, in addition to the Sf. 1.25 million expected from the Prosperity Fund.

The other health projects included in the provisional program have been included in our recommended program without change, except that the proposals for an institute of tropical diseases and for a preventorium for lepers, which we were informed have a somewhat lower priority than the others, have been put into the Supplementary rather than into the Ten Year Program.

(iii) *Education and General Welfare.* Although the level of primary education is high, the schools are badly overcrowded. It is estimated that, in the districts, there are about 10,000 children of school age who live in the neighborhood of existing schools but are not attending either because the schools have no facilities for them, or because they are working or otherwise unable to attend. The present facilities must obviously be increased if the school system is to continue to function at its present level of effectiveness for the increased number of children who will come of school age during the period of the program. We estimate that, by the end of the program, more than 110 new classrooms will be needed for the Paramaribo primary schools and more than 250 new classrooms for the district primary schools. In addition, because of the anticipated population increase, perhaps 40 new classrooms will be required for the U.L.O., M.U.L.O. and high schools. On the basis of a cost of Sf. 7,000 per classroom in Paramaribo and Sf. 6,000 per classroom in the districts (excluding teachers' housing), plus Sf. 2,500 per classroom for equipment, the total investment required for all these new facilities would be at least Sf. 3.6 million. Housing for the necessary additional district teachers may require the investment of

another Sf. 1 million. The provisional program provided for an allocation of only Sf. 2,525,000 for new schools. In view of the extent of the requirements, we believe that this allocation is too low; in our recommended program we have provided for an allocation of Sf. 3.5 million out of program funds, to be supplemented if possible by an additional Sf. 1 million out of the Supplementary Program.

We regard the modernization and expansion of the technical school as perhaps the single most important educational need (see Chapter VI). Accordingly, we have increased the proposed allocation for that purpose from Sf. 250,000 to Sf. 350,000. Our recommended allocation for the normal school is the same as that contained in the provisional program; the proposed domestic science school investment, on the other hand, appears of somewhat lower priority and it has therefore been reduced from Sf. 125,000 to Sf. 100,000 and put into the Supplementary rather than the Ten Year Program.

We have included in our recommended allocations, without change, all the proposed general welfare projects included in the provisional program. These projects, all of which are small, appear to have been well selected.

(iv) *Water Supply and Town Improvement.* Paramaribo has a good water supply system, as is shown by the low rate of incidence of intestinal diseases in the city. However, the size of the city is outgrowing the capacity of its water works and water is already short in the dry season. The villages of Nickerie, Coronie, and Commewijne have no water supply system at all. Adequate though rudimentary installations in these last three communities would cost approximately Sf. 920,000, while expansion of the Paramaribo facilities would cost about

Sf. 1.35 million. We regard these projects as important and have accordingly included them in our recommended allocations.

On the other hand, we believe that the proposal in the provisional program to invest Sf. 9 million for other town improvements in Paramaribo is too ambitious. Paramaribo does need to pave more of its streets, to provide the older parts of the city with adequate sewers, and to improve the drainage of the canals and ditches which serve as outlets to the sewerage system. However, satisfaction of all these needs would, in our judgment, divert an undue amount of resources from other economic and social projects which we regard as having a somewhat higher priority. We recommend, therefore, that only the most urgent town improvements be undertaken and have suggested an allocation for this purpose of Sf. 3.5 million. Similarly, in the case of Nickerie, we suggest that the proposal to invest Sf. 900,000 in development of the town be revised so as to provide for an expenditure of not in excess of Sf. 500,000.

We have included in our recommended program an allocation for the full estimated cost (Sf. 450,000) of the new market which the Government plans to construct in Paramaribo. Since the present market is old, crowded and inadequately equipped, its replacement appears to be necessary, particularly in view of the increase in business which may be expected from the anticipated rise in population.

D. RATE OF DISBURSEMENT AND FOREIGN EXCHANGE REQUIREMENTS

As already indicated, we believe that the Ten Year and Supplementary Programs should be pushed ahead

as rapidly as possible. The rate of progress will depend primarily on the amount of funds available in any particular year, the time required to formulate definitive plans for specific projects included within the program, and the availability of sufficient technical skills to carry out those projects.

During the first year of the program, it is unlikely that disbursements could exceed around Sf. 13 million, because of the state of project preparation; perhaps Sf. 3 million of this amount might come from the Prosperity Fund. Major expenditures would presumably be in connection with the land improvement program, the Wageningen project, the construction of farm-to-market roads and the first stages of the forestry and social investment programs. In the following four years, assuming that sufficient progress has been made in the formulation of projects and no serious labor shortage is encountered, it might well prove desirable to step up the rate of investment to as much as Sf. 15 million per year. However, since budgetary resources available for development are likely to be larger in the latter part of the program period than in the earlier years, achievement of this rate of investment in 1953-57 will probably require that a substantial part of whatever external financing is secured for the program be available for disbursement during the first five years.

Because of the preliminary state of the planning for many of the projects, it is not possible to make any accurate forecast as to how the estimated cost of the program may be divided as between foreign exchange and Surinam guilder requirements. Very rough and tentative calculations would indicate, however, that for planning purposes it might reasonably be assumed that the

local currency costs would amount to around 60%, and direct foreign exchange costs to around 40%, of the total. The indirect foreign exchange requirements of the program will undoubtedly be much greater than this assumed division would indicate, since a sizable part of all wages represents a demand for imported consumer goods.

E. INVESTMENT IN THE PRIVATE SECTOR

During the last three years, the bauxite mining companies have undertaken a program of capital expansion which should enable them, without any further major investment, to produce considerably in excess of the assumed level of three million tons during the program period. These companies should certainly be in a position to finance out of their own resources their requirements for maintenance, replacement and any further plant expansion which may be necessary.

In the fields of trade, finance and the services generally, the capital requirements for expansion are also likely to be low. Existing facilities appear to be adequate, in general, to serve the expanded population expected by the end of the program period. In these fields, as in bauxite, it is reasonable to expect that whatever capital expansion takes place will be largely financed out of earnings.

New private investment in agriculture, manufacturing and housing is likely to present a greater problem. Monetary savings of the farmers are not now sufficient to meet their needs; for this reason, the Ten Year Program recommended by the Mission contains an allocation of Sf. 3 million for agricultural credit. Some private investment in agriculture will also take place as farmers, by their own labor, improve their properties; improve-

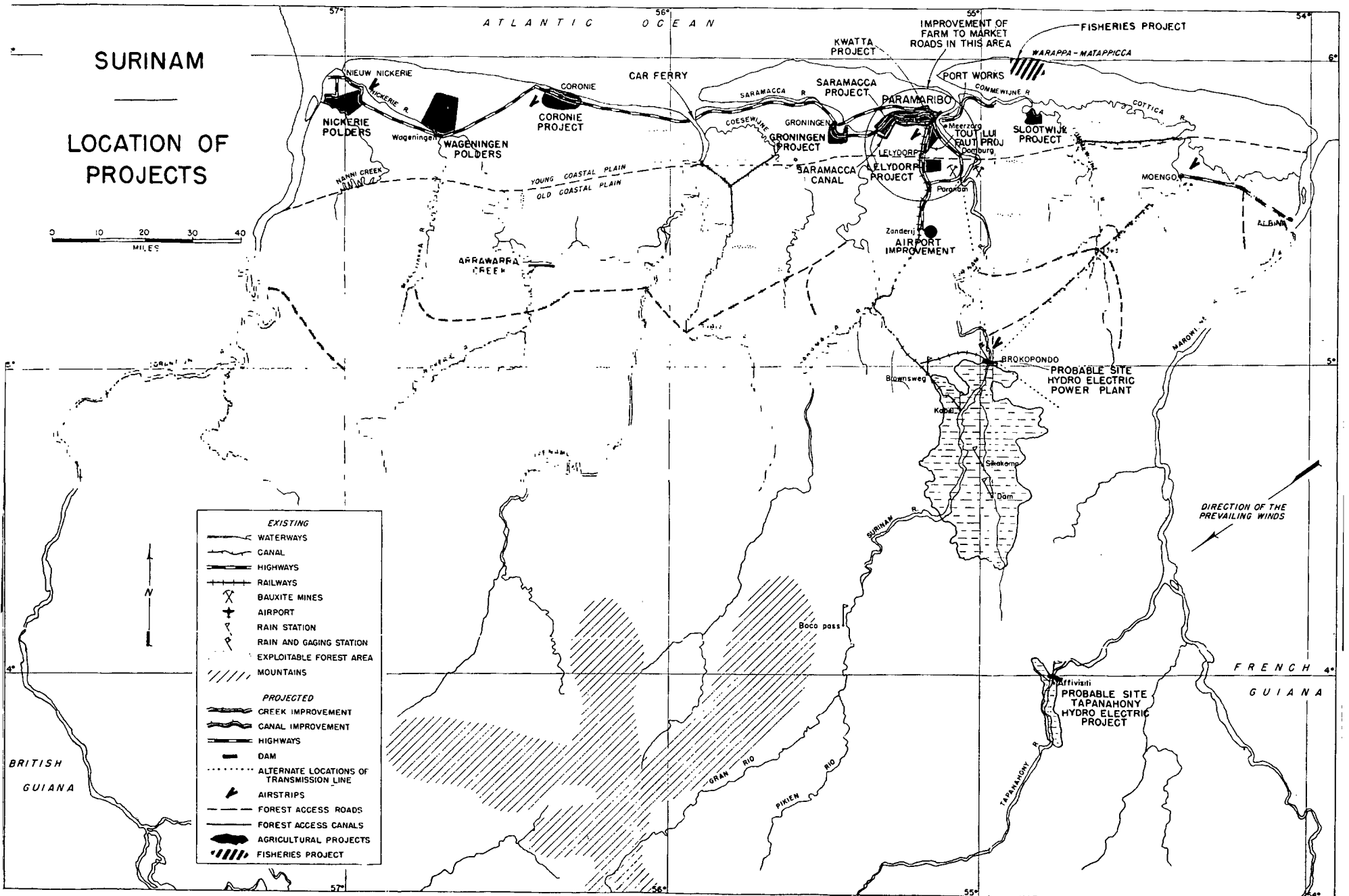
ments of this character, which we estimate may be valued at Sf. 2-3 million per year, are not reflected in Surinam's statistics or in the national accounts as presented in this Report. The large manufacturing firms may be able to bring in new capital from abroad, and it is likely that credit to the extent of Sf. 400,000-600,000 per year may be available from the *Herstelbank* and other banks. Moreover, the program recommended by the Mission includes Sf. 4 million for the support of private enterprise. Nonetheless, because of the low level of personal savings and corporate earnings (except for the bauxite and wood products industries), we believe that a capital shortage may develop; in our judgment, it may prove to be particularly acute in the field of housing. In this event, provision will have to be made for additional credit to the private sector, either through revision of the Ten Year Program or of the Supplementary Program, or through use of any budgetary surplus which may exist after the Government's contribution to both programs has been made.

SURINAM

LOCATION OF PROJECTS



<i>EXISTING</i>	
	WATERWAYS
	CANAL
	HIGHWAYS
	RAILWAYS
	BAUXITE MINES
	AIRPORT
	RAIN AND GAGING STATION
	EXPLOITABLE FOREST AREA
	MOUNTAINS
<i>PROJECTED</i>	
	CREEK IMPROVEMENT
	CANAL IMPROVEMENT
	HIGHWAYS
	DAM
	ALTERNATE LOCATIONS OF TRANSMISSION LINE
	AIRSTRIPS
	FOREST ACCESS ROADS
	FOREST ACCESS CANALS
	AGRICULTURAL PROJECTS
	FISHERIES PROJECT



DIRECTION OF THE PREVAILING WINDS

FRENCH
GUIANA

CHAPTER IV

ADMINISTRATION AND FINANCING OF THE PROGRAM

A. PROPOSAL FOR A DEVELOPMENT BOARD

COMPETENT, NONPARTISAN administration is essential to the success of any long-term public investment program. To the extent possible, investment decisions should be made on the basis of an objective, long-term view of the best interests of the country as a whole, free from the influence of current political pressures.

To achieve this objective, we recommend that, once agreement has been reached between the Netherlands and Surinam Governments as to the size, objectives and general content of the Ten Year Program, administration of the program be entrusted to a Development Board, to be created jointly by, and to be responsible jointly to, the two Governments. The Board should, we suggest, be small in size and composed of the most highly qualified men available.

The precise form, responsibilities and methods of operation of the proposed Board would, of course, have to be the subject of a detailed agreement between the Netherlands and Surinam. On this matter, the only suggestions which the Mission feels qualified to offer are the following:

1. The Board should have its main headquarters in Paramaribo.
2. The Board should have full authority to make all investment decisions required to carry out the program

as agreed to by the two Governments, and should also have a limited discretionary authority to make minor changes in the program.

3. The Board should not be authorized to make major changes in the agreed program. It should, however, be responsible for proposing to the two Governments for their study and decision any major changes which it believes to be necessary or desirable.

4. There should be a periodic (perhaps annual) review of the work of the Board by the two Governments jointly.

5. The coordinating and planning functions at present discharged by the Surinam Planning Bureau, as well as the assets and functions of the Prosperity Fund, should be transferred to the new Board.

6. The Board should not be responsible for carrying out development projects included within the Ten Year Program. Its functions should be confined to planning; making investment allocations within the limits of its authority; deciding upon the appropriate agency to be entrusted with the execution of particular projects; and supervising the disbursement and utilization of program funds. The actual work of executing the projects should be performed either by the appropriate government department or agency, by private firms operating under contract with the Government, or by organizations such as the Stichting which might, in special cases such as Wageningen, operate under direct arrangements with the Board.

B. FINANCIAL ARRANGEMENTS

As already noted, it is anticipated that the funds for the public investment program will come from three sources: (1) budgetary contributions from the Surinam

Government totalling at least Sf. 40 million; (2) a loan from the Netherlands in the amount of Sf. 40 million; and (3) additional external financing in the amount of perhaps Sf. 20 million.

For the proposed Development Board to operate effectively, it must have assurance at least as to the minimum amount of funds which will be at its disposal to carry out the investment program and as to the rate at which such funds will be forthcoming. The Mission believes that it is essential, therefore, that, before the plan is put into effect, the Surinam Government enter into a firm commitment to make available to the Development Board a specified amount each year from budgetary resources. Similarly, before the program becomes effective, an understanding should be reached concerning the proposed external financing, the proceeds of which should also be put at the disposal of the Development Board for investment in projects included within the program. As we have already indicated, it would, in our judgment, be desirable if arrangements could be made for at least a substantial part of the external financing to be available for disbursement during the first half of the program period. Such disbursements, at whatever rate might be agreed upon, would presumably be conditional upon satisfactory progress by the Development Board in the discharge of its responsibilities.

Should the Surinam Government find itself in a position to finance all or part of the Supplementary Program, we believe that it would be desirable (although not essential) that the funds for this purpose should also be handled through the medium of the Development Board. Even if this procedure is not followed, the Development Board should be consulted before decision on the investment of such supplementary funds is made.

CHAPTER V

ANTICIPATED RESULTS OF THE PROGRAM

IT IS OBVIOUSLY impossible to forecast with any degree of accuracy the course of events in any country over as long a period as 10 years. The actual economic history of Surinam during the next decade will be determined, not simply by the type of development program which may be adopted, but by a multitude of factors and individual decisions which cannot at present be predicted. Nonetheless, there would be little justification for the adoption of the type of program outlined in Chapter III unless economic projections, on the basis of the best hypotheses now available, indicate that there is at least a reasonable likelihood that the program will achieve its objectives. This chapter of the Report is accordingly devoted to a brief discussion of the economic and financial developments which might logically be expected to occur during the program period.

A. PRODUCTION AND NATIONAL INCOME

It seems reasonable to expect that the production of goods will increase very substantially over the next 10 years. As a result of the reconditioning of existing farm lands, the opening up of new lands and the execution of the cattle-breeding and fisheries projects, the value of the annual output of food and other agricultural products should, we believe, grow by perhaps Sf. 18 million or

more over the 1950 level.¹ An additional Sf. 2 million annual increase in output should come from tree crops already planted but which were not in production in 1950. The proposed forestry investment by the Government, coupled with the anticipated private investment in the logging and wood products industries, may reasonably be expected to result in an increase in output in this field of about Sf. 9 million over the 1950 level.

Bauxite production has already increased substantially since 1950. Bauxite exports in that year amounted to 2.1 million tons, with a value of Sf. 25.6 million. As already noted, the 1951 production was estimated at 2.6 million tons at the time of the Mission's visit, and in 1952 and the years immediately following, we believe that production will come to at least three million tons and may substantially exceed that figure. Even on the basis of three million tons, without any change in price, the annual value of bauxite production would be Sf. 11.3 million above the 1950 value; in fact, the increase in value may be considerably greater.

There will almost certainly be at least some increase in industrial production in addition to the forest industries already mentioned; we believe this expansion is likely to be largely in the field of agricultural processing. The amount of the increase is, of course, very difficult to predict because it depends on so many individual investment decisions. For planning purposes, however, it seems reasonable to assume that the growth in the annual value of industrial production over 1950 may be of the magnitude of around Sf. 4-6 million. Similarly, there should be, we estimate, an increase in the annual output

¹The increases in income expected to result from the increases in gross output values cited here and below are set forth on p. 78.

of construction materials (other than timber products) and of the construction trade amounting to anywhere from Sf. 2-4 million.

On the basis of these rough estimates, which we believe to be generally conservative, the value of goods produced should, by the end of the program, have increased by around Sf. 45-50 million above the 1950 level. This is probably equivalent to an increase in income by about Sf. 30-35 million.²

In addition, of course, there will be an expansion in services. The Government will need additional personnel for the new schools and medical facilities which are projected, as well as to administer other expanded services provided for in the development program. As explained in more detail below, these additional services may represent an increase in national income of roughly Sf. 4-5 million. In addition, it may safely be assumed that the growth in income from services in other sectors, such as trade, banking, the professions, utilities, rentals and transport, will be at least proportional to the growth in the production of goods. Since services in these sectors accounted for income of around Sf. 18 million in 1950, we estimate that they may account for income of around Sf. 28 million by the end of the program.

As already shown in Table VI, the gross national

²The spread between the figures for the value of goods produced and the income accrued to residents will probably be larger in 1962 than in 1950. This is due principally to anticipated changes in the agricultural and mining sectors. In 1950, value added in agriculture was quite close to value of product. The transfers of profits and interest payments implied in the agricultural sector of the development program would broaden the gap. In mining, the expected reduction in unit costs of production, the increase in transfers of profits abroad, and the reduction in local investment activities would also tend to increase the spread between value of product and value added.

product in 1950 was around Sf. 96 million. On the basis of the projections we have made, we believe that it is reasonable to expect that, by the end of the program, the gross national product will increase by about Sf. 45-50 million to reach a level of roughly Sf. 140-145 million. This estimate is, in the nature of things, conjectural; we have computed it, however, on what we believe to be conservative assumptions.

This anticipated increase in the gross national product, if realized, would be more than sufficient to enable Surinam to achieve the objectives of its development program as set forth in Chapter II. It would represent an increase in per capita gross income from the 1950 level of roughly Sf. 500 to somewhere between Sf. 540 and Sf. 555 and would imply not only maintenance of the present level of per capita consumption expenditures but a probable increase in that level of about 1% per year. Such a rate of increase is, in our judgment, well within Surinam's capacity to achieve.

B. INVESTMENT

Gross investment is not expected to exceed an average of Sf. 18-22 million in the period 1950-62. Of this total, about Sf. 9-10 million will presumably be applied to maintenance and depreciation. On this basis, we estimate that, by 1962, the net value of the capital stock will be roughly Sf. 475 million.

Under these conditions, it can be expected that, after the end of the program period, depreciation would be roughly Sf. 11.5 million per year, and capital requirements to maintain the new population at the level of income then obtaining would be about Sf. 11.5-13.5 million, assuming continuance of the present rate of population

growth. A gross capital formation of roughly Sf. 23-24 million would thus appear sufficient to maintain per capita expenditures at their new high level.³

In all probability, not all of this investment will have to be met by Surinam. New net capital inflows, including the maintenance of a military establishment by the Netherlands, might reasonably be expected to decrease the amount to be met out of local savings to Sf. 21-22 million at most.

As already noted, local savings were about Sf. 8.5 million in 1950. In order to meet anticipated requirements by 1962, they would have to grow by roughly Sf. 12.5-13.5 million. The Government is expected to provide Sf. 7-8 million of this margin out of taxes. The private sector will therefore have to save about Sf. 5 million out of the additional income of roughly Sf. 35 million likely to be available to it. This is a low margin of savings. It is all the more possible of realization since much of the additional income is likely to accrue to the classes of the population which in the past have shown the greatest tendency to save, and since higher per capita incomes may substantially affect the savings habits of the other groups.

C. BUDGETARY SITUATION

In 1950, the Government's current revenues amounted to Sf. 26.83 million and its current expenditures to Sf.

³The explanation for the difference between the estimated investment requirement of Sf. 23-24 million mentioned above and the figures of Sf. 21-22 million mentioned in Chapter II on p. 28 is that, in Chapter II, we estimated the requirement on the basis of a maintenance of the present per capita consumption level, while in this Chapter we forecast an increase in that level, thus requiring a correspondingly higher level of investment.

24.45 million (see Table III). There was thus Sf. 2.38 million available from budgetary sources for extraordinary expenditures. As shown by the breakdown which appears in the footnote below,⁴ Sf. 8.6 million of the 1950 revenues (or about 32% of the total revenues) came from bauxite mining and transportation; the income and excess profits taxes on the bauxite mining companies were based on their 1949 production of 2.1 million tons, valued at Sf. 25.4 million. On the basis of bauxite production of three million tons in 1952 and succeeding years, we estimate that Government revenues from bauxite alone should increase by something in the neighborhood of from Sf. 5-8 million in 1953 and subsequent years. We have made this estimate on the assumption that a 50% increase in production is likely to result in a considerably greater percentage increase in the profits of the mining companies, with the consequence that their income and excess profits tax payments may more than double. We assume that other tax receipts depending directly on bauxite production will increase directly in proportion to the increase in output.

Other Government revenues, amounting to Sf. 18.2

⁴Government receipts in 1950 may be classified as follows (in millions of Surinam Guilders):

<i>Bauxite</i>		<i>Other Sectors</i>	
Income Tax	3.2	Income Tax	2.3
Excess Profits Tax	1.9	Import Duties	6.9
Royalty	1.8	Other Indirect	2.3
Harbors	1.0	Work Beekhuizen	0.5
Rivers—Pilot Fee	0.3	Pensions	0.4
Land Concession	0.4	Others	3.0
		Stocks	2.8
Sub Total	8.6		
		Sub-Total	18.2
		<i>Grand Total</i>	26.8

million in 1950, are likely to increase more slowly. However, with the anticipated expansion in production, and as a result of the efforts being made to increase the coverage of the income tax, we think it may conservatively be estimated that these other revenues will gradually grow until, by the end of the program, they should be at least Sf. 5 million above the 1950 level.

There is no reason to believe that current expenditures of the Government need expand at the same rate as the estimated increase in Government receipts. The administration of Surinam is large relative to the size of the present population;⁵ it should be able, without any significant increase in personnel except in a few fields, to serve the needs of the expanded population expected by the end of the program period. There will, of course, be need for more teachers and more medical personnel, the mining bureau and the agricultural and forestry services will have to be expanded, and, as the number of public works increases, the costs of maintenance will grow. In addition, assuming foreign borrowing of Sf. 60 million for the public investment program, average annual interest charges on these loans may amount to around Sf. 1.75 million. Taking all these factors into consideration, we estimate that current expenditures may grow from the 1950 level of Sf. 24.45 million to around Sf. 30-32 million by the end of the program.

It appears, therefore, that the Surinam Government should have no difficulty in making a yearly contribution of Sf. 4 million to the Ten Year Program from budgetary

⁵Government expenditures (excluding those financed by the Netherlands Government) represented more than 30% of the gross national product in 1950. The ratio prevailing in most South American countries is closer to 20%.

sources, that it may well be able to carry out the entire Supplementary Program, and that, by the end of the program period, it should be able to continue to balance its budget and still maintain a rate of public capital expenditure of perhaps Sf. 7-8 million. Obviously, the major determining factor will be the actual course of bauxite production. As already indicated, however, we believe that our estimate of three million tons per year is a minimum figure; if, as seems likely, production rises considerably above this figure, the Government's budgetary position will be correspondingly strengthened. On the other hand, if for any reason bauxite production should decline below the three million ton figure, the Government might find itself in a financial squeeze which would require revision of the investment program.

D. BALANCE OF PAYMENTS

As shown in Table IV, Surinam had a current deficit in its balance of payments in 1950 of Sf. 14.3 million, of which perhaps Sf. 3 million represented abnormal inventory accumulations due to the Korean war.

Substantially increased exports receipts may be expected during the program period. Here, again, bauxite plays a dominant role. On the basis of production and exports of three million tons in 1952 and succeeding years, and no change in price, annual trade receipts should increase by Sf. 12 million above the 1950 level by reason of bauxite alone. In addition, the estimated increase in agricultural production of Sf. 20 million by the end of the program is likely to include, we believe, export goods to the value of perhaps Sf. 13 million. In the forestry sector, exports of lumber and wood products are estimated to increase by over Sf. 7 million. From these

major sectors alone, therefore, we anticipate an increase in current trade receipts, over the 1950 level, of perhaps Sf. 32 million by the end of the program period.

Import requirements will, we believe, grow more slowly. While the expansion in population and the anticipated increase in income, particularly in the low income category, will create a large additional demand for consumer goods, we believe that the potential pressure on consumer goods imports will be more than offset by the increased availability of domestically produced foods for local consumption and by the increase in savings of at least some elements of the population. This opinion is founded on our evaluation of the response of various racial groups to increases in income, and on our estimate of the relative changes in the economic importance of these racial groups in the future. On the basis of these factors, we estimate that the additional value of consumer goods imports at the end of the program may be around Sf. 10 million above the 1950 level. If the increase cannot be kept within these limits, it is probable that the additional drain on imports will be compensated by a larger availability of local agricultural products which could be marketed abroad. In any event, we believe that pressure on imports could be kept within manageable limits by controls, if necessary, without substantial adverse consequences.

The transfer of profits is likely to increase considerably, particularly if there is no need for further investment to expand bauxite production over the three million ton level expected in 1952. These transfers of profits, we estimate, may run about Sf. 5 million above the 1950 level. Additional invisible payments (including interest) may add another Sf. 3 million to the current payment re-

quirements. On the other hand, the requirement for capital goods imports is not likely, in our judgment, to exceed greatly the level reached in 1948-50. While total investment by 1962 may be much larger than in recent years, we believe that much of it will involve purchases of construction materials which by then may be produced locally. Furthermore, a much larger share of investment is likely to be applied to wages of construction workers. Altogether, then, current payments may increase by Sf. 18-20 million over 1950, as contrasted with an estimated increase in current receipts by at least Sf. 30 million.

If these estimates prove reasonably accurate—and they may prove too pessimistic if bauxite exports substantially exceed three million tons—the current account deficit, if any, in Surinam's balance of payments by the end of the program should be small. It seems reasonable to anticipate that any small current account deficit is likely to be covered by a net inflow of capital.

It has already been noted that most of Surinam's exports of bauxite are sold in the dollar area, while a large proportion of its imports come from the EPU area, particularly the Netherlands and the United Kingdom. Since there is no reason to expect any significant change in the direction of trade, Surinam should not be confronted with any problem of exchange convertibility. To the contrary, it should have a substantial trade surplus with the dollar area out of which it will have to finance a trade deficit with the rest of the world.

E. LABOR SUPPLY

In the absence of up-to-date and detailed statistics on manpower, any discussion of the problem of labor must

unfortunately be based on incomplete and inadequate information.

It has been estimated that in 1950 a little more than one half of the population of 195,000 belonged to the 14 to 54 age group which constitutes the potential labor force. Population actively employed in the districts appears to have been between 40,000 and 50,000 and in the town about 13,000 (excluding housewives and domestic servants).

There were wide differences between the potential and the actual labor force. In the districts perhaps 70% of the potential was actually working. This ratio can be considered high and it is doubtful that it can be increased. In Paramaribo, however, the labor statistics show less than 35% of the people in the active age group as actually working. This is largely explicable by the fact that most of the women are housewives or domestic servants and these groups are not included in the labor statistics. There were, however, about 3,000 to 5,000 adult males in Paramaribo who did not work, or who were only employed in odd jobs. It is because of the existence of this labor pool that it should be possible to carry out the construction works contemplated in the Ten Year Program without creating serious labor shortages in other activities.

It may fairly be expected that, from 1950 to 1962, the age group 14 to 54 may increase by around 25,000 people. Taking into account the present unemployment and underemployment, a maximum use of the manpower potential available might increase the availability of workers in 1962 by around 30,000.

A very rough estimate by the Mission of the probable labor requirements indicates that only 20,000-25,000 ad-

ditional workers may be needed by the end of the program period. We estimate that the various classifications of employment may need to be increased as follows: agriculture, 13,000-16,000; industry, trade and government, 6,000-8,000; mining, 400. Basic to these estimates are the following assumptions:

(1) That the mines will need new workers to handle a higher level of output, but perhaps less manpower for construction and other capital projects.

(2) That the Government will require an increase in staff by only about 300. The new staff members will presumably be highly skilled—such as doctors, agricultural specialists, mining and forest engineers and teachers.

(3) That the peak labor force required to implement the construction projects under the Ten Year Program will be about 3,000. Inasmuch as they will engage in projects now being carried out wholly or in part by the Government, the Prosperity Fund, or the Stichting, this will not be a net addition to the current requirements of construction workers.

(4) That while the forest products industry in Paramaribo may treble its production, it will not need to increase employment proportionally.

(5) That the additional services expected to be provided by trade and transport could be performed by increasing employment in this field by 20%.

The availability of labor for agricultural employment bears particularly careful scrutiny. It is usually reported that Surinam is short of agricultural labor and population, and that immigration will be needed to cope with this deficiency. It should be noted, however, that the actively employed agricultural population is estimated to increase by from 13,000-16,000 people, while the planned

increase in agricultural land is 26,000-29,000 hectares of which 7,000-10,000 hectares will be included in the Wageningen project. On the basis of these estimates, the increase in productivity of the small farmer required to cultivate the additional land which will be available to him should easily be capable of realization.

The major foreseeable difficulty is that, while the pressure on the manpower potential seems bound to increase in the districts, unemployment or underemployment seems likely to increase in Paramaribo. Most of the additional staff required by the Government will have to live in the districts, at least one half of the peak labor force required for the construction works included in the Ten Year Program will have to work outside of Paramaribo, and the increased manpower requirements in trade, transport and services will probably also originate primarily in the growing villages rather than in the town. However, given proper incentives, it is believed that many workers, or potential workers, in Paramaribo may well be willing to migrate towards the country. It is not expected that this population originating from the town will dedicate itself to agriculture, but the demand for labor in construction and mining, as well as in trade, transport, services, and similar activities in the new villages, may be sufficient to absorb all surpluses which develop. Recent migrations of a substantial number of Creole construction workers from Paramaribo to the Wageningen project and the bauxite mines at Moengo demonstrate that there are no basic obstacles to such a development.

Although, for the reasons given, we believe that the over-all supply of labor should be large enough for a development of the type contemplated in the Ten Year Pro-

gram, spot shortages may well occur in different sectors of the economy at various times during the program period. Even more serious, there will in all likelihood be severe shortages of skilled labor for jobs which require technical knowledge, or which involve the exercise of organizational or supervisory talents. It is therefore recommended that strenuous and prompt efforts be made to increase and improve the technical training program, and that, while this training program is being carried out, young Dutch technicians be encouraged to come to Surinam to provide the skills not yet present there in sufficient quantities.

CHAPTER VI

SUPPLEMENTARY MEASURES NECESSARY FOR SUCCESS OF THE PROGRAM

DURING ITS STAY in Surinam, the Mission concentrated its attention primarily on the proposed public investment program; it did not attempt to analyze in detail all the various governmental policies and practices which affect, directly or indirectly, the pace of Surinam's development. Nevertheless, since the success of any investment program must depend in large part on the effectiveness of governmental action in such fields as fiscal and monetary policy, exchange controls, vocational training, agricultural research and extension and the like, and upon the character of governmental regulation of private economic activities, we have felt it appropriate to set forth briefly in this concluding chapter a few major recommendations on these matters which we believe to be of substantial importance to the execution of the Ten Year Program. Other more detailed recommendations in various fields will be found in the Technical Appendices.

The general principle which has guided us in formulating the recommendations in this chapter is that government controls of all types should be avoided to the extent practicable and that the Government should seek to achieve its economic and financial objectives, not through direct intervention in the economic life of the country, but rather indirectly through the exercise of its

power over such matters as credit, banking, taxes and concessions.

A. FISCAL POLICY

So far as we could determine, the tax system of Surinam is well designed and, in comparison with most other underdeveloped countries, is well administered. Nonetheless, there is still room for considerable improvement. Income tax collection in the past has not been very effective; returns have been filed by only a small part of those with taxable incomes. We urge, therefore, that the Government push forward with its plan to tighten the tax administration.

We further recommend that, as a matter of general policy, all public expenditures during the period of the program be covered out of current revenues and external borrowing; the larger part of voluntary savings within Surinam should not be tapped for Government expenditures but should be left available for the private sector. There should also, of course, be no resort to note issues to finance public outlays, as has happened on occasion in the past.

We recommend that, shortly after the end of each year, the year-end cash position of the Treasury be published; changes in the cash position from the previous year should be reconciled with statements of actual Government revenues, expenditures and other financial operations during the year. Expenditures should be broken down not only as between ministries but also as between salaries, other current payments, expenditures for capital works and other types of transfers. Information of this type is essential for the formulation of proper economic and financial policies.

B. MONETARY POLICY AND BANKING FACILITIES

The Surinamsche Bank operates as a central bank, is by far the largest commercial bank in the country, and is the depository of most of the funds of the Foreign Exchange Board and of the Government. Its policy regarding credits, overdrafts and rediscounts determines to a large extent the fluctuations of the money supply, the liabilities of Surinam towards the EPU area, the volume of credit, and price levels in the country.

For all practical purposes, there is no limit on the expansion of the money supply by the Surinamsche Bank. Moreover, as long as the Surinamsche Bank is ready to increase its liabilities to the Nederlandsche Bank, and as long as the Nederlandsche Bank is ready to increase its advances, there is no effective check on the amount of commercial credit which can be extended to facilitate imports. Gold and bullion reserves against note issues by and deposits with the Surinamsche Bank are theoretically 30%. The mere fact that actual reserves are 50% of the current money supply indicates that the credit expansion potential is considerable. Furthermore, Surinam is a gold producer and the Surinamsche Bank can decide at any time to issue more notes in order to purchase additional gold and thus to increase its reserves.

In these circumstances, it is clear that the maintenance of monetary stability depends primarily upon decisions taken by the Surinamsche Bank. In our judgment, the present management of that Bank properly emphasizes the maintenance of a stable price level and the protection of foreign exchange reserves in formulating its operating policies. We believe that these should continue to be the major objectives of Surinam's monetary policy

and that the Government should give every possible support to the Surinamsche Bank in pursuing these objectives.

The banking facilities already available appear to be reasonably adequate, from an institutional standpoint, to meet the country's requirements, except that (1) the Popular Credit Bank or other institution designated to handle the increased agricultural credit provided for in the recommended program needs to have adequate offices in the districts for this purpose, and (2) some provision needs to be made, either through the expansion of an existing institution or the creation of a new one, for home mortgage financing. From the standpoint of resources, the available facilities are considerably less adequate. It is for this reason that the public investment program recommended by the Mission includes allocations of Sf. 3 million for additional agricultural credit and of Sf. 4 million for support of private enterprise. If these allocations are made, it would appear desirable that steps be taken to channel some of the personal savings now on deposit with the commercial banks, and some of the funds of insurance companies and other institutional investors now deposited with the Surinamsche Bank, into the financing of housing.

C. EXCHANGE POLICY

The increase in foreign exchange receipts which we anticipate over the period of the Ten Year Program should eventually obviate the need for foreign exchange controls and trade restrictions. However, during the next few years at least, while Surinam is launching its development program and simultaneously amortizing its large outstanding liability towards the Nederlandsche Bank,

the present control systems will have to be maintained to counter the pressures on the balance of payments which seem likely to occur.

At the present time, only trade with the dollar area is subject to restriction; imports from the Netherlands and the rest of the EPU area are unrestricted. Because of this situation, Surinam will, in all likelihood, tend to have a continuous deficit with the EPU area, although through the imposition of a ceiling on commercial loans any rapid accumulation of large liabilities could be prevented. If this deficit with the EPU area can be covered by a surplus with the rest of the world, without adversely affecting the economy of Surinam, there would appear to be no particular cause for concern; Surinam would then be in a position to finance its trade deficit with the Netherlands by transferring gold and dollars. If, however, it should become clear that an over-all balance of payments equilibrium cannot be maintained under the present system, the only way for Surinam to avoid the necessity of foregoing essential purchases in the dollar area, or of purchasing goods in the EPU area at higher prices than they are obtainable elsewhere, would be to relax restrictions on dollar imports and reduce imports from the EPU area by monetary or other measures.

D. TREATMENT OF FOREIGN PRIVATE CAPITAL

The pace of Surinam's development will, of course, be directly affected by the amount of foreign private capital which may flow into the country for investment in productive enterprise. Unfortunately, few foreign investors know Surinam, and there are no special fiscal, legal or financial advantages to attract them. Accord-

ingly, the stimulation of a greater flow of foreign capital will require vigorous and positive action by the Government.

In the judgment of the Mission, the first step which should be taken is to remove all restrictions on the movement of capital. Due to the fact that, in the past, private business ventures have often proved unsuccessful, Surinam has unfortunately acquired a bad reputation in investment circles. In an attempt to avoid any repetition of these failures, the Government permits foreign capital to enter the country only if satisfied that the proposed private undertaking has a reasonable prospect of success. The Mission believes, however, that it is neither appropriate nor desirable for the Government to pass judgment on whether a proposed private industrial endeavor is likely to prove profitable; nor is the Government well equipped to perform any such function. While we agree that foreign capital wishing to enter Surinam should be registered, that the prospects of new foreign enterprises should be carefully studied and that an opinion on such prospects should be given to the investors by the Government, we strongly recommend that the intervention of the Government should go no further.

As a second step to attract more private capital from abroad, the Mission recommends that, for at least a limited period of time, appropriate fiscal advantages in the form of income tax exemptions and favorable rates of depreciation should be extended to desirable types of foreign enterprises. Specific proposals to this effect are under consideration within the Government; we urge that the matter be pushed forward promptly.

The mining concession policy of the Government should also be re-examined. Concessions are now granted

to private companies only after the Bureau of Mines has fully explored the area in question and has become fully aware of the extent, quality and estimated mining costs of deposits therein. With the limited number of men available, this becomes time consuming. The Mission recommends that reputable private concerns be given the privilege of doing their own exploratory work, provided they give the Bureau of Mines full access to all data, and provided final terms of the concessions are based on the data obtained from the exploratory work. This would permit Surinam's minerals to be exploited more rapidly and thereby accelerate the country's over-all development.

Finally, we recommend that some means be devised for making more information about Surinam available to prospective investors; such information services are particularly needed in financial centers such as New York and Amsterdam. Through direct contact with individuals and corporations in businesses of the type most likely to flourish in Surinam, and the preparation of special studies on projects most likely to attract them, it should be possible to arouse at least the preliminary interest of a few important investors. If this is accomplished, the representatives of those investors should then be invited to visit Surinam to study on the spot the projects in which they are interested, if necessary at the expense of the Government.

E. VOCATIONAL TRAINING

We have several times in this Report emphasized the need for additional skilled labor as one of the major prerequisites for successful execution of the Ten Year Program. Since that Program contemplates substantial

further mechanization of Surinam's productive plant, the demand for engineers, mechanics, tractor drivers, carpenters and the like will undoubtedly increase considerably. There is as yet, however, no well-formulated program for training labor in these skills. While Paramaribo does have a technical school, its facilities are woefully inadequate to meet the country's requirements. As a result, most enterprises requiring skilled labor have up to now had to give their employees most of their training on the job.

The improvement of technical training is, we believe, one of the country's most urgent necessities. We strongly recommend, therefore, that the technical school be provided promptly with adequate personnel, equipment and buildings and that a program of vocational training be drawn up, if necessary with foreign technical assistance, to assure effective use of these improved facilities. Among the important objectives of such a program should be to teach unskilled laborers in Paramaribo how to operate and maintain industrial, mining and construction machinery, and young farmers how to operate and maintain agricultural machinery and equipment. Provision should also be made within the educational system for courses in business and government administration.

It will take some time, under the best of circumstances, for sufficient Surinamese workers to be trained to fill all the country's requirements for men with technical skill and supervisory or managerial talent. In the meantime, as we have already indicated, Surinam should encourage the immigration of young Dutch technicians—engineers, mechanics, doctors, administrators, foremen and the like—who can provide skills of which the country is still badly in need.

F. AGRICULTURAL MARKETING

By and large, the methods of agricultural marketing in Surinam are antiquated and disorganized. As a result, the producer earns less than he should, the consumer pays too much for low quality food, and there is considerable waste and spoilage of perishables. If the Ten Year Program is to be of maximum effectiveness in increasing agricultural production, it will have to be accompanied by improvement of the present marketing system. The necessity for this is recognized by the Government.

The main crop in Surinam today is rice, and one of the major results expected from the Program is a multiplication of rice output. Yet the present state controls on both internal and export sales of rice considerably hamper the production drive. As is explained in some detail in Technical Appendix 6, the present system provides the rice growers with a fixed price considerably below the world market price; it thus reduces the incentive to maximize rice production which a free market would provide. We recommend, therefore, that the Government decide, as a matter of policy, to effect a gradual decontrol of rice prices with the idea of ultimately establishing a free rice market. In Technical Appendix 6, we outline a series of measures by which we believe this policy can be carried out over a period of years while at the same time safeguarding urban consumers against any steep or sudden rise in prices.

Increased production of citrus fruits is also hampered by poor marketing, particularly for export, although in this case the difficulty is not state controls but the lack of any adequate marketing organization. We urge that the export growers who comprise the membership of the Citrus Fruit Growers' Association (CFGÁ) consider its

transformation from a mere sales agency into a complete cooperative instrumentality for improving the quality, grading, and packing of Surinam's export citrus, as well as for promoting export sales. A number of measures which might be taken by the CFGA and the Government jointly to achieve the objective of larger sales of better quality fruit with less spoilage and deterioration are outlined in Technical Appendix 6.

It may fairly be expected that the internal distribution of food will be substantially improved as a result of several proposed projects included within the Ten Year Program, in particular the new Central Market, the new fish market, the central milk depot and the improved slaughter house. In addition, we recommend that the Government: (1) formulate more stringent rules and establish tighter controls than now exist to assure the purity and quality of local foods for local consumption; (2) assist the dairy farmers of the Paramaribo region to organize a producers' cooperative, possibly equipped with its own dairy and perhaps operating the projected central milk depot; (3) provide more short-term credit, through the Peoples' Credit Bank, to small farmers, fishermen and food merchants who now must frequently either sell their wares at once for what they can get for them or else borrow short-term working capital at exorbitant interest rates; and (4) encourage private enterprises, through financial assistance if necessary, to construct modern facilities for the storage, treatment and processing of perishable food.

G. TRANSPORTATION

Technical Appendix 5 contains a number of suggestions for administrative action which, in the opinion of

the Mission, would substantially improve the efficiency of Surinam's transportation facilities. The major recommendations may be summarized as follows:

(1) Modern methods of accounting, budgeting and inventory control should be introduced to improve the operational efficiency of the Department of Public Works, the Beekhuizen Works, the Paramaribo bus lines and the railroad.

(2) The possibilities of increasing state purchases of bauxite ore as a road-building material should be thoroughly explored with the mining companies.

(3) Closer public control of the maintenance of the Zanderij Airfield should be exercised to the extent consistent with the existing concession.

(4) Existing tariffs for the internal transport of freight by truck, barge and rail should be reviewed, with a view to encouraging the most efficient forms of transportation for the various types of goods and to effecting a reduction in the general level of haulage charges.

(5) Negotiations with KNMS, other vessel operators and fruit companies should be intensified in an effort to have fast refrigerator shipping assigned to the Paramaribo run.

(6) Negotiations should be pushed forward for the grant of concessions in favor of the private Dutch interests which wish to start internal air services within Surinam.

H. STATISTICS

In comparison with many other underdeveloped countries, Surinam's statistical services are reasonably good. However, there are still large gaps in the statistical information available, which are particularly important to

fill now that the country is engaged in formulating and carrying out a long-term development program. In particular, considerable work should be done in connection with recalculating the national income and comparing it with the total value of goods and services produced in the country. There should also be thorough and regular study of the structure of gross and net capital formation. Full population and labor force statistics should be maintained and indices should be kept of the cost of living and the cost of import, export and local goods and services.

We believe that the necessary additional statistical work implied by our suggestions, including the computation of national accounts, could be performed by the Statistical Office with only a slight increase in staff. We suggest, however, that the objectives of the statistical work, as well as the interpretation of the data available, should be worked out by the Statistical Office in consultation (among others) with the proposed new Development Board.

AGRICULTURE

SURINAM is about five times as large as the Netherlands. Its population is very small in relation to its size and its productive agricultural area covers only about 30,000 hectares, little more than 1% of the total cultivable area. Yet its range of agricultural possibilities is wide and most interesting, and there are sound reasons for confidence that present production can be expanded many times.

Only the coastal regions need be considered, for the interior has hardly any population or agriculture. The coastal regions enjoy a very agreeable, equatorial climate with temperatures moderated by sea breezes. There are no hurricanes such as those which every few years wipe out much of the agricultural production in Jamaica, and serious dry spells are uncommon. The rainfall is good and well distributed; humidity is high. Hours of sunshine—six per day—are low for the tropics.

In the coastal strip there are large areas of clay soils of high fertility; with the aid of fertilizers the sandy soils, too, can probably be maintained at a commercial level of production, if care is taken to conserve the organic matter in the top layer of the soil. On these two types of soils a large variety of tropical crops can be grown, some of which already give high returns per hectare.

With a climate so admirably adapted to tropical crops, it is at first surprising that Surinam has such a minute area under crop. And, in fact, the area under crop was at one time very much larger than it is today. A variety

of reasons, chief among them the almost complete absence of scientific methods for the control of the many crop diseases which are always to be expected, accounts for the reduction in the cultivated area.

There is now in Surinam a small number of scientists with many years of experience in tropical agriculture in Indonesia; this number will no doubt be increased and problems of this type can be tackled vigorously. Greatly increased production should follow—a production which will need the protection and insurance which only modern scientific knowledge can give.

A. PHYSICAL SETTING

Climate. Among the factors favoring agricultural development are:

1. The absence of hurricanes which frequently devastate neighboring countries; instead there is a constant sea breeze (trade wind) that makes temperatures bearable.
2. The climate is classed as “rain-forest” which is the most suitable for perennial tree crops.
3. There is no cold season, no period when temperatures at night are low enough to check tropical growth. Paramaribo has a yearly average temperature of 27° C (80.6° F). Night temperatures rarely fall below 21° C (70° F). The hottest month is September with 28° C (82° F). Paramaribo has never recorded a temperature of 38° C (100° F).
4. There are two rainy seasons, which means that the distribution of the 2,000 mm. or so of rain (say 80 inches to 90 inches) is spread rather widely and the two dry seasons are short. The high humidity reduces the loss of moisture from soil and vegetation in the dry seasons.

The unfavorable factors are few:

1. There are occasional years, perhaps every 12th or 14th, when the short rainy season is missing. In 1912, 1926 and 1940 rainfall was low. The lowest recorded rainfall at Paramaribo was 48 inches in 1899.

2. In the dry seasons, when irrigation is needed, the river water is brackish to saline for many kilometers from the coast and, below the brack-water line, cannot be used for this purpose.

Rainfall. The wettest months are April through July (peak in May, 300 mm.) with a second wet season in December and January (December peak, 210 mm.). In the driest month, October, the average rain is 70 mm. The wet seasons will be termed "long" and "short" rains in this Appendix.

The humidity at Paramaribo averages 81% relative humidity.

The rainfall increases as one goes inland and also towards the east; the heaviest rainfall is thus found towards the southeast corner where the average is 2,400 mm. or nearly 100 inches.

The Soils. The agricultural areas can be divided into three zones which are almost parallel to the direction of the coastline but widen to the west.

1. The young coastal plain of about one million hectares of flat land, composed largely of heavy clay (Demerara Series).

2. The old coastal plain, more undulating, of 1½ million hectares—largely light soils (Lelydorp Series).

3. A very sandy strip, composed of coarse white sands (Zanderij Series).

All three zones were originally covered with forest except for some open grassed areas in the sandy zone.

Inland beyond these coastal areas are 13,000,000 hec-

tares of coarse, infertile, lateritic soils which have received little attention; their potential is not known but is regarded as very low, although Bush Negroes manage to raise crops in places. Much of the area has not yet been surveyed.

Most of the agricultural development has taken place in the *young coastal plain*. Composed of highly fertile clay areas interspersed with sandy ridges, this zone is about 10 miles wide in the east and 40 miles in the west. It has been formed from Amazon silt deposited by ocean currents. There are a few large areas of sand ridge well above sea level composed of sand brought down by the local rivers. In the west there are large and more or less uniform areas of clay while in the central districts patches of clay and sand are found.

The area is largely below the level of high tide and this has necessitated the use of dykes and sluices to keep out the sea and drain the soil. Normally there are only a few inches of soil above the permanently wet zone. All these heavy soils can grow rice, sugar, cacao, citrus, soya and pasture grasses. The soils are, in general, acid (pH5 to pH6), but there are patches of alkaline clays and the profile of the acid soils becomes less acid with depth. The calcium content of these soils is very low while magnesium is high.

The typical heavy soils have a very high percentage of clay—90%—and a high content of organic matter—4–5% humus. They are low to medium in phosphate but contain sufficient potash and, because of the presence of a large amount of organic matter, it has been concluded that the use of fertilizers will not be necessary for a few years. Much has to be learned about these clays but their fertility has been established by many decades of cultivation in Surinam and British Guiana. Moreover, when

drained, these soils can carry heavy tractors. They are very short of calcium but liming seems to have little effect. The preparation of a suitable crumbly top-soil layer of several inches depth is very desirable if crops other than rice and soya, which do well without it, are to be grown.

X-ray studies have shown that the clays contain considerable amounts of a shiny clay mineral, probably illite (a potash-containing clay mineral), and of kaolin.

The *old coastal plain* can be divided into two strips, both with very patchy soils—the northern part (about 40% of the total) composed of fine sandy soils and the southern part (about 60% of the total) composed of dust clays. The site of the Lelydorp Project is in the sandy portion and more is said about the soils when discussing that project. In the old coastal plain, fertilizers will be necessary to give good crops but not enough work has yet been done to know what is required. Several tree crops do well in the newly cleared areas—oil palms, cacao, coconuts and citrus; and also peanuts, sweet potatoes, pineapples, bananas, etc. The acid soils are very deficient in phosphates and rock phosphate will probably have to be used on all crops. Much of the old coastal plain has not been soil surveyed but it is known that there are many variations in soil. The low-lying swampy areas have heavier soils, suitable for rice and fodder grasses.

Much of the zone is well drained but the natural drainage lines (creeks) need to be opened up and kept clear of vegetation. Further, if large areas including the big swamps are opened up, it will be essential to install regional drainage systems. Portions of the zone are scheduled to be surveyed by men specially trained in the Netherlands.

An aerial photographic survey has been made and the

large-scale (1/10,000) photographs have been of great assistance in discussing the program of land utilization. The combination of aerial photographs with soil and vegetation knowledge obtained on foot is the soundest, most effective and least expensive way of studying the problems of land utilization in new areas. In the low-lying areas of Surinam the levels for drainage have to be meticulously exact, for a few centimeters can be of critical importance.

The Polder System. The distinctive feature of Surinam agriculture is its polder system. (Polders are areas enclosed by dykes or walls from which water can be drained at low tide quickly enough to avoid damage to crops.) In Surinam, with much of its coastal plain areas below sea level at high tide, to empolder was to "make a virtue of necessity." Empoldering comes naturally to the Dutch and the system was introduced for sugar-cane growing centuries ago; as the area under sugar decreased, it was used for a variety of plantation crops and the larger part of the cultivated areas (past and present) is now empoldered. The soils are generally deep, heavy clays or peat over clay with some sandy strips.

The system is expensive in money and labor and requires that the crops grown give a large monetary return per acre. It is, however, an absolute essential and has some great advantages as well. Given irrigation, as is generally the case, the polder system is an insurance against dry spells. In addition to protecting the area against salt or brackish water, it enables flood water and storm water to be drawn off through the sluices at periods around low tide. The polders are frequently flooded during the heavy tropical showers in the short rains and the drainage canals must be large enough to draw off 50-60 mm. of rain rapidly, for, apart from rice, few crops can

stand flooding more than a few hours. There are usually large swamp areas of shallow water, on the land side of the polders, which supply the irrigation water to the polders.

The construction of large polders (up to thousands of hectares) entails careful surveying and levelling, and, since large sluices have to be installed, a knowledge of polder engineering. Empoldering in the Nickerie district costs about Sf. 400-500 per hectare in a large polder; this figure does not include the cost of clearing, which in swamp areas is generally low.

From the point of view of humus and of soil and silt conservation, the polder is an ideal system for rice or sugarcane. Soils are also markedly improved in fertility by what is known as "flood fallowing," i.e. keeping the soil for several months or a year under water not less than 30-40 centimeters deep. Then water weeds grow vigorously and the soil is changed and improved in structure and in organic matter content.

On the other hand, drying out the soil periodically also noticeably improves its fertility. With the good drainage system found in polders, this can readily be done in the case of annual crops and Surinam's two dry periods facilitate the drying out of all well-drained soils. One result of effective draining is to dry out and harden the clay subsoil, which can then carry heavier tractors. The cost of maintaining sluices and ditches in good order is low. With proper maintenance, the life of a polder can be extended indefinitely.

The polder system is, of course, admirably suited to rice growing and the same clay soil that gives a high rice yield has been found to produce a good yield of soya in the short rains. Maize can be grown in place of soya but it is more sensitive to soil conditions.

The polders are flat areas with only slight differences in level over areas of hundreds of hectares—but these differences are important. Uniform flooding is most desirable for rice, especially when water is in short supply. Areas which are lower than other portions of the same polder tend to be poorly drained; they do not dry out in the comparatively short dry seasons and cannot grow soya or maize in the short rains. Where feasible, levelling should be done year after year until inequalities have been smoothed out.

It should be added that the typical empoldered area does not have complete water control. Damage may occur—either through flooding from the tropical rains which the sluices, opening only at low tide, may not be able to carry off, or because the normal drainage obtainable does not allow sufficient depth of dry soil for the roots of tree crops to develop adequately. To insure complete control a system of pumping is necessary.

The Prince Bernhard Polder for Mechanized Rice Production. This experimental polder of over 250 hectares was started in 1949; it was partially planted up in 1950 and almost fully planted up in 1951. On this polder, regarded as a necessary preliminary step in the Wagenin-gen mechanized project described later, a variety of agricultural methods, new crops and machines is being tried out by experienced Dutch farmers. It has already been shown that, with the help of irrigation water, soya will do well (1,200 or 1,400 kilos per hectare) in this soil in the short rains. The top soil after drainage and cultivation is in a good crumbly condition but it is probably not deep enough for maize and most annual crops; with cultivation, however, this top layer will undoubtedly become deeper.

Rice yields vary considerably from field to field and much study may be necessary to isolate the causes of the differences. Fortunately, excellent research work, especially in the production of better types of rice and other crops, is being carried on.

The greatest difficulty, thus far, is the weed problem. Weeds can be controlled by various methods: crop rotation; inundation, when the weeds are not rice or other water-loving plants; cultivation by man and machine; and spraying or dusting with plant hormones (rice stands up well under this selective weed-killing). All are being studied but up to now the problem has not been solved.

The Prince Bernhard polder gives Surinam an excellent opportunity to study mechanized agriculture under polder conditions. It has already proved a valuable factor in the further development of rice mechanization and in the next few years should set a high standard of achievement in efficiency of mechanization and in crop production.

In the British Guiana mechanized rice area, it has been found advisable to replace rubber-tired wheels by steel wheels which can be made on the spot and readily repaired or modified as necessary. Steel-wheeled tractors can work under wet conditions better than rubber-tired vehicles.

The River System. While the most striking artificial feature in Surinam is the polder, the river system is an equally striking natural phenomenon. How these rivers came to be so deep and so winding and to parallel the coast for so much of their length is not for discussion here. These characteristics have, however, had a vital bearing on agricultural development. For example, the depth of the river beds explains the presence during the

dry seasons of brackish water many kilometers above the estuaries.

Being tidal, the rivers are the outlet at low tide for the floodwater (rain water) from the plantations, as described later. It was this fact and the ease of access given by the navigable rivers which led to the riverine development of Surinam's agriculture from the beginning of the slave plantations. There were no roads, but plantations were easily reached by river and all produce could be loaded into river boats from the plantation wharves. The swamp or forest areas which constituted the hinterland of the plantations were the reservoirs for their water supply in the dry season, while all drainage water passed through sluices into the rivers around low tide. Thus the rivers of Surinam were a controlling factor in the establishment of the plantations and the type of agriculture introduced.

B. TYPES OF FARM LABOR AND THEIR REGIONAL DISTRIBUTION

Surinam's agricultural production is shared between Creoles, Hindustani, Indonesians and a few Dutch settlers. The other racial groups are Bush Negroes and Amerindians who live in the interior and who are negligible as agriculturists. The former are employed chiefly on logging and theirs is a "shifting" agriculture (*milpa*). The Amerindians, too, practice *milpa*; they occupy very little land in the coastal strips.

The total population outside Paramaribo is about 115,000. Most of these are on small holdings and only about 20,000 live on the plantations.

The Creoles. While the Creoles form the largest racial group (82,000), they live largely in Paramaribo

and only a minority has taken to farming. The percentage of literacy among the Creoles is high. They are good at mechanical work, for example, as tractor drivers in the bauxite industry, but have had little opportunity to use this ability in mechanized farming.

The chief Creole farming area is at Coronie, where Creole farmers have successfully established 1,200 hectares of coconut trees and 400 hectares of rice. Coronie is on a coastal sandy ridge, between the Coppename and Nickerie rivers. It is an isolated area with no river connection. The village has no services or amenities and it is an urgent task to make the area more attractive to its inhabitants as well as to increase greatly the area under crop to meet the needs of the rising population.

The Land Improvement Program of the Government includes both a project for the development of Coronie and one for the development of Para, the second Creole farming area. It is thus hoped to stop the drift of Creoles to Paramaribo, as well as to overseas countries. With the opening of larger rice farms in which mechanization will play a part, Creoles may also find profitable employment as tractor drivers.

The Hindustani. The Hindustani, who form the next largest racial group (67,000), live for the most part on the land. This is in sharp contrast to their tendency in other tropical countries to move to urban centers. There is no solely Hindustani area comparable to the Creole area at Coronie. Hindustani are found scattered on small farms in all the rice-growing districts, chiefly in the neighborhood of Paramaribo and around Nickerie. A number of them are dairy farmers. Hindustani are showing a great interest in the larger holdings which the Government will be offering in the new empoldered areas and

it seems likely that the larger rice farms, i.e. those over four or six hectares, may be taken over largely by Hindustani and developed with more or less mechanization.

The Indonesians. Recent importations of labor have been almost entirely Indonesian. Numbering nearly 40,000, almost all of them live on the land, chiefly as small farmers who work parttime in industry to supplement their incomes. They are to be found in all the rice-growing areas, especially on small Government farms of one to two hectares within a few miles of Paramaribo, scattered along the Commewijne, at Nickerie and on the plantations; indeed, the plantations depend very largely on Indonesians for their labor. There has recently been some drift to Paramaribo.

The Dutch. Most of the 5,000 Europeans in Surinam are Dutch, but the total number of Dutch farmers is very small. They have settled primarily at Kwatta, in the neighborhood of Paramaribo, where they have 61 holdings (averaging 12 hectares) and engage in dairying. The Kwatta settlement is over 100 years old; it is struggling under adverse conditions, poor drainage in particular, which are described elsewhere. The Wageningen project is to a great extent designed for new Dutch farmers from the Netherlands with a good knowledge of mechanized farming.

C. THE RISE AND FALL OF THE PLANTATIONS

Sugar was established over 300 years ago and cacao and coffee some 200 years ago. These were the main plantation crops until the 20th century when bananas and citrus were also grown. While a century ago there were 200 plantations, employing 50,000 workers largely in

sugar production, today there are only 24 plantations with 5,000 cultivators growing sugar, coffee and citrus. The average size of the cultivated area on plantations in 1950 was about 200 hectares, the total area of plantation crop being roughly 5,000 hectares.

1. CHIEF PLANTATION CROPS

Sugar. Sugar was the first and most important product of Surinam during the old slave days, and at one time it was even legal tender. It is still the chief crop of British Guiana and of the Caribbean, but in Surinam it has fallen away to three small areas which together do not produce the 6,000-7,000 tons consumed locally. Once grown on over 100 plantations, sugar began to decline with the liberation of the slaves. By the beginning of the century there were only 5,000 hectares under cane producing 9,500 tons of sugar and 1,200 tons of molasses. As sugar beet in the Netherlands and sugar cane in Indonesia were grown in increasing amounts, the area under cane in Surinam continued to diminish. In 1932, as a result primarily of modernizing the Marienburg estate, production reached 25,000 tons, but the closing down of estates because of the world slump and the advent of the froghopper pest, followed by the loss of labor in World War II, combined to reduce sugar production to its present small proportions. The areas are now too small for efficient mill production and fertilizers are hardly used at all.

Cacao. Cacao is a native of South America and the world's supply came from that continent until other areas, in particular West Africa, developed cheaper production. After the abolition of slavery in Surinam, cacao developed rapidly as it replaced the coffee which went out

of cultivation. The first cacao introduced was Criollo, from Trinidad; later the higher-yielding Forestero was brought in. Production reached its peak in 1895 with 4,400 tons produced on 5,400 hectares, a yield of over 800 kilos per hectare.

Then witch-broom disease attacked the trees and pods so that the present area under old cacao is only a few hundred hectares. Today, with new highly productive strains from Trinidad, which should give two to three times the previous yield and which include some types immune to witch broom, there is hope that cacao may again become a significant export.

Coffee. Coffee has been a Surinam crop for centuries. In fact, it was from Surinam that the cultivation of coffee spread to Brazil and other American countries. Arabica coffee was grown at first and in the 18th century exports reached 13,000 tons. The attack of the leaf disease (*Hemileia*), which has attacked Arabica in most parts of the world, and the shortage of labor after the liberation of the slaves led to the introduction of Liberica coffee from West Africa. The Liberica coffee tree is resistant to disease and pests and can be harvested over long periods instead of a short peak period as with Arabica. Liberica has, however, a marked flavor which many coffee drinkers do not like. Nearly 7,000 hectares were in production up to 1939 but by 1950 the effects of the war had reduced the area to 2,500 hectares with a production of 567 tons, less than half the former yield per hectare. The trees have been neglected and have grown to a great height so that picking is very difficult. In recent years a new *fusarium* wilt has been killing the trees.

Bananas. Conditions in Surinam are very suitable for bananas. In 1906, by an arrangement between the Surinam Government and the United Fruit Company, the

Government undertook to plant up 7,500 acres with Gros Michel bananas and to deliver to the Company 1.5 million bunches a year. A labor shortage, an unfavorable season and the outbreak of Panama disease delayed the first shipments and by 1909 the disease had destroyed most of the crop. The Congo (a Cavendish type) banana, which was practically immune to Panama disease, was introduced but the Government by this time was not prepared to find any more money for the scheme and it collapsed in 1911. The maximum export (to the United States) was 650,000 bunches a year in 1909 and 1910.

After the first World War, banana export was again considered but in 1933 the leaf spot disease (*Cercospora*), which does not kill the trees but seriously reduces production, had spread to such an extent that all developments ceased for a period. Given control of disease, Surinam can, however, undoubtedly grow good bananas on both its heavier and lighter soils.

Citrus. When coffee failed, the Government encouraged the planting of citrus, the last of the crops to be planted in any quantity on the plantations. The total area under citrus is 2,000 hectares, of which a little more than half is on plantations. Export was started but met with great difficulties and very little fruit is being exported today in spite of the modern processing and packing plant which has been erected in Paramaribo. There are plans for a juice factory in Paramaribo to take the unexportable fruit, but no substantial development of citrus growing can be expected without a vigorous export trade.

Oil Palms. This is a new crop in Surinam. A few palms were established successfully on a small area near Lelydorp in 1930 but the trees were neglected during the war and little information is available about their production. New seed from Sumatra and West Africa has

been obtained and it is hoped that on suitable soils oil palms can be highly productive.

2. THE FUTURE OF THE PLANTATIONS

Sugar, cacao, coffee and bananas have all suffered from or have even been wiped out by diseases and pests. For successful operation in the future it seems clear that plantations must have:

- a. at least two or three marketable crops on each plantation;
- b. the assistance of the latest methods of disease control, including the introduction of new strains, modern spraying methods, soil hygiene and the like;
- c. highly productive types which can be rapidly multiplied;
- d. better drainage in accordance with the standards of the scientists of the Paramaribo Experimental Station;
- e. export markets, without which there can be neither development nor stability; and which in turn require
- f. a high standard of quality and processing.

Given these, the remaining and all-important problem is labor. The plantation managers insist that the shortage of labor is their greatest handicap. They argue that better wages will not attract labor but may have the effect of reducing the number of hours which existing laborers will work.

In addition to the present producing plantations, there are several thousand hectares of abandoned plantations which were at one time cleared and drained at great expense. These could be brought back into production

if they were turned into small rice farms, but if they are to remain as plantations the three problems of production, marketing and labor will have to be tackled without delay. Production can be increased if the new strains of cacao and oil palms do well; it cannot be assumed as yet, however, that oil palms will do well on typically heavy plantation soils. The marketing and shipping of citrus is essential for most of the plantations; this is a difficult problem and one which the plantations by themselves cannot be expected to solve.

Finally, there is the problem of attracting labor. At Lelydorp the authorities hope to develop a cooperative system of farming (initially cooperating in purchasing and marketing and later perhaps in spraying, harvesting and processing), and farmers will be assisted to acquire their holdings. A cooperative scheme for the plantations, if one could be worked out, might also help in attracting more labor and stimulating better work. For example, a large portion of many of the plantations is not in use; perhaps such areas could be leased conditionally to the workers who might be helped to plant up these holdings with good material.

In the opinion of the Mission the possibilities for establishing cooperative or private sharing systems on the plantations should be carefully studied. The plantations were not laid out for mechanization and without some such device for increasing the productivity of labor it is difficult to see what advantages plantations have over small farms, provided the latter get the full benefit of scientific advantages such as new varieties. The Slootwijk project, described later, should also help in finding ways to improve the present agricultural methods of the plantations.

D. SMALL FARMS

History and the Conditions of Tenure. With the abolition of slavery and the abandonment of plantations in the latter decades of the 19th century, small farms began to be established under a variety of conditions reflected in the present-day lack of uniformity as to size, tenure and the like.

1. "Government Settlements" consist of small tenant farms ranging in size from less than one to three hectares for which a rent of Sf. 10 per hectare is paid. Here the Government is responsible for maintaining the drainage system. Farms in the settlements total 6,300 and cover 9,500 hectares.

2. In the "Outside Settlements" (i.e. outside the Government Settlements), maintenance is the responsibility of the tenants and a lower rent is charged—Sf. 3 per hectare. Farms in Outside Settlements number 12,800 and cover 13,600 hectares.

3. There are a number of cases where a small farmer has come to some arrangement with a plantation owner to lease a holding or has acquired a long lease direct from the Government.

4. In the new Government-built polders at Nickerie farms of somewhat larger size (usually four hectares but up to 32 hectares) are allotted to applicants.

In recent years portions of the Government Settlements have been handed over to "village" communities with powers of self administration; the village community is granted a long lease on its whole area which it sublets to tenant holders. In the polder areas the administrative body is the Cooperative Water Board. Out of this should arise a very useful type of public body, which might even override racial groupings. Polder farming is

necessarily to some extent collective farming and it requires some centralization of administration.

Importance of the Small Farms. The plantations cultivate 5,000 hectares out of a total of 30,000 hectares. The 25,000 hectares occupied by the small farmers have a population of about 80,000, i.e. some 16,000 families with an average of 1½ hectares each.

Today there is a strong feeling, which the Mission shares, that the rehabilitation of small holdings, an increase in their number and size, and the opening up of new polder areas for small to medium farms, constitute the most important, least speculative and most far-reaching task of the Government.

Conditions on the Small Farms. Most of the small farms are in an unsatisfactory condition.

The first impression gained from a visit to several peasant areas near Paramaribo was the almost universal insufficiency of the drainage systems. Probably these systems were originally installed without sufficiently accurate surveys, and in any case the drains have generally been long neglected. Many areas now need to be re-surveyed and the drains deepened and connected up to regional systems. One or two feet may make all the difference between a dry sandy ridge and a marsh. Full advantage must be taken of all natural drainage lines. Roads and polders in the past were often made with but little regard for soils and levels.

Poor drainage is a problem in pasture (dairying) and in rice areas. Most of the pastures are in miserable shape, yet they consist for the most part of valuable reclaimed (empoldered) land which at one time was far more productive. As a result of the lack of drainage, cattle suffer badly in the wet season and go down in condition, while pasture production is reduced to less than

half. On the whole, the farmers have little idea of what good pastures are like, or what they can produce, either in grass or milk. The improvement in pasture in three months of dry weather as a result of draining the pastures at the Animal Husbandry Farm in Kwatta should be a convincing demonstration of what can be accomplished in a short time. Pasture improvement must, of course, be linked with improvement in stock.

But the most important product of the small and medium-sized farms is rice. The typical small farmer grows rice as the main crop. Here, too, improved drainage is necessary, chiefly in order to enable a rotation crop such as soya beans to be grown; at present nothing is grown in the short rainy season between the rice crops, so that annual production is nearly halved. Proper drainage and the growing of a leguminous crop should, as explained later, also help to increase rice yields. It should be noted, however, that, in many areas of Surinam, rice yields are already very high for the tropics; on the Saramacca River, for example, yields are probably the highest in the tropical world.

The small farms produce nearly half the total citrus fruits of Surinam and these provide a useful cash income for the peasant. Other crops, such as bananas and vegetables, are of less commercial importance although they are very important for the family food supply.

Improvement of the Small Farms. To improve the drainage on individual farms is generally useless unless the regional drainage has been improved. The Government has in view large schemes to improve drainage conditions but its efforts thus far have been limited by lack of money. In 1951 the Government improved the drainage of Government Settlements near Paramaribo, totalling an area of 1,600 hectares at a cost of Sf. 35 per hec-

tare. This will increase yields by 15% on land under cultivation and make more land cultivable.

In 1952 five other Government Settlements will be tackled—a total of 2,400 hectares to cost Sf. 60 per hectare—and four Outside Settlements consisting of over 2,000 hectares at a cost of Sf. 76. In these latter areas the increases in the yield of rice should be 20% over the present figure of 2,700 kilos. This work is not at all spectacular, but it is most valuable and should be speeded up until all such areas have been rehabilitated and reallocated. By allowing soya to be sown in the short rains it will very considerably increase the value of the production per hectare.

The need for increasing the size of the small farms is also recognized, but expansion depends first of all on the availability of oxen for plowing. Without oxen, a farmer cannot prepare an area larger than half a hectare to put under rice. With oxen, farms can be increased to at least four hectares—quite a considerable rice farm in comparison with those in, say, Japan.

Whether a peasant now holding a farm about one hectare in size can manage a four-hectare holding will depend, not only on the man himself, but often on the size of his family. A survey made during the war showed that peasants with farms of about one hectare obtained nearly half their income from other employment while the holders of four hectares obtained only 8% of their total earnings outside the farm. With the development of soya beans as a rotational crop with rice, good farmers should be quite independent. A four-hectare holding, if in good condition, should bring in—with two crops a year, rice and soya—a gross return of Sf. 2,000, with direct expenses Sf. 500, giving a remuneration of about Sf. 4 per day for the farmer. In comparison, plantation workers

get Sf. 1.5 per day, although they can sometimes increase this to Sf. 2.5-3 when on piece work.

In most cases expansion of a one-hectare farm to four hectares will not be possible without some financial assistance from the Government to the farmer to enable him to purchase the oxen, implements, larger quantities of seed and similar items that will be required for the larger area.

Future of the Small Farms. The Mission believes that the growth of small farms in the next few years will be largely in the direction of:

1. More cooperative enterprise. The Lelydorp venture is to a large extent a cooperative development, there is a cooperative rice mill at Nickerie, a cooperative oil press at Coronie and other indications of an increase in cooperative working.

2. Commercial farming at Nickerie on farms of, say, 16 hectares or more. While the total area of small holdings is small today, the prospects, thanks to the new outlook and new knowledge of the Department of Agriculture, are very healthy and encouraging.

What part the new cacao types and later the new oil palms will play in the development of the small to medium farms we do not know. At present these farms are regarded as primarily rice farms but there are all the conditions in parts of polder areas and in the old coastal plain of a high standard of mixed farming, i.e. annual crops, tree crops and pastures.

E. CROPS

Crop Yields. The following table gives the areas and yields per hectare of the chief crops. In the case of the less important crops the areas and yields vary considerably from year to year.

TABLE I
CROP PRODUCTION

<i>Crop</i>	<i>Area (hectares)</i>	<i>Average Yields per hectare</i>
Rice	18,000	2,700 kilos
Coconuts	2,500	7,000 nuts (Coronie)
Coffee	2,300	250 kilos
Citrus	2,000	50,000 fruit
	(1,200 in production)	
Bananas and Plantains	1,400	650 bunches
Sugar cane	1,300	3,300 kilos (sugar)
Beans	600	500 kilos
Cacao	530	200 kilos (old trees)
Maize	450	1,000 kilos (on cob)
Peanuts	400	800 kilos (in shell)
Soya	100	900 kilos
Casava, yams and sweet potatoes		several tons
Oil Palms	Only a few palms giving 4 tons fruit, 1 ton kernels	
A large variety of vegetables and tree fruits is also grown.		

The areas under rice and soya are being rapidly increased. Those under tree crops will increase considerably in the near future in the case of coconuts and cacao and more slowly in the case of oil palms as young trees become available from the Experimental Station.

Citrus, banana and pineapple production cannot expand substantially unless and until regular exports are assured.

Rice. Rice has recently become the foremost crop in Surinam, in both area and value of total production. Roughly 25% of the population lives on farms primarily devoted to rice. There are large flat areas of clay soils in the young coastal plain which are admirably adapted to

rice cultivation. It presents very few disease or pest problems until it gets into storage, where insects and rodents do more harm than is done in the field.

Add to these favorable factors the high rainfall, the high temperatures throughout the year (or rather the absence of any cold spell), the fact that much of the potential rice area is under swamp vegetation which is easily and cheaply cleared and that soya can be grown as a second season crop, and it seems clear that there are substantial opportunities for the further development of rice production.

Because of the shortage of labor and because the flat rice lands lend themselves to mechanical treatment, the possibilities of fully mechanizing rice production are being worked out. The major problem of mechanization is to grow a high-yielding rice capable of being readily combined.

The swamp areas which cover the hinterland of the present rice areas supply the irrigation water which insures early sowing of rice and the additional water for periods of low rainfall and for the second season crop. River water above the brack is available in some places, notably at Wageningen, and thus insures supplies in the occasional dry years.

An important piece of work on rice which is being carried on at the Paramaribo Experimental Station is to test the possibility of growing rice with the brackish estuarine water which is available in most of the rice-growing areas. If this brackish water could be used at times of emergency, the effect in dry years would be important. The high rainfall should insure adequate leaching out of the salt under the right conditions.

The most striking feature of rice growing in Surinam is the high yield, especially in certain areas of good soils

—yields much higher than elsewhere in the tropics. Some varieties of rice are not at all adapted to the short equatorial day, and it has often been claimed in countries like Malaya, Indonesia and Ceylon that, owing to the short day, it is not possible to produce the high yields per hectare of Japan, Italy and other countries in the sub-tropics or temperate regions with longer summer days.

In the Saramacca area of Surinam, however, yields of five tons of paddy per hectare are sometimes realized. With poor drainage this yield falls to half—showing how important soil drainage is for rice. The Saramacca yields are obtained without the use of fertilizer, rotation or fallowing. With a crop of soya as a second season crop, yields should increase. Japanese yields average five tons per hectare, hand grown; in the United States, where production is mechanized, yields are much lower. The average yields per hectare in well-drained soils of Surinam are: Skrivemankoti, 3.5 tons; Rexora, 2.7 tons. The next highest yield in the tropics is in British Guiana where rice averages 2.5 to 3 tons per hectare, indicating the high fertility of the coastal clays which are common to British Guiana and Surinam. Moreover, Surinam grows a crop of rice each year whereas in some countries, for example in the United States, only about one crop every three years is grown. It is also worth noting that in Surinam about 120 days a year are spent on rice culture per hectare contrasted with 170-180 days in Japan.

The area under rice in 1945 was 14,600 hectares, producing 37,000 tons of paddy; in 1950 17,800 hectares produced 50,000 tons of paddy. Most of this was exported and the whole of the export was acceptable to the European market.

Coconuts. Coconut palms have been growing for centuries in Central and South America. Next to the African

oil palms they are, measured by production per hectare, the most prolific source of oil. Coconuts do well in Surinam, especially at Coronie where diseases and pests are almost unknown. Some trees produce 200 nuts per year— at 8¢ Surinam per nut the crop from such a tree is worth Sf. 16 and there are about 120 trees to the hectare.

Coconuts are prone to a variety of diseases and every effort should be made to keep Coronie free from these and from the various borers which are such a curse to coconuts in other parts of Surinam.

While the drainage at Coronie is good, this does not apply to many other parts of the country where poor drainage seems to be the chief cause of the death of the young trees. With bad drainage the trees appear to be so physiologically weakened that they succumb to various diseases which otherwise would be less troublesome. In Nickerie bud-rot is also serious.

Coconut oil was imported in 1950-1951. A small amount of oil from the copra (the dried flesh of the coconut) is expressed locally at Coronie in a not very modern press. It is more profitable, however, to export coconuts in the shell than to express and sell the oil for soap-making and feed the residue to pigs.

The yield of oil is 800 to 1,000 kilos per hectare and with selection of trees and better expressing this figure could undoubtedly be increased considerably. If this figure is compared with the production of, say, 300-400 kilos of groundnut oil per hectare (which entails annual plowing, sowing, weeding and harvesting), the economics of coconut growing look very attractive; but between the wars, with the low prices of fats and oils, even the coconut industry had a very bad time.

At Lelydorp, where it is proposed to grow coconuts, there will be more trouble with diseases and pests than at

Coronie. Fertilizers will be used but there is little knowledge available about the yield of nuts or the effect of fertilizers. Much will depend on the success of the efforts to maintain the top soil of the forest undisturbed.

The dwarf type of coconut has been introduced into Surinam but there are no records of production. It will be planted up at Lelydorp.

Coffee. Since the war there has been no difficulty in selling Liberica coffee, primarily to Scandinavia. However, because the flavor of other coffees is generally preferred, any substantial improvement in the world supply of coffee might make export from Surinam difficult. Dr. D. S. Fernandez, until recently Director of Agriculture in Surinam, has developed a simple process of treating the coffee which is said to change the flavor and long storage is reported to have a similar effect.

In Slootwijk there are a few trees of *Canephora* (*Robusta*) which give a better coffee. *Canephora* will present somewhat the same difficulty as did Arabica because it has to be picked during a short period. To meet the problem of securing labor during this peak period, consideration should be given to the use of school children from Paramaribo at picking times. They could be transported by water in a few hours to most plantations; it would be a "holiday with pay." This might solve one of the limiting problems of the plantations. In England, for example, all hops are picked by Londoners who travel perhaps 60 miles and live in the hop gardens; and fruit picking is largely done by people who take their holiday that way. Children in Paramaribo might grow up with a different idea about the country and about working on the land if given the opportunity while young to become familiar with farming conditions.

In the meantime Liberica coffee is being grown and

exported. It is remarkably free of leaf disease and insect pests, and if the wilt disease can be controlled, the flavor improved and the young trees pruned so that picking is easy, then *Liberica* should have a future even if competition again becomes acute. But it would be safer to plant up the *Canephora* or other types of good coffee (for example, *Congolensis*) and study their possibilities.

Bananas. Surinam can undoubtedly grow good bananas on both its heavy and lighter soils. The problem of Panama disease which ruined earlier banana projects has been solved fairly satisfactorily by the introduction of the Congo banana, which is said to be rather better than the Lacatan banana now being exported from Jamaica. The control of *Cercospora* is still difficult but by no means impossible.

Given control of disease, the conditions for banana growing are good. Soils are fertile and production is rapid, and also very uniform throughout the year if irrigation water is supplied in the dry seasons. As already noted, however, fresh water all the year round is only to be found in the upper reaches of the rivers.

Apart from occasional small shipments there is no export of bananas at the present time. The fruit itself is very satisfactory but the lack of refrigerated holds prevents any growth of export. There is a standard size bunch of nine hands known as a "count" bunch, but this is rarely found in Surinam today owing, we believe, largely to the damage done to the leaves by the *Cercospora* disease. The average bunch of bananas in Surinam is only seven hands. With spraying, it should be practicable to produce nine-hand bunches wherever soil conditions are good.

The absence of shipping facilities is most serious. Unless and until regular shippings of bananas (with citrus

and perhaps pineapples) are made, Surinam will never develop its banana production substantially.

There are certain small outlets for other banana products—dried bananas, “chips,” “flakes” and flour—all of which are supplied from banana exporting countries and which are worth considering; but the basis of a banana industry is the regular export of fruit in large quantities.

A Banana Plantation. Many years ago it was suggested that a banana plantation should be started under the best conditions available in Surinam. These would be (1) rich virgin soil, (2) fresh water for irrigation at all times, and (3) deep-water loading of ocean-going ships alongside the plantation.

A site for a large (4,000-hectare) banana plantation on the Cottica River was chosen by a Surinam firm before World War II. Growing conditions would, it is believed, be unusually good and should permit a steady supply of at least 50,000 bunches of bananas each week all year round, i.e. one ship a week. Loading could be direct from the estate to ocean-going refrigerator ships with no interference from wind or wave.

Despite the technical advantages of this project, it cannot be carried forward unless an adequate supply of labor can be assured, sufficient capital interested, and arrangements made for weekly refrigerated shipping service. These difficulties, particularly the labor problem, may prove insuperable, but the possibilities of the scheme appear sufficient to justify discussions with a fruit shipping company. In connection with the labor problem, immigration might be considered. A banana plantation in a new area might offer an opportunity for a new approach to an enlightened immigration policy combined with a cooperative agricultural development.

Citrus. The growing of citrus, like that of bananas, can be considerably extended if a dependable export market for the fruit, and also for fruit juice, can be developed. Only about 1,200 hectares of citrus are now in full production. Production per tree is 600 fruit on the best plantations and this could easily be increased with more knowledge, better drainage, spraying and, on light soils, fertilizing.

Since the war the Paramaribo Experimental Station has demonstrated that good quality oranges, rich in sweet juice and of fairly good appearance, can be grown. Since 1945, 300,000 young trees have been distributed, i.e. sufficient for over 1,000 hectares. As elsewhere in equatorial coastal regions, the oranges are green or greenish-yellow when ripe but they can be tinted artificially when going through the packing house. If protected against rustmite (by spraying the trees with "wetttable" sulphur), the appearance of the fruit is still further improved. Above all, the fruit must be protected against storage rot and this can be effectively done by dipping the fruit in Dowiecide A. Stem-end rot is not troublesome on the tree but develops rapidly in storage. In addition to chemical treatment, the storage of the fruit in cold rooms during the long voyage to Europe is essential. When cooled to below 10° C. the percentage of rot in four weeks is only 1% of the fruit affected. Improved appearance and quality would probably bring double the present price in the Netherlands.

Fertilizers, when needed, improve the quality of the fruit and reduce stem-end rot. On sandy soils fertilizers are essential and zinc must be applied. Complete fertilizers (NPK) plus manganese are needed on these soils and may increase the crop yield many times. In the clay

soils no zinc or manganese is required but phosphate may be.

The citrus trees throughout Surinam seem to be lacking in foliage. This may very possibly be due to a lack of nitrogen caused by poor drainage conditions in the heavy soils. It is significant that, on one plantation where the level of the drains between the rows of citrus was lowered and kept low by pumping after every heavy rain, there was a marked improvement in the foliage of the trees in a short time.

The chief local orange variety is known as Kwatta 202. It is high in sugar and low in citric acid (content of Vitamin C is not known). The local grapefruit is very good, sweet rather than sharp; and a very good mandarin, King Variety, is grown.

The citrus problem is now primarily a marketing problem. This is discussed elsewhere.

Sugar Cane. Sugar should do very well on the Surinam coast. The froghopper pest can now be controlled by chemical dusting; varieties resistant to "leaf scald," a serious bacterial disease, are now available; and yields can be considerably increased by the use of sulphate of ammonia. Furthermore, Surinam is entitled to obtain the newest cane varieties produced as a result of the British West Indies research organization working at Barbados. In British Guiana, sugar cane yields 3.2 tons per acre. There is no reason why Surinam yields could not quickly be raised to at least two tons per acre, equivalent to five tons per hectare.

The chief and haunting problem is that of labor. Wages are low in comparison with those paid in industry in Surinam. At least two lots of immigrants from the Caribbean (St. Lucia and Barbados) returned home after working at Marienburg only a few weeks. Because of

the labor shortage, the manager of Marienburg is anxious to mechanize his crop as much as possible. As the cane fields were not laid out for mechanization and have numerous ditches, this is not easily accomplished. The Mission had the impression that Marienburg had been starved for money and for scientific work.

If the Marienburg mill is to be used effectively, the area under cane must be increased to keep the mill working for a longer period. The mill also needs to be improved and further mechanized. But the labor problem remains. Labor must be attracted if more cane is to be planted and more sugar per hectare to be produced.

It is not suggested that Surinam should attempt to become a considerable sugar-producing area again since it would probably be unable to compete in the world markets. More efficient production could, however, make the country self-sufficient in sugar with a small surplus for export.

Cacao. The heavy, generally badly drained, soils in which cacao is found are such a contrast to the "deep, well-drained friable loams" which agriculturists usually recommend for tree crops that it is surprising that the cacao tree does so well in Surinam. The Mission saw trees 40 and 50 years old—witch-broom-infected, it is sad to add—and there is no doubt that the tree grows well on the coastal plain. Its root systems have adapted themselves to a heavy clay with barely two to three feet of dry soil in the dry season above the permanently wet zone which we may crudely call a "water table." Instead of the usual long, main taproot, the cacao tree here sends out fairly strong laterals with numerous fibrous roots or has a root system composed almost entirely of a mat of fibrous roots. In those cases where deeper roots had penetrated the water table, the roots had died.

The importance of drainage is obvious—another foot or so of dry soil above the water table would be very advantageous. Mulching is recommended to reduce the drying out of the soils during the dry seasons.

Cacao is attacked by witch broom, black-pod, “die-back” and insect thrips—all diseases which have been brought under control in other countries. If all growers cooperate, witch broom can unquestionably be controlled. The right amount of shade given both by the shade trees and by cacao trees themselves is important for the health and productivity of the trees. Although for 150 years cacao was planted without shade, it is now always grown under the shade of the Koffie-mama tree.

There are now strains of cacao which are resistant to witch broom, but even more important, high-yielding strains have been developed by the Imperial College of Tropical Agriculture in Trinidad. If these high-yielding strains can be given the right conditions for their growth and production, cacao could become a profitable new crop for the small farmer, for the old plantations and perhaps for new estates.

Recent work at the Paramaribo Experimental Station, following on the introduction of high-yielding clones from Trinidad, has rapidly multiplied these strains and there has been a speedy distribution of the rooted cuttings. About 150,000 young plants from cuttings were distributed in 1951 and 200,000 will be sent out in 1952. At 500 trees to the hectare, this should plant up about 600 hectares which will be giving cacao beans in about three years. The rate of production of cuttings could be doubled to plant up 600-800 hectares per annum. The rooted cuttings cost 40¢ each. Many of the plantations were visited and the young trees were vigorous, except perhaps where sufficient shade had not been provided. It is usual

to plant "low shade" and "tall shade" before setting out the cacao trees.

High-yielding cacao may give 1,200-1,500 kilos per hectare, compared with the present Surinam yield of 200-250 kilos and the Gold Coast yield of 600-700. With the constant support of the Scientific Section of the Department of Agriculture, cacao may become one of the hopes of Surinam.

African Oil Palm (Elaeis guineensis). Next to the coconut, the African oil palm is the world's chief source of supply of vegetable oil. In 1941, the United States alone consumed 300,000 tons of coconut oil and 135,000 tons of palm and palm kernel oil. The production per acre of oil from the African oil palm is about twice the production from coconut palms and ten times that from groundnuts.

In Sumatra a good production of oil from trees grown with pedigree seed is five tons per hectare plus one ton of kernels. In West Africa, under "natural" forest conditions and primitive methods of obtaining the oil, the yield is often only 200-300 kilos per hectare.

African oil palms are being grown successfully in Brazil, in Central America and in a wide area of the Caribbean, and there is no reason to doubt that they will also grow in Surinam. Native palms bearing oil seed are widely scattered through Surinam's forests and mention has already been made of the patch of African oil palms growing near Lelydorp. Seed of known productivity has recently been imported from Sumatra and West Africa—20,000 seeds from Sumatra (which should give 14,000 seedlings) and 5,000 from West Africa. With 150 planted to the hectare, there should be 120 hectares of oil palms—presumably on varying soils—which should provide the

answer to many questions about prospects for the African oil palm in Surinam.

Conditions suitable for African oil palms are a warm climate, sea level, abundant sunshine and rainfall over 1,500 mm. with no marked dry period. The palm does well in deep, well-drained loams and it does not do well in heavy or swamp soils with poor drainage. (This description of the palm's requirements is taken from the Report of the recent Mission to Venezuela of the Food and Agriculture Organization to study oil seed production.) Except for the well-drained loams, the conditions in Surinam are very suitable. Certainly the African oil palm can do well on the light, well-drained soils such as are found at Lelydorp, if fertilizers are used; it is not known how it will produce in the heavy clay soils but probably, once again, drainage will be the controlling factor.

The African oil palm is not free from enemies. Borers attack and kill the trees and there is a serious wilt disease in both West Africa and Surinam due to *Fusarium oxysporum*. However, the variety of oil palms doing well in Surinam encourages the hope that severe attacks of disease or pest can be avoided. Some pest troubles are, of course, to be expected but if they are dealt with by scientific methods as they arise, they can be kept from becoming too serious.

The FAO Mission to Venezuela recommended that the African oil palm be planted up there on a large scale. It also recommended that the American oil palm, *Corozo oleifera* (frequently referred to as *Elais melanococca*), be planted up on an experimental scale. There may be a place for this or other local palms on the poorer soils of Surinam where little else will grow.

The modern Pioneer Mill (which is being erected in

West Africa in large numbers) can turn out 240 tons of oil and 150 tons of kernel per annum. It costs (1950) £5,000-6,000. One mill could deal with perhaps half the area of palms to be grown from present seed supplies.

F. LIVESTOCK

Cattle. There are about 30,000 cattle in Surinam. Of these, about 4,000 are dairy cattle and the remainder are used as draft animals and for beef. The cattle are mostly native herds, although from time to time Dutch farmers at Kwatta have brought in a few European cattle. The beef weight of the local cattle is only a little over 100 kilos, the milk yield only three liters a day. Only a third of the minimum amount of fresh milk required is produced locally; 500 tons of milk and other dairy products were imported in 1950.

European breeds are ill suited for wet tropical conditions. For them, the optimum temperature for both production of milk and reproduction is about 10° C (50° F); they suffer considerably when kept under conditions of high temperature and high humidity with no cooling off at night and with no cool season. In recent years, the factors that make for adaptation to tropical conditions—color, skin, hair, bodyweight, type—have been under study in several countries and progress has been made in developing tropical dairy herds.

With the constant wet, swampy conditions in the polders during the rainy seasons, the use of water buffaloes for milk, beef and draft animals would be advantageous. Although apparently the water buffalo is not liked and its meat is regarded as inferior in Surinam, consideration of its use in the coastal area would seem desirable.

A new animal husbandry station has recently been

built near Paramaribo. Areas have been planted up with various tropical grasses and a section for the study of pasture grasses has been started at the Experimental Station. In the near future rice by-products, which are very rich in protein and fat, should be available in quantity for feeding.

There are few serious livestock diseases—remarkably few for the wet tropics.

It has been suggested that cattle would do well in the open grassed patches of the sandy savannah zone. These grasses are poor and little has been done so far to follow up the suggestion because so much remains to be done in the coastal plain.

Pigs. The Mission learned very little about pigs in Surinam except that their bacon was unattractive, probably due to the fact that they are fed largely on copra residues which contain too much oil. There are about 7,000 pigs in the country, half of which are in the coconut growing district of Coronie. Pigs will also be kept on the new farms at Lelydorp.

Conditions in the tropics are difficult for pigs as they suffer from the heat. Their food requirements, except for the requisite small quantity of animal protein (meat meal, tankage and fish waste), are well established and can readily be met in Surinam. As pigs are a very important source of animal protein, there is a place for them in a country of low protein production and consumption.

Berkshire, Large Black and Duroc Jersey pigs have been imported to improve the breed. In Indonesia the chief types of pigs are crosses between the small, dark Chinese pig and the European breeds; crosses of this type should be tried in Surinam.

G. THE PROJECTS

Most of the following projects were under consideration for inclusion in the Ten Year Program at the time of the Mission's visit to Surinam. Work on some of them has actually commenced, but most are still in the study stage and are far from being in definitive form. Other projects being considered may be added to the list or substituted for projects now on the list.

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|---------------------------------|---|--|
| 1. Saramacca (River) Polder | } | Under the direction of the Bureau of Rural Development |
| 2. Kwatta Reorganization | | |
| 3. Gromingen Reorganization | | |
| 4. Tout Lui Fant Reorganization | | |
| 5. Coronie Expansion | } | Directed or managed by the Stichting |
| 6. Saramacca Canal | | |
| 7. Para | | |
| 8. Wageningen | | |
| 9. Lelydorp | | |
| 10. Slootwijk | | |
| 11. Fisheries | | |
| 12. Cattle breeding | | |
| 13. Agricultural Research | | |

1. SARAMACCA (RIVER) POLDER

It has already been pointed out that the rice yields in the Saramacca River area are the highest in Surinam. New polders and sluices are required to improve drainage conditions. The crops to be grown are rice, soya and pastures (for dairying). This project, although not fully worked out, is plainly important.

2. KWATTA REORGANIZATION

Kwatta is a dairying area adjoining Paramaribo. Pas-

tures are very poor owing to lack of drainage and are so wet in the rainy seasons that cattle paddle about disconsolately and go down badly in condition. Half the area is occupied by Hindustani on two-hectare farms, a third by Dutch on 11-hectare farms, and the remainder by Creoles and Indonesians. The total area is over 2,300 hectares of which 1,000 is pasture and nearly as much is under rice. Although the soils are waterlogged, they are fertile and could be made far more productive merely by improving drainage. Topographical and soil surveys, as well as a social and agricultural economic survey, have already been made. Now the land needs to be redistributed in accordance with these surveys and new regional drainage canals should be dug.

This sound and very necessary project is already under way and is scheduled for completion in 1952.

3. GRONINGEN REORGANIZATION

There is an old polder of about 1,500 hectares along the Saramacca River which is lying largely uncultivated and covered with forest. The object of the scheme is to redesign the whole polder with new drainage canals and to lay out farms with regard to the different soil types. A large part of the 1,500 hectares will be allotted to 35 young Dutch farmers from the Kwatta area, each of whom will get a farm of 20 hectares. There will also be 75 small farms of four hectares each which will be allotted to Indonesians and 25 improved farms of 10 hectares each in the areas presently occupied. The 20-hectare farms will be divided into eight hectares of rice (alternating with soya) on clay soil, seven hectares of pasture on sandy soil and five hectares of cacao, also on sandy soil. On the improved pasture it should be

possible to keep 14 head of selected milk cows. The small Indonesian farms will be devoted to rice and soya.

The estimated cost per hectare of the reorganization of this polder for small and mechanized farms is high and no explanation of the high figure is given in the project description; presumably it is due to the fact that part of the area has yet to be empoldered and a large part is still under tall forest.

The reorganization of old polders of this type is a most important matter since there are large areas under similar conditions. Through "land utilization" methods and improvement of the drainage and irrigation systems, these areas can be made capable of profitable production.

4. TOUT LUI FAUT REORGANIZATION

The rehabilitation of the Tout Lui Faut area, southeast of Paramaribo on the Suriname River, is an important project as it is typical of much of the agricultural land around that River. Of the total area of 6,000 hectares, 4,400 are in the young coastal plain and 1,600 are in the old coastal plain. Only the area in the young coastal plain is being developed under this project, leaving the old coastal area for later treatment. A thousand farms of four hectares each are projected. The scheme entails first of all a better drainage system (draining the surplus water into the river) in order to stop the recurrent flooding of the farms; it involves, in addition, a reallocation of land. The project is already under way and large canals are being cut.

5. CORONIE EXPANSION

The increasing population of this isolated coastal settlement makes it necessary to expand the area under crop.

Fortunately a further sand ridge can be devoted to coconuts and there is also a large swamp area which can be put under rice.

It has already been noted that rice in Surinam requires about 120 man days of labor per hectare and coconuts 60 man days per hectare. On this basis a man should be able, with some help from his family, to farm four hectares (three of coconuts and one of rice), provided he has a common pasturage on which to graze his draft oxen.

The project contemplates extension of the coconut area over a ten-year period by nearly 3,000 hectares, and of the rice areas by 2,000 hectares, with 700 hectares of grazing land where the draft cattle can be left when not working. The facilities of the area also badly need improving; better water supplies, lighting and some central buildings are the least that should be supplied.

The yields of coconuts and rice per hectare are well established. Coconuts in Coronie are remarkably free from disease and pests; by using nuts from only the best yielding trees, the present production of 7,000 nuts per hectare could easily be increased to 10,000. The copra produced in the enlarged area will be expressed in a modern factory. The rice should be milled locally so that the valuable by-products can be fed to the pigs and cattle.

At present pigs are fed on copra residues. In addition to rice bran they should be given sweet potatoes and a little animal protein. When the scheme is in full production it is expected that 8,000 pigs will be slaughtered every year.

This is a most desirable project and should be speeded up and so laid out that the best possible drainage conditions are assured. With good drainage, soya could be grown in the rice areas in the short rains as a second

crop, although there was no mention of this in the project description.

6. SARAMACCA CANAL

When the Saramacca River is high in flood, much of the Saramacca Canal area can no longer be drained effectively. Soil and crops suffer as a consequence. Part of the area affected is in the Kwatta district and comes under the Kwatta project.

The canal must be widened for shipping, as well as deepened for the improvement of drainage. Existing farms on 2,000 hectares of paddy fields and on 500 hectares of sand ridge soil will be improved and these areas will be increased by 1,000 hectares and 350 hectares respectively. This development will permit 350 hectares of sand ridge soil to grow cacao and 500 hectares of similar soils to be devoted to pasture for 1,000 milking cows. In addition, the new 1,000-hectare clay area will be put under rice with soya. A large part of the cost of improving the canal will be charged to transport. The cost per hectare of the project appears reasonable and the Mission believes that the project should be carried out.

7. PARA

Little need be said of this project as it is a simple, desirable and inexpensive attempt to encourage some of the rural Creoles to become settled farmers. A group of them around Para have shown an inclination to take to agriculture and the object of this project is to establish cacao farms on the light soils of that district. Plans call for 300 cacao farms of four hectares each to be established in forest clearings. It would seem wiser to plant the trees in standing forest, with shade trees gradually

replacing forest trees, as is being done at Lelydorp. The workers will be paid wages while the cacao is being established. Bananas and vegetables should be grown on the cleared areas during the four or five years' interval before the cacao trees are producing a reasonable amount of pods.

This project is desirable both from the agricultural standpoint and from the standpoint of attracting the local Creoles (and perhaps some from the city) into settled agriculture.

8. WAGENINGEN

The history of this project for the mechanized production of rice and the Mission's views concerning the scale of the project in the light of the economic and technical factors involved are set forth in some detail in the main Report.* This discussion is therefore limited to an examination of the technical aspects of the project and to those factors in particular which led to the Mission's conclusion that the project should be regarded as still experimental.

The Wageningen project is located near Nickerie on the north bank of the Nickerie River. The site, which consists of representative clay soils, was chosen because at this junction of the two rivers the water is never salt and therefore irrigation can always be relied upon. Rice, the main crop, will be grown during the long rains, and soya or maize during the short rains. Areas will also be allotted to pastures. The size of the individual farm units, to be cultivated by carefully selected farmers from the Netherlands, is yet to be decided and, as explained in the main Report, the total size of the project is still under consideration.

*See Chapter III, pp. 40-45.

Rice prices today are high and rice growing on the small farms is very profitable. The Wageningen Project has several advantages over smaller holdings:

1. It is based on river irrigation which is a much more reliable source of water, especially in a dry year, than the shallow swamps.

2. It will use pumps to insure complete control of water.

3. It will have experienced farmers to demonstrate for the first time in Surinam the use of expensive and heavy machines.

4. The promoters believe in research work.

On the other hand, it is not necessarily correct to assume, as have most of the reports and articles which have been written about Wageningen, that, if the peasant could grow 3,000 kilos of paddy per hectare, a scientifically directed, mechanized enterprise could do much more. In British Guiana, for example, the yield per hectare on a 2,000-hectare mechanized farm is lower than that on a good hand-grown rice farm. The problem is twofold: first, achieving a high rate of mechanical efficiency, and second, finding or producing a type of rice which will give a high yield and can also be readily harvested by machine. Thus a high degree of mechanical skill and expert tropical research are required. This is a combination to which the Dutch have shown themselves particularly well adapted. Nonetheless, it is likely to take a few years to bring the cost of mechanized production down to that of hand-grown rice.

To justify the costs of mechanization, machinery must have a long life operating not less than 1,000 hours per year and should make it unnecessary to use more than a negligible amount of hand labor, if any at all. In this connection, mechanical control of weeds is all important.

As noted earlier, in the experiments on mechanized rice production at the Prince Bernhard polder this has proved to be a stubborn problem. Last year, for example, in addition to three machine man hours, 52 hours of hand labor per hectare were spent in killing weeds. Pre-emergence applications of selective weed-killers and a variety of other methods are now being studied.

The second big problem is finding or producing a high-yielding type of rice which can be harvested by combine. At present, the two types of rice being grown at Nickerie and the Prince Bernhard polder are Skrivemankoti and Rexora. High-yielding Skrivemankoti is very difficult to harvest mechanically for it lodges badly and the grain shatters easily with consequent loss at harvest time. Its tendency to sun cracks means a large percentage of broken rice, though this percentage could be reduced by parboiling. Rexora yields are 20-22% smaller but otherwise it is an excellent all-round rice. As five or six hours have been required to combine one hectare of Skrivemankoti as against two hours for one hectare of Rexora, it has been decided to discard Skrivemankoti and to use Rexora for the time being for the mechanized areas.

Tied in with this problem is the question of the cause of the rather substantial variations in the yields of different fields. As noted earlier, it may take some years of experimentation to discover whether the variations are due to inherent soil differences or some other factor. There is, however, already some evidence that yields after soya will probably be higher than after a bare fallow (weeds). On the basis of experience in the Prince Bernhard polder, it is estimated that 7,000 hectares at Wageningen (of which 1,000 would be under grass) could yield approximately 15,000 tons of paddy rice, in addition to 7,000 tons of soya beans.

The scheme is sound so far as site, soil, crops and water control are concerned. Initial installation of pumping facilities for a large area would make the cost per hectare somewhat less than for a smaller area. On the other hand, the experience and knowledge gained in the first few years' working of a smaller area may make it possible to realize substantial savings in later extensions.

For example, the experimental work now being done in clearing the more heavily timbered river front areas may well lead to cheaper methods of clearing. If the tree-poisoning method is successful, then the two frontal areas which drain naturally into the river can be brought in at less cost per hectare for drainage and irrigation canals. Mechanization of these two areas of 2,000 hectares each might be the best way of extending the project area.

There are, of course, as pointed out in the main Report, other social and economic factors involved in a decision as to the scale of investment in the Wageningen project. From the purely technical standpoint, it is an undertaking of unusual interest and can have a far-reaching influence on Surinam's agricultural development. Until, however, there is greater assurance that the technical obstacles can be successfully overcome, it must be regarded as essentially experimental in character.

9. THE LELYDORP PLAN

As already stated, the Lelydorp project is an experiment being conducted just south of Paramaribo to determine the practicability of opening large areas of the old coastal plain to agricultural development.

According to present plans, the farms are to be leased on a hereditary basis at a low rental and all produce is

to be handled on a cooperative basis, including transport, processing and export.

The area cleared at the end of 1951 was about 330 hectares and the project, as recently revised, has been reduced to these dimensions. There is much to be learned from operating this area and there is no need to develop immediately 125 farms as first suggested; 25 or less are sufficient until techniques of clearing and establishment and cropping have been worked out. This project is not a commercial enterprise compared with, say, Coronie, where there is much experience on which estimates can be reliably based, although it is fully as important as Coronie when considering the future of Surinam.

When the scheme was first drawn up, it was thought that a farmer with some assistance from his family would be able to work 16 hectares of mixed crops. It was later realized that the average farmer would probably not be capable of dealing with 16 hectares of the several different types of cultivation suggested (10 in all, although not all on each farm). The original scheme has accordingly been revised and it is now suggested that the largest farms should be reduced to 11 hectares and that most of that area be devoted to tree crops.

Because the soils in the Lelydorp area are light, it is of the utmost importance that, wherever possible, the top soil developed under forest, even secondary or degraded forests, should be maintained. In banana plantations in Central America and in the rubber plantations of Malaya, by poisoning the trees the forest is changed over into plantations with, most important of all, minimum disturbance of the soil. The poisoned trees are removed gradually or left to rot while the banana or rubber trees are growing. This method not only preserves the top soil,

but is also much cheaper than drastic clearing; wherever possible it is being followed at Lelydorp.

Trees such as cacao need to be established in shade; this is being done at Lelydorp by clearing by hand small patches a meter or so wide in forest areas without removal of the trees. The erythrina (*Erythrina glauca*) shade tree is planted alongside the young cacao, together with bananas as quick growing shade. Oil palms and coconuts can be grown without shade.

In addition to tree crops, bananas and plantains are to be grown in the early days of the establishment of cacao and other tree crops; and bananas will also be grown in association with coconuts. In the original scheme five hectares out of the 16 on each farm were to be under annual food crops, but annuals are not included in the revised scheme. The growth of annuals would certainly be worthwhile as an experiment, but they will require a good deal of hand labor (especially at sowing time, which is a difficult peak period for labor) and the essential cultivation operations are likely to be very destructive of the topsoil and its fertility. Preference should be given to annuals that cover the ground more or less completely for a large part of their growing season, for example, cover crops such as cowpeas and the runner type of groundnuts; crops such as maize and upland rice should be regarded as more dangerous. Where possible leguminous cover crops should be chopped up and plowed into the top few inches of soil, some being left on top where this does not interfere with the next seeding. It has been suggested that two leguminous crops and one cereal should be grown per year.

In the original scheme four hectares were to be allotted to pasture. In the new scheme one hectare only is allotted to pasture, but 1½ hectares are to be under forage

crops. If fertility is to be maintained with annual crops, it will probably be necessary to rotate them with pasture grasses after two or three years and to keep cattle; the farmyard manure would then be used either on the pastures or on the annual crops. The pastures must be fertilized generously and treated as a valuable and intensive crop.

It will be seen from the above that the scheme is a very flexible one. The layout of the farms and the areas to be allotted to the various crops will vary according to the types of soil on each farm. At this stage it is difficult to estimate the production per hectare. If oil palms of a highly productive type are successful and if cacao grown from the high-yielding Trinidad types is also successful, then one would be very hopeful of the success of this courageous experiment. Much will depend on these two tree crops, and it is interesting to note that in the revised scheme they will cover more than half the 11 hectares on each farm. The success of citrus will depend largely on whether citrus can be successfully exported, as fruit or as juice. Coffee is not included among the tree crops to be grown at Lelydorp.

TABLE II
COMPARISON OF THE ORIGINAL AND REVISED SCHEMES
FOR LELYDORP

	<i>Hectares per Farm</i>	
	<i>Original Scheme</i>	<i>Revised Scheme</i>
Coconuts	1	1
Oil Palm	2	3
Citrus	1	1
Cacao	2	3
Groundnuts	1	—
Rice and Soya	2	—

Bananas	1	(3) with cacao
Maize	1	—
Tubers	1	—
Pastures	4	1
Pineapples	—	(2) with cacao
Forage	—	1½
Vegetables	—	½
	<hr/>	<hr/>
	16	11

One would at first expect that the cost of preparing a farm at Lelydorp would be much less than that of empoldering the same area for rice. In fact, however, the cost of Lelydorp is about Sf. 1,000 per hectare, twice as much as the cost per hectare of a farm in a large polder at Nickerie. In the case of Lelydorp the land is cleared and put under crop by the authorities, whereas at Nickerie the cost does not include any clearing or planting, both of which are done by the farmer, so the comparison is unfair. Again, at Nickerie the farmers who take up holdings in the empoldered rice areas have already had farming experience. At Lelydorp, on the other hand, the farmers are to be trained while working for wages on the project until they have shown they can take over the farms. The scheme may succeed or fail according to the type of persons chosen for the first few farms.

At the time of the Mission's visit, the planted areas looked good—many crops had been successfully established although the soil on the area cleared by bulldozers and windrowed had suffered considerably. The establishment of cacao in standing forest was a sound piece of work. Altogether a good first year's work had been done and much had been learned. A wider range of small to medium tractors, plows and the like should be avail-

able so that the best machines can be chosen and the workers can become accustomed to their use.

There is no need to utilize the poorest soils except as small experimental areas. Given legumes, pasture grasses and fertilizers, one need not despair of improving the fertility of the poorest soils—but this is an expensive study and should not be allowed to divert effort from the exploitation of the better soils. The lighter soils, especially on slopes, are liable to erosion. With torrential rains it is difficult to prevent the separation and floating away of the finer particles of humus and colloids and with them the stored fertility which has taken decades to produce. Working according to contours and with ridged crops whenever possible should be standard practice where the forest cover has to be removed and the soil plowed. Along the drainage lines it may be best to grow elephant grass or other deep-rooting or soil-binding grasses. Mulching with vegetable debris is advisable for various reasons.

If a technique can be found by which fertility can be not only maintained but enhanced, much will have been learned which can be applied to very large areas of light soils. The main principles are: (1) use of pastures with mixed or complete fertilizers, rotating the pastures with annuals; (2) use of legumes with rock phosphate; (3) minimum disturbance of soils; (4) maximum crop covering of soils; (5) use of mixed crops; and (6) working on contours with crops on ridges. These factors are fully appreciated by those in charge of the work; they are stressed here because it is important not to push on with the sowing of large areas of annuals until these problems have been solved.

Little is known about fertilizers in these soils and a study of their use should be undertaken without delay.

Especially with tree crops, careful and prolonged scientific experimentation is required. Maximum use should be made of rock phosphate combined with legumes to add phosphate and nitrogen to the soil. Potash will also probably be needed. Work at the Paramaribo Experimental Station has shown that there are deficiencies of minor elements in some of Surinam's sandy soils which have a marked effect on citrus and may reduce the yield of other crops.

10. SLOOTWIJK

Slootwijk is a 3,500 hectare abandoned sugar plantation on the upper Commewijne River, on which experimental work is being conducted under the supervision of the Stichting, to determine whether either totally or partially abandoned plantations can be brought back to life and made profitably productive. In all, there are 30,000 hectares of such plantations on good clay soil. Their soil areas are divided up into long, narrow beds separated by deep drains and transport canals. Such areas are difficult to mechanize, yet if mechanization is not possible and hand labor is not available, the plantations must close down. The Slootwijk project envisages a thorough study of the possibilities of mechanization and, if these are promising, of the immigration of labor.

Slootwijk is below the brack-water line during the dry season and it presumably cannot be considered as an irrigation area although a certain amount of water would always be available for small areas of 50 to 100 hectares such as are contemplated in this project.

Sugar cane and groundnuts on plantation scale are being grown elsewhere in Surinam by private interests and these are not being studied at Slootwijk. Other crops

can be roughly divided into annuals and tree crops; the former need much labor at sowing time and the latter at harvest. Coffee has been grown in the past at Slootwijk, chiefly *Liberica* coffee in recent years. Neglected during the war and postwar years, the trees have grown to a great height so that they are difficult to pick and the yield has fallen from 700 to 250 kilos per hectare. Experiments with *Canephora (Robusta)* are planned. There is a coffee factory at Slootwijk capable of dealing with 40-50 tons a year.

If annual crops are to be grown, they must be mechanized. This is not impossible but it will require a good deal of investigation and probably adaptation of the beds. Moreover, it is very doubtful that machines can accomplish the weeding necessary in the heavy rainy seasons at Slootwijk. In the sugar areas of British Guiana where drainage and irrigation canals are also used, the McLaren outfit is employed—i.e., a cable drawing a plow is suspended between two diesel engines mounted on barges in parallel canals. When attached to a high-wheeled (steel wheels) carriage, the plow or sub-soiler crosses drains four feet deep and four feet wide with ease.

While this is a possibility, it might be wiser to grow high value perennials such as cacao and oil palms which do not make heavy seasonal or peak demands on labor. Basically, it is the problem of labor supply which is all important to the rejuvenation of the old plantations. Only if Slootwijk can grow valuable crops can it afford to obtain the necessary labor.

The crops suggested for the Slootwijk experiment are coffee, cacao, coconuts, oil palms, fibers and citronella grass. Plantings will be made of various native oil-bearing palms. The fibers to be tried are Ramie, Urena, Hibiscus and Corchorus (jute). The project is entirely

experimental and quite small, using five plots of 10 hectares each. There is no estimate of production.

11. THE FISHERIES PROJECT

Supplies of fresh fish are insufficient to feed the population of Paramaribo and the prices are very high. The total local supply is only 400 tons per year, about one pound per head per month. The total fish consumed is over 1,000 tons, the difference being made up by dried imported fish. Investigation has shown that the quickest way to increase supplies of fresh fish is to develop artificial inland water fisheries rather than sea fishing or river fishing.

There is an area adjoining the coast to the north of the Matapicca River, which, being below sea level, can be inundated with brackish water, as the high tide floods into the adjoining creeks.

About 1,200 hectares of this flooded area have been used for native fishing but with poor results. A much larger area, nearly 4,000 hectares including the above 1,200 hectares, is now to be developed at the rate of 450 hectares per year, using modern scientific methods based on experience in Indonesia, the Philippines and other countries. Feeder canals, sluices and fishgates will be constructed. Production costs have been figured on the basis of a catch of 250 kilos per hectare of edible fish which would be refrigerated and taken by river transport to Paramaribo to be sold at 40¢ per kilo—much less than half the present price. Annual production would then total Sf. 100 per hectare. In time, however, it is thought that actual production is likely to be 400 kilos per hectare.

The ponds are very shallow except for deep ditches on the borders. The clay soil containing a few percent

of organic matter is suitable for the growth of a mat of blue-green algae provided the right conditions are maintained. The feeding habits of the chief varieties of fish are known, and it has been found that the use of green manure (the coarse grasses of the ponds) at the rate of two tons per hectare enhances fish production. Artificial fertilizers have not given positive results in brack-water fish production. With the correct degree of salinity there is a high production of myxophyceae (blue-green algae) and diatoms on which fish feed. Periodically, perhaps three or four times a year, the soil must be dried up. One essential precaution is to keep down the number of carnivorous fish which are liable to get into the ponds with the incoming young fish.

The first year's work has shown that the expected amount of fish of marketable size can be produced. Commercial quantities of shrimp are also caught. With more knowledge of the local conditions this project should be very successful. Some effort may be needed, however, to persuade the people of Paramaribo to prefer the kinds of fish available.

An essential part of the project is the establishment of a refrigerated store on the site and another at the fish market in Paramaribo (see Technical Appendix No. 6). The production of fish meal and the possibility of canning are being considered but their practicality needs to be carefully examined. It should be added that far more can be done to increase fish production than is visualized in this project description.

12. CATTLE BREEDING

Present plans call for milk production to be a little more than doubled over a ten-year period. This is ob-

viously too small a scheme and should be revised.

In addition to better drainage and pastures, improvement is to be effected by crossing Zebu cows with Friesland bulls; later artificial insemination will be used. There are already five Friesland bulls and a few Zebu cows, and more bulls and cows will be imported. The Dutch predilection for their famous milking Friesian cattle no doubt determined the choice of Friesian bulls. Zebu cows are well adapted to hot tropical conditions but do not do well in the badly drained, waterlogged pastures of the polder areas. Good types of Zebu have excellent milk production; crossing with Friesland and then back to the Zebu side should produce a good type of dairy animal. It should be emphasized, however, that the breeding of the best type of beast is a long continued process of selection requiring expert knowledge.

Since there is at present no livestock breeder in Surinam, it would be advisable to call in an expert from the neighboring tropics with several years' experience to advise on the best scheme of breeding. He will probably advise that a tropical cattle breeder must be added to the staff of the Department of Agriculture.

Attention should be called to the work done at Moengo by Alcoa. Here, as a result of selection, the native breed cows are already giving over six liters of milk a day when fed solely on local foodstuffs and grasses. In other tropical countries native cattle giving about 900 kilos of milk per lactation have by breeding and selection alone been brought up to over 2,000 kilos. Work on native cattle, though slow, would produce valuable results. More should be done with local feeding stuffs as well as with improved grasses.

The project is a very desirable one and should be speeded up considerably. As it stands, it is not sufficient-

ly courageous. One addition is certainly necessary—there must be some way of collecting milk from the farms. Present methods are wasteful and inefficient. The milk should be pasteurized or sterilized and cooled in Paramaribo.

To improve the beef cattle a few Zebu bulls will also be imported. An experimental ranch will be started in the Saramacca Polder on 250 hectares, and pasture plants and pasture management are to be the subject of study by an expert at the Experimental Station.

Large-scale cattle ranching in the savannah belt may be possible but will have to wait until further studies have been made of the grasses and soils in the areas available.

13. AGRICULTURAL RESEARCH AND EXTENSION WORK

The research work of the Department of Agriculture is centered at the Paramaribo Agricultural Experimental Station. Before 1948 the staff of the station was totally inadequate and even now needs considerable expansion. In addition to the Director, the staff includes:

1 Pedologist	}	All fully trained university men
1 Agriculturist		
1 Entomologist		
1 Plant Pathologist		
1 Grassland Specialist		
1 Chemist		
5 Medium grade technical staff—for work on soils and crop investigation		
25 Lower grade staff		

In view of the large-scale developments covering several crops and soils that are being undertaken, this staff needs to be substantially increased in order to give more attention to (1) soil surveys and other soil studies includ-

ing drainage problems; (2) crop research including work on the new cacao types, oil palms and other crops new to Surinam; (3) grassland and pasture problems; (4) methods of pest control; (5) the processing of agricultural products; (6) cattle breeding; and (7) mechanization.

Supplementary Personnel Needed for Agricultural Research. The present staff would be greatly strengthened by additional personnel as follows:

	<i>University educated personnel</i>	<i>Personnel with secondary education</i>	<i>Personnel with elementary education</i>
1. Soil Research	1	1	2
2. Pests (Entomologist)	1	2	4
3. Technology (Processing) ..	1	1	
4. Spraying Specialist	1		3
5. Specialist in Agricultural Engineering	1	1	2
6. Marketing	1		1
7. Cattle Breeding	1		1
8. Chemist	1	2	2
	—	—	—
	8	7	15

Soil Research. Soil survey and research should be extended to the whole of the coastal plain and the Zanderij area. Detailed studies are required on the correlation between the height and the movement of the soil water on the one hand, and the yielding capacity of the crop on the other; and on the fertilizer requirements of the various soils and the best methods of maintaining fertility.

Entomology. The expansion of agriculture and the use of new insecticides will require more intensive entomological research. Over a period of many years a good

deal of data has already been collected which needs to be studied and written up.

Technology (Processing). One technologist is not sufficient for the many new processing problems on which work is needed. Among them are the drying, storage and processing of a variety of agricultural products, including fiber plants, oil seeds, citrus, banana products, maize and casava flour.

Spraying Specialist. A specialist is needed to study and test the application of the various chemicals used for spraying and dusting, and to determine the machinery and apparatus needed to combat insects, fungi and weeds.

Agricultural Machines. A specialist is needed to determine which machines are most economical and labor saving for the various crops and soil types.

Marketing. Expansion of exports will make it important to have an official acquainted with marketing problems, including packing, shipping, freights and tariffs.

Cattle Breeding. Surinam has no specialist in the field of cattle breeding, which is the most important task in the livestock field.

Chemist. In connection with the expansion of soil research and technological research in the processing field, a second chemist is necessary.

The Extension Service. The Mission saw too little of the extension service of the Department of Agriculture to report on its effectiveness. It was apparent, however, that extension work has received far more attention than research. The extension service now has seven officers with Agricultural College training. They are supported by two Chief Assistants for Field Experiments and seven Assistants. There are also 27 foremen. This is a considerable organization considering the small area under crop.

Research work and extension work must be carried on concurrently. It is unwise and unprofitable for either section to be far ahead, for this is a team job. Expansion of research staff and facilities should enhance the value of extension work. As the research program begins to show results and as the area under cultivation increases, the activities and staff of the extension service will also need to expand.

FORESTRY

A. FOREST RESOURCES AND THE TIMBER INDUSTRY

1. FOREST RESOURCES

THE FORESTS OF SURINAM constitute one of its prime resources. They are both vast in extent and complex in composition. Aerial photographs indicate that 4.5 million of the 6 million hectares in the northern area are forested. The 8 million hectares to the south are also heavily forested, but these have been little explored. No reliable estimate of the total timber stand is available, but the allowable annual cut has been authoritatively estimated at "2 million cubic meters for the 4 million hectares of the plains; for the hills at a multiple of this amount."¹ The present annual cut is only 130,000 cubic meters.

Forests of commercial importance are of two broad types—swamp and dry land. The swamp forests, mainly found in the large swamp areas of the coastal plain, yield Baboen (Banak) and Possentrie (Possumwood), both valuable for plywood, and Krappa (Andiroba), the Surinam mahogany and leading lumber wood. The dry land forest begins roughly at the head of navigation of the rivers. A belt of this area averaging about 24 kilome-

¹J. W. Gonggryp and Dr. D. Burger Hzn, *Bosbouwkundige Studien Over Suriname*, H. Veenman & Zonen, Wageningen, 1948.

ters in width has been demarcated by the Forest Service for enumeration and exploitation. The enumeration so far of 45,275 hectares shows an average stand of 90 cubic meters per hectare of 35 species which are presently utilized to some extent, and 154 cubic meters per hectare of all species. The timber in this mixed tropical forest ranges from the hard, toredo-resistant Basra Locus (Angelique) and Manbarklak to relatively soft Cedar and Simaruba (Bitterwood). Swamp species are found along the streams. The terrain is flat to gently rolling.

The savannah belt intervening between the two main timber forest types also contains scattered patches of mixed forest but, as these serve as protection forests for the water supply to the communities and agricultural areas on the young coastal plain below, no increase is contemplated in the rate at which they are presently being exploited. Fringes of Mora forest border the large rivers. Mora is the second most-used species in British Guiana and Trinidad, but it is as yet little used in Surinam.

2. FOREST ADMINISTRATION

In 1947, after 22 years of abandonment, the Surinam Forest Service was reactivated. In addition to the usual forestry activities of protection, enumeration, research, inspection and collection of stumpage royalty (currently at the rate established in 1912 of Sf. .5 per log), the Forest Service inspects and verifies export timber and collects export duties on logs. Its staff is small; it includes three academically trained forest officers, seven rangers and seven trainees with secondary education, and 34 forest guards and inspectors with primary education. The annual budget appropriation for the Service is Sf. 350,000.

3. THE TIMBER INDUSTRY

Logging. For over two centuries selective cutting has been carried out in the vicinity of the navigable rivers and the merchantable species are said to be largely exhausted by now up to a distance of three kilometers from the river banks. In 1950, 120 concessionaires held 267 concessions for cutting timber, most of them bordering the navigable rivers and totaling in all 1.257 million hectares. The Bush Negroes also have cutting rights. In 1950, 60% of the logs extracted came from concessions, 25% from Bush Negroes below the rapids, and 15% from above the rapids.

The Forest Service estimates that 75% of the logs are produced by Bush Negroes using primitive hand-logging methods. They use only axes for felling and cross-cutting operations. Logs for the sawmills are generally hewn by axe into squares, tapered at one end for dragging and bored with holes for drag-rope and rafting pins. These practices result in great wastage of wood. The squares are dragged to the river by hand. In Baboen swamp logging, round logs are hand-skidded to creeks which are dammed to raise the water level; then the logs are worked downstream and over the dams by hand.

Mechanized operations account for the remaining 25% of the log production. Steel-wheeled and crawler tractors are used for ground skidding. Crawler tractors with steel pans skid as much as six kilometers, a distance far too great for economical operation. By using motor trucks on earth roads the year round, one operator has reduced tractor-pan skidding to a maximum of one kilometer. One operator in the savannah forest also uses motor trucks and tractors. Tractor drivers include Creoles, East Indians and Bush Negroes. Supervisors of

mechanized operations report no difficulty in obtaining labor as the work is easier than hand logging.

The many large rivers, navigable for roughly 60 to 120 kilometers from the coast, provide cheap transportation for logs. The larger operations load sinker logs in barges or suspend them by slings from beams laid across boats or barges. Floaters are tied together in flat rafts, and barges and rafts are towed by tug boats. Timber extracted by Bush Negroes from above the rapids is laboriously worked through the rapids, then tied into rafts and drifted downriver with the current and ebb tides.

Dependence on Bush Negro hand logging with its wasteful primitive methods constitutes the greatest weakness in the Surinam timber industry. Although 3,500 to 4,500 Bush Negroes engage in hand logging, they work irregularly, usually only in the intervals between clearing forest for their shifting cultivation and other domestic pursuits.² Sawmill operators who depend on Bush Negroes for their timber may find themselves unable to get a supply sufficient to operate efficiently, since, despite cash advances, promised timber may not be delivered; and they have sometimes had to refuse profitable export orders because of the uncertainty of log supply.

Sawmilling. Paramaribo is the center of the sawmilling industry. It has 16 mills, only three of which have carriage head-rigs on which logs can be turned to cut for maximum grade. One of these is a modern band mill and the other two are double-circular mills.³ The remaining mills are European log gangs or frame sawmills through

²Surinam Planning Bureau, *Surinam's Development Possibilities, Preliminary Report, Part II—The Projects*. Paramaribo, 1951.

which lumber is moved by hand. Since many of the mills lack adequate log-handling facilities, have little space for log storage and usually none at all for yard storage, lumber is commonly sold green to local buyers. There are six small mills in Nickerie, a new circular mill on the Coppename River and several small mills sawing for the local market in the Commewijne and Marowijne Districts. A number of small planing and millwork plants are operated in conjunction with sawmills.

A study made late in 1949 gave the lumber outturn capacity of the sawmills as 45,000 cubic meters a year,³ but production figures indicate that the industry is operating well below this level. Only three mills are sawing for export and the yield of export grades (excluding round logs) has been only 30% of the lumber output. However, this percentage is being improved. The sawmill operators are not organized in a trade association and the industry is highly competitive for log supplies and local markets.

Plywood Manufacture. A modern, efficient plywood plant produces an excellent product which finds ready acceptance in the export markets. The plant is equipped with a veneer lathe, clipper, automatic drier and hot press. Baboen (Banak) is the only species used. Production in 1950 is estimated at 7,000 cubic meters, and in 1951, 10,000 cubic meters, with an increase of 1,000 to 2,000 cubic meters anticipated in 1952. Recovery is about 35% of log input. In 1950, 6,470 cubic meters were exported, primarily to the Caribbean and Europe. In 1951, about 65% of the total exports, estimated at 9,400 cubic meters,

³Surinam Forest Service, *Memorial Concerning the Milling Capacity of the Sawmills in Surinam*, Paramaribo, 1950.

⁴Ibid.

went to the Caribbean area. In the opinion of the Mission, plywood production could be greatly increased. We think it is likely that over a 10-year period three times the 1950 volume of plywood exports could be profitably marketed abroad. There is also likely to be a substantial increase in domestic consumption.

Production. The estimated value and volume of timber production in 1950 is shown in Table I.

TABLE I

ESTIMATED VALUE AND VOLUME OF TIMBER PRODUCTION IN 1950

Product	Domestic (est.)		Destination	Export		Total	
	cu. m.	Sf.		cu. m.	Sf.	cu. m.	Sf.
Round logs	—	—	British Guiana.....	6,033	99,362		
			Europe (mainly	5,459	112,537		
			Netherlands).....				
			<i>Total</i>	11,492	211,899	11,492	211,899
Hand Hewn Squares	—	—	Netherlands.....	4,468	301,454		
			Caribbean.....	432	28,622		
			U.S. UK.....				
			<i>Total</i>	4,900	330,076	4,900	330,076
Railway Sleepers	—	—	Netherlands.....	425	19,899	425	19,899
Sawn Lumber	(15,000)*	(1,335,000)	Netherlands.....	833	73,264		
			Caribbean.....	364	39,620		
			<i>Total</i>	1,197	112,884	16,197	1,447,884
Plywood	(530)	(165,000)	Netherlands.....	960	223,649		
			United Kingdom....	945	224,476		
			Cuba.....	2,249	724,440		
			Germany.....	1,077	293,949		
			Other.....	1,237	380,760		
			<i>Total</i>	6,468	1,847,274	7,068	2,012,274
Timber Products	(15,530)	(1,500,000)		24,494	2,521,967	40,094	4,021,967

*() indicate estimated figures.

The principal exports by specie were: round logs—Krappa, Cedar and Simaruba to be processed in British Guiana mills, Baboen and Possumwood to Europe; squares—Basra Locus (80%), Cedar, Kopie, Manbarklak, Greenheart and Wana; railway sleepers—Matakkie; sawn lumber—Baboen, Krappa, Wana, Basra Locus, Kopie, Cedar and Possumwood; and plywood—Baboen.

Logs and squares to the number of 93,947, volume not

given, were extracted in 1950. *Kleine houtwaren* (small wood wares) extracted totaled 1,364 cubic meters and firewood 5,839 cubic meters. The local consumption of sawn lumber is estimated at 15,000 cubic meters. Charcoal production from crude earth kilns built where the timber is felled is important in the domestic economy but no production data are available.

4. POTENTIAL MARKETS

Domestic Markets. The Ten Year Program will greatly increase the domestic demand for timber products. As indicated in the main report, new houses, hospitals, schools, community houses, markets and industrial buildings will need to be built. In many of these structures wood could well be used as the basic material; its durability is attested by the number of buildings in Paramaribo which, although centuries old, are still in use. Even where basic construction is of brick or concrete, lumber, plywood and fiberboard will be needed for interior trim, doors, partitions, floors, insulation, cabinets and furniture.

Export Markets. In 1950 the Netherlands imported approximately 300,000 cubic meters of hardwood lumber, of which only 10,349 cubic meters or little more than 3% came from Surinam. In the same year Surinam supplied only a small fraction of the total amount of hardwood lumber imported by the Antilles. Considering the close ties with these countries, the Surinam timber industry should be able to sell them a much larger percentage of their hardwood lumber requirements. Cuba would also seem to offer an opportunity for export expansion. In 1950 Surinam supplied only 94 of the 35,000 cubic meters of hardwood lumber imported by Cuba. In the same year the plywood company was able to sell Cuba twice as much

plywood as it sold to any other country.

There is also a potentially large market in the United States for Surinam timber products. United States supplies of high-grade hardwood timber are rapidly diminishing and stumpage and log prices are high. The demand is for low-density, tropical hardwoods, blonde or light in color. These are woods which are not usually suitable for tropical construction, and their export would utilize a larger percentage of the timber stand. Brown-colored woods are also acceptable, but the market for red or mahogany-colored woods is at present well supplied. Plywood manufacturers are interested in tropical hardwoods suitable for slicing into face veneers. While the experience of one company indicates that it is more economical to slice the veneer in the country of origin and import the dry veneer, others import quarter-sawn flitches for slicing in American plants.

The interest of United States hardwood companies in the development of tropical lumbering operations is shown by the number of United States foresters currently making investigations in Central America. In addition to timber resources, logging and transportation conditions, Surinam offers the advantages of relative political stability and a favorable attitude toward private investment; yet it is a virtually unknown country in the United States.

The United States interest in tropical woods has been further stimulated by the large quantities of lumber which are being purchased by defense agencies. For example, 30% of Douglas fir plywood production is on allocation for defense programs. The United States Navy is financing the research program in tropical woods now being carried on at Yale University.

In countries with little or no timber resources, such as those in the Near East and the Mediterranean area, the

import demand for railway sleepers is large and steady. As mechanization of logging proceeds, the number of Bush Negroes employed will decrease and the surplus labor could be diverted to the production of hand-hewn sleepers. In view of the quality of Surinam woods, these should be able to compete on favorable terms with those produced elsewhere in the world.

The shortage of teak, caused by the reduction in Burmese production, offers an opportunity to market Locus (Courbaril) for ship decking and other uses for which substitutes for teak are being sought.

Less profitable than other timber products, but desirable from the standpoint of utilizing more species in the mixed tropical forest, is the production of box, case and crating material from light softwoods. Export possibilities both in the southern United States and in the Near East, together with the expanding domestic demand for boxes and crates for packing agricultural products, indicate an opportunity for a shoo factory in Surinam.

B. RECOMMENDATIONS

The Ten Year Program for forest development recommended by the Mission modifies some of the projects in the Surinam Planning Bureau's preliminary report and adds three new ones, namely *Logging Engineering*, *Market Research and Trade Promotion*, and *Reforestation*. Details of the main projects are set forth below. The program for the forestry sector calls for total expenditures over the 10-year period of Sf. 5.2 million. Three quarters of these expenditures will be required in the first five years. If the program succeeds as anticipated and budgetary funds are available, a supplementary program of Sf. 1 million is recommended for expen-

diture primarily in the second five years. In the over-all Ten Year Program the Mission has also included the sum of Sf. 4 million for the support of private enterprise. This is intended primarily to help in financing the logging and wood products industries should private investment for these purposes prove insufficient.

1. FOREST INVENTORY

Knowledge of the timber stand, the topography and the location of concentrations of the species most in demand is essential to logging development. Type mapping and enumeration of the demarcated dry land forest belt, together with further enumeration in the swamp forest areas to be opened up by canals, should therefore be continued and accelerated, if possible, to complete the project within the next five years. The Central Bureau for Aerial Mapping and the Forest Service should cooperate closely in the preparation and use of type maps from which to determine the best areas to enumerate. The more accessible blocks, bearing the better timber stands, which would be the first to be exploited, should be surveyed first. It is recommended that in such areas the width of the enumeration strip be increased from 10 to 20 meters, thus increasing the sample from 2% to 4%. Since the larger number of men in the field party are engaged, in any case, in running and clearing base and strip lines, this would involve little extra cost and would give more reliable data on the distribution of species for planning and logging operations. In calculating tree volume, a uniform form factor of 0.7 has been used for all species. It is recommended that measurements be taken in logging operations where felling is being done and the true form factor of the commercial species determined and applied.

If it is found feasible to determine the routes of the

main roads from the type maps made from aerial photographs, roads to be built under the forest access project should be constructed in advance of enumeration. Even if the roads were only "roughed out" to permit a jeep or a four-wheel drive pickup truck to get over them, a great saving would be effected in the travel time of the field parties to their camps in the interior. This would increase the number of productive work days and expedite the enumeration. At a later time the roads could be realigned and improved.

In hilly terrain, location of truck and tractor roads would be aided if contour maps, instead of the present outline or hatchure maps, were made. Elevation data is already available along the strip lines and little extra time would be needed to add contours to the mapping of streams, ridges and type boundaries between the strip lines.

An allocation of \$1.16 million is recommended for the forest inventory project.

2. FOREST ACCESS PROJECTS

Swamp Forest. Large swamp areas between the rivers could be made accessible for logging by digging canals through them from the rivers. Since the main canals require a large capital investment and would serve the country over a much longer period than the first forest cutting cycle, their construction is properly a function of the Government. The loggers operating in the area thus opened up would be expected to clear and dam the creeks and to build the necessary small feeder canals as they do at present. Since the main canals should be built where they will best open up the richer concentrations of Baboen and Possumwood plywood timber, it is recommended that they be located and built by the Forest Service. In the

forestry sector of the recommended Ten Year Program, the Mission has allotted Sf. 350,000 for equipment and Sf. 330,000 for construction of canals. We estimate this sum should build 100 kilometers of canals.

The Forest Service proposes to carry out an experiment in mechanical extraction in the swamp forest with the *Motormuli*, a crawler tractor developed in Austria with the aid of United States funds. The *Motormuli* is said to have a ground pressure of only 2.5 pounds per square inch. The trial of small power winches is also proposed. It is recommended that Sf. 112,000 be provided for this project, and that the equipment be sold to private logging operators when its success has been demonstrated.

The Planning Bureau projects include Sf. 700,000 for "construction and cleaning of waterways, including locks, if any."⁵ No details are given in the Planning Bureau Report, and no specific information on the work proposed to be done was available to the Mission. The Mission, has, however, provided a total of Sf. 1 million for opening up the swamp forests, of which approximately Sf. 800,000 is allocated to canals and the mechanical extraction experiment. This would leave roughly Sf. 200,000 for necessary work on the waterways. If additional funds are needed for this or the other access projects, they might be made available under the Supplementary Program.

Dry Land Forest. Access Roads: Opening up the dry land forest belt will require construction of main access roads from the head of navigation on the rivers. The lower portions of some of these roads will lie outside the forest belt where some settlement and small agricul-

⁵Surinam Planning Bureau, *op. cit.*

tural development may be expected. It will be desirable, therefore, to consider these roads as part of the general transportation system of the country and to link them so as to provide a through east-west connection to the rivers. Since, however, the primary objective is to open up the forest for logging, the location of the roads should be determined with a view to tapping the better timber stands and serving the needs of logging operations, rather than joining the rivers by the most direct or cheapest route. Similarly, the class of road to be constructed should depend upon the amount of log traffic which will use the road. The Mission has already recommended in connection with the Forest Inventory project that the roads be cleared in advance of the enumeration. In the light of these considerations, we suggest that the Forest Service locate and construct the main access roads. Precedent exists in other countries for construction of access roads by the Forest Service. For example, in the United States during the period of the fiscal years 1942 to 1952, almost \$40 million was appropriated for timber access roads in the National Forests. The main roads will make prospective concessions accessible for inspection by private logging operators who should be expected to construct the branch and spur roads required for logging operations.

In all, the Mission recommends that the sum of Sf. 1.5 million be provided for access road construction in the Forestry Sector of the Ten Year Program. Of this, Sf. 600,000 would be used for capital equipment (bulldozer tractors, scrapers, automotive graders and pickup trucks) and Sf. 900,000 for operations. The experience of private logging operators in Surinam and in British Guiana in building truck roads under similar conditions indicates that this sum should be sufficient to build the 400 kilome-

ters of roads now planned by the Forest Service.

Mechanical Extraction Operations. In the areas newly opened up by the access roads, the Mission suggests that in granting concessions preference be given to operators who will follow modern logging methods. Certain minimum operating standards might even be established as a condition to the concession. Among the practices which have proved successful under similar conditions in other tropical countries such as British Guiana, West Africa and the Philippines and which the Government should seek to encourage, are the following:

Felling and Bucking (cross-cutting into log lengths). Hand saws and wedges should be used rather than just axes. While it is said that the Bush Negroes who do the felling prefer to use axes, experience with similar labor in other countries demonstrates that they can be trained to use saws, with resulting savings in labor and raw material.

Skidding. Crawler tractors and fairlead crawler arches are preferable for this purpose. The size of the tractor which offers the best combination of power and maneuverability for arch skidding is the D-7, HD-15 or TD-18A. Where the swamps along the streams are too wide to reach the logs with the arch line, light power "yarders" or logging donkeys mounted on sleds could be used.

Loading. A variety of equipment and methods for loading trucks is available. Although highest in initial cost, the mobile converted shovel loader, mounted on crawlers or rubber tires, is the most economical to operate. Use of a mobile loader permits logs to be dropped by the skidding tractor anywhere alongside the truck road since the loader can move along the road picking up and loading the logs on an accompanying truck. The sled-mounted hoist or winch type of loader is much cheaper in initial cost. The time required to move and rig up the sled-mounted loader, however, necessitates skidding to "landings," or concentration

points, located at intervals along the truck road, and the landing area must be continuously cleared to provide space for logs so that the skidding tractors will not be delayed.

Unloading. A power hoist can be rigged to unload trucks and also to load barges and to dump floaters for rafting. The Forest Service has been provided with drawings of moving cable-loading and yarding systems which are also suitable for unloading.

Logging Planning. Efficient operation of trucks and tractors requires careful planning and layout of spur truck and tractor roads and landings. A well-equipped workshop for maintenance and repair of equipment and adherence to the program of "preventative maintenance" recommended by the manufacturer, are also essential to minimize mechanical breakdowns and consequent loss of production.

Chemical Spraying. Trial of log spraying is recommended to reduce the loss from borer attack. In the Philippines it has been found profitable to debark logs of species subject to pinhole-borer attack soon after felling and to spray them with a portable pressure spray gun. Experience already gained in Surinam with dipping chemicals to inhibit borers and stain in sawn lumber should indicate the best chemical to use.

Increasing Tractor Production. In the concessions bordering the rivers where tractors are used but soil conditions do not permit the use of trucks, the payload of tractors on long hauls can be increased by loading logs on Athey wagons with crawler wheels, pulled by tractor.

Communications Equipment. In order to carry out the enumeration and forest access projects recommended above, and to perform the administrative tasks involved in increased timber cutting, the Forest Service will need pickup trucks and more launches and outboard motorboats. Communication by river transport is slow, however, and the efficiency of the Forest Service's operations could be greatly increased by the use of FM short-wave,

two-way radio. Radio facilities of this type have become indispensable in both public and private forest operations in the United States and highly efficient equipment has been developed. It is recommended, therefore, that a sum of Sf. 170,000 for communications and transportation equipment be included in the Forestry Sector of the Ten Year Program.

The Supplementary Program recommended by the Mission includes a sum of Sf. 400,000, to be applied to either the swamp or dry land forest projects, or to both, in accordance with the experience of the first five years.

3. LOGGING ENGINEERING

To carry out the forest access projects, it is recommended that a Logging Engineering Staff be added to the Forest Service. This staff would make the location surveys for the access roads and canals and would supervise their construction. It would carry out experimental mechanical logging operations in the swamp forest and would plan and lay out the new logging operations in the dry land forest belt. To head the staff the Mission suggests that two academically-trained logging engineers be recruited abroad, their assistants and crews to be recruited locally and trained in the field by the engineers.

Two alternatives for recruitment of qualified engineers are suggested for consideration. One is to obtain experienced professional logging engineers from the United States. Whether Dutch-speaking men could be obtained is unknown. The other is to recruit from the Netherlands forest engineers who have had construction and logging experience in Indonesia. If the latter are selected, they should be sent to the United States for a short but intensive period of training in logging engi-

neering. This training should include practice in modern road location and construction and logging planning techniques, and the study of logging operations using equipment and methods suitable for Surinam.

Provision in the Ten Year Program of the sum of Sf. 270,000 for logging engineering is recommended.

4. TECHNICAL RESEARCH

Forest Products Research. In the opinion of the Mission, forest products research can best be carried out by utilizing established research agencies in other countries which already have the necessary equipment and experienced staff. This would save both money and time since the data required could be obtained at less cost and more promptly than if a laboratory were to be set up, staffed and equipped in Surinam. The following research projects are recommended:

Plywood. Further research is needed in the peeling, slicing, drying and glueing properties of species which show some promise for veneer and plywood. Species should be selected which are found in sufficient volume to insure an adequate supply of raw material. The demand in the United States is for light-colored woods with an attractive figure or grain. Two possible laboratories for this type of research are: the Forest Products Laboratory at the University of Washington, Seattle, which has excellent electronic glueing equipment as well as conventional hot and cold presses and complete testing facilities; and the experimental laboratory of the Bruynzeel Co. in the Netherlands, where the research work preliminary to the establishment of the plywood plant in Paramaribo was done.

Fiberboard. Further pilot tests are desirable to ascertain whether abundant woods for which no present market exists can be used for hardboard and insulating board. It is technically possible to make fiberboard out of practically any

wood. The cost of production and the quality and consequent marketability of the products are therefore the most important considerations. The cost data determined from the tests conducted in Sweden on five Surinam species should be checked by another agency. This would doubtless be done by any company interested in the possibilities of building a hardboard plant in Surinam. The Forest Products Laboratory of the United States Forest Service, at Madison, Wisconsin, is recommended for fiberboard research in the United States. In the Netherlands the William Pont Company, Zaandam, has a fiberboard plant and might be interested in carrying on this research.

Pulp and Paper. Tropical hardwoods are being pulped in West Africa and temperate hardwoods in the United States. Research to determine the best methods of pulping hardwoods and the kinds of paper that can be made from them is a long and expensive task. The Pulp and Paper Laboratory of the New York State College of Forestry at Syracuse, New York, has been conducting pilot plant experiments on hardwoods for several years. This work is financed by the American Pulp and Paper Industry, which also supports the Institute of Paper Chemistry at Appleton, Wisconsin. The United States Forest Products Laboratory at Madison also does pulp and paper research and research in pulping tropical woods has been done in France and in French colonies in Africa. A pulp and paper mill involves a very large capital investment as compared with other forest products plants. It also requires large quantities of pure water and highly skilled labor. In the absence of information on the pulping qualities of the more abundant Surinam woods, pulp and paper development is not included in the present Ten Year Program. However, research in this field is recommended and, if the results of technical and economic research are favorable, development could be added. One of the Surinam forest officers attended an International Pulp and Paper Conference in Africa in December 1951 and at

the time of the Mission's visit it was expected that his report would indicate what action might be taken by the Government in this field.

Lumber. Considerable research has been done on the mechanical properties of Surinam woods for use as lumber. Research has been carried on in the Netherlands for many years, and Dr. J. T. Pfeiffer has published three volumes on Surinam's woods. A number of Surinam species have also recently been tested at Yale University under the United States Navy program of research in tropical woods. The Forest Service recently published an excellent booklet in English which describes 53 woods and includes a bibliography of 50 publications relating to Surinam woods. However, further research in the kiln drying of lumber and the preservative treatment of the less durable woods to increase the number of species usable in the tropics appears desirable. This research could be carried on at the institutions named in the bibliography cited previously, and also at the University of Washington, where one of the leading commercial dry kilns was developed.

Silviculture and Forest Management Research. Research in silviculture and forest management, currently being carried on by officers of the Surinam Forest Service to the extent that their other duties permit, should be continued. This work would be aided by cooperation with the United States Tropical Forest Experimental Station at Rio Piedras, Puerto Rico. That station, which is the center of forestry research in tropical America, has collected considerable data from many countries which could be helpful to the Forest Service. The Director of the station has indicated that cooperation could be readily arranged.

In addition to the seeding, planting, thinning and diameter limit cutting experiments already undertaken, experiments should be conducted on the girdling or

poisoning of "weed" species to lessen the competition with merchantable species and to increase the growth rate of the latter. Information on poisoning hardwoods is available from the United States Forest Service. Growth data can be accumulated by periodic measurements of marked trees in sample plots established in stands varying in type, composition and treatment.

Research Funds. The Ten Year Program suggested by the Mission provides the sum of Sf. 530,000 for technical research. Most of this amount should be made available during the first five years. The Supplementary Program includes an allocation of an additional Sf. 200,000 intended, if available, for expenditure for research in the second five years.

5. MARKET RESEARCH AND TRADE PROMOTION

The financial success of the Ten Year Program depends in considerable measure upon a steady increase in exports of forest products. The Mission has already indicated its belief that such an expansion is possible. More than an improvement in production techniques will be required, however, to realize the goal. Equally essential is a vigorous research and trade promotion program to find and develop the best foreign markets for Surinam products. Nor should the potentialities of the domestic market be neglected. The advantages of timber construction and the best use of native woods need to be kept constantly before architects, builders and financing agencies. Finally, to attract new private investment capital, an organized effort is needed to make the opportunities for new forest industries more widely known and to bring prospective entrepreneurs to Surinam for firsthand investigation.

In most, though not all, important lumbering countries, activities of this type are carried on by the forest products industries through their trade associations. For example, the world export market for United States Douglas fir lumber was largely developed by the Douglas Fir Exploitation and Export Co., and for Douglas fir plywood by the Pacific Forest Industries. Both these groups are organizations of manufacturers who pay dues based on their mill production. Both in Canada and India, however, government agencies have performed such functions.

The timber industry in Surinam is not at present organized in any trade association. Although there is keen competition for domestic markets, few of the mill operators are actively interested in exporting lumber. Until such time as the companies in the timber industry are willing and able to join together in a trade association, it appears that leadership in organizing trade promotion, market extension and consumer education activities will have to come from the Government.

The Mission therefore recommends that the Government set up an agency specifically for the purpose of carrying on market research and trade promotion in the timber products field. It should be staffed with men who have had wide experience in the export-import trade in forest products and who are salesmen of the highest caliber. The staff should include an experienced advertising copy and publicity writer who can prepare attractive promotional literature. As soon as the industry as a whole is organized to do it, these activities should be taken over by private enterprise. Meanwhile, the organization should work in close cooperation with members of the industry.

To finance the organization, the Mission has included

the sum of Sf. 450,000 for the first five years in its recommended program, and a supplementary allotment of Sf. 200,000, if available, for the second five years.

6. REFORESTATION

To take care of the reforestation of the larger areas proposed to be cut under the projects already discussed, the Mission has provided the sum of Sf. 120,000 in the Ten Year Program and Sf. 100,000 in the Supplementary Program. We do not believe any comment on this item is necessary beyond pointing out that reforestation and timber stand improvement is a capital investment which will be recouped when the next forest crop is harvested.

7. INDUSTRIAL MODERNIZATION AND EXPANSION

Numerous opportunities exist in the timber industry for improvement or expansion which would be both profitable to industry and beneficial to the economy of the country. A number of these are set forth in detail in the paragraphs that follow. While, admittedly, such improvements or expansion are the function of private enterprise, there is a variety of ways in which the Government can encourage private companies to undertake them. For example, the Government might make loans to private companies for the purchase of new equipment. Such loans should include the provision of foreign exchange for the necessary imports. Other methods the Government might consider are: allowing capital investment to be amortized over a short term; granting timber concessions to companies which now have none; and giving tax relief to new industries during the early years of their development.

Logging. Modernization of logging is the most urgent need of the industry. Mechanical extraction equipment would both increase the supply of logs and make it more certain. In view of the military demand for trucks, tractors and construction equipment, orders for such equipment should be placed as soon as possible. Adequate stocks of spare parts should be ordered at the same time. Preference in concessions should be given to companies willing to establish modern logging operations.

Sawmills. The demands of the Ten Year Program for labor point to the desirability of installing labor-saving devices for the handling of logs and lumber in the older mills. The companies would profit by the consequent reduction in labor cost. At some of the mills, derricks or power winches are needed for handling logs. Mills handling lumber between the sawing machines by hand need live or dead rolls and transfer chains. Mills without yard storage space should be helped to acquire adjacent land so that they can pile lumber for air-drying and supply the local consumers with a better product. Installation of dry kilns would extend the range of species marketable for domestic use and would also aid in the expansion of the lumber export trade. In the experience of United States companies with tropical lumbering operations, it pays to kiln-dry export lumber where shipping rates are on a W.M. (weight or measurement) basis.

Log gang mills are not adapted to cutting for grade, since the log cannot be turned as it is opened up. In expanding capacity or replacing obsolescent frame saws, the installation of head saws with carriages would increase the percentage of export grades. At some of the mills, the sawn lumber is passed through dipping tanks of chemicals to inhibit stain and borer attack. This practice should be followed by all mills. Stored logs of species

susceptible to borers should be sprayed with chemicals.

Plywood and Veneers. The owners of the present plywood plant should be encouraged to expand their production by the early addition of another drier and the necessary steam boiler capacity. When additional tracts of swamp forest are opened up and adequate supplies of Baboen logs can be organized, it should be possible to double present plywood production.

Experiments made by the plywood company demonstrate that other Surinam species can be peeled for plywood but they involve higher production costs. Wana and Basra Locus must be boiled before peeling and take longer to dry than Baboen. Possumwood peels easily but brings a lower price. Cedar is satisfactory but the log supply is limited. Research at Yale University indicates that Krappa is suitable for decorative plywood and Gronfoeloe, Simaruba and Quaruba are suitable for utility plywood.

The research projects already recommended will determine the possibilities of slicing face veneer for export. Many ornamental woods would make attractive decorative plywood, providing their slicing, drying and glueing properties are satisfactory. The fitches for slicing should be quarter-sawn for figure of grain and dimensional stability. If the results of research are favorable, it is recommended that the Government endeavor to interest a foreign plywood company in establishing a veneer-slicing plant in Surinam.

Fiberboard. The *Defibrator Aktiebolaget* of Stockholm, manufacturers of machinery for making fiberboard, have conducted experiments in making hardboard from Bebe, Mierenhout, Possumwood, Koffie-mama and Kan Kan (Ceiba). Estimates have been prepared of the capital and operating costs of plants with annual capacities

of 6,000 tons and 10,000-12,000 tons. The production cost per ton in the larger plant is estimated to be 81% of the cost in the smaller plant while the capital investment is only 61% more. In a report on the possibilities of establishing a hardboard plant, the Surinam Planning Bureau came to the conclusion that, with the 12,000-ton capacity plant, hardboard for the world market could be produced in Surinam at United States production cost level.

The establishment of a fiberboard plant would have many advantages. The industry is a fast-growing one and it offers an excellent opportunity for utilization of species of Surinam woods which are not marketable for lumber or plywood. The more species that can be utilized from the mixed tropical forest the greater the volume per hectare that can be extracted; this, in turn, reduces the fixed per-hectare costs of truck and tractor roads and hence lowers unit logging costs. A fiberboard plant could also use some of the sawmill waste, with consequent benefit to the sawmill industry.

The Mission urges the Government to take active steps, as a matter of priority, to interest a company experienced in the manufacture and marketing of fiberboard in building a plant in Surinam.

8. THE FOREST SERVICE

The Ten Year Program will greatly increase the work of the Forest Service which is already small in size compared with those in other tropical countries. In British Guiana, for example, the Forest Service has a sanctioned strength of eight academically-trained senior staff (Colonial Forest Service Officers), seven intermediate staff, and 29 forest rangers; Trinidad and Tobago, with a forest area of only 618,061 acres, have six Colonial

Forest Service officers, five intermediate staff, and 30 rangers. The Planning Bureau projects included a sum of Sf. 300,000 for forest management and administration. Since, however, the expansion of the Forest Service will necessitate annual recurring expenditures extending beyond the Ten Year Program, it is recommended that the regular annual budget be increased to provide the necessary staff to handle the increased administrative load.

When a forest inventory project is completed at the end of five years, it is recommended that the Service put concentrated effort on the preparation of sustained yield management plans. For the special staff that will be required for this work, an allocation of Sf. 100,000 has been recommended in the Supplementary Program.

As all Forest Service activities expand under the Ten Program, securing trained personnel to serve as rangers, forest guards, export inspectors, enumerators, surveyors and the like, will be a problem. At present, the needed personnel has to be trained in the field. Field training should be augmented, wherever possible, by short training courses of about two weeks' duration conducted by forest officers for groups of men from the field. To interest boys in entering the Forest Service or the timber industry special lectures in the schools are also recommended. In time it may be possible to incorporate some special training facilities in the high school course.

Scholarships might also be established by the Government to send promising young Surinamese to the Tropical Forest School at Wageningen, Holland, for training as forest officers or forest industry engineers; their education ought to include as well study tours of lumbering operations in the United States. Young forest officers might also be deputized to the U. S. Forest Service in

Puerto Rico which accepts foresters from other tropical American countries for short periods of on-the-job training in forest administration and management.

Mechanics, truck and tractor operators, and other skilled labor needed in the timber industry and in the construction operations of the Forest Service, can be trained in the vocational trade school at Paramaribo. Modernization and expansion of this school are recommended in the main Report of the Mission.

C. ANTICIPATED RESULTS OF THE PROGRAM

The annual production volume which the Mission believes can be achieved by the tenth year of the recommended program is set forth in the following table. Values are calculated at slightly under 1951 rates. This estimate is based on the following assumptions: (1) the recommendations of the Mission relating to projects which will utilize timber products domestically will be carried out; (2) the recommendations of the Mission relating to the forestry sector will be followed; and (3) private enterprise will be encouraged to make the necessary capital improvement in equipment and plant.

TABLE II

ESTIMATED ANNUAL PRODUCTION AND VALUE OF TIMBER PRODUCTS
IN THE TENTH YEAR OF THE PROGRAM

(All Figures in Thousands)

<i>Product</i>	<i>Domestic</i>		<i>Export</i>		<i>Total</i>	
	<i>cu. m.</i>	<i>Sf.</i>	<i>cu. m.</i>	<i>Sf.</i>	<i>cu. m.</i>	<i>Sf.</i>
Logs ^a			6	120	6	120
Squares, hand hewn ^b			5	330	5	330
Sleepers, hand hewn			5	250	5	250
<i>Sub-total</i>			16	700	16	700
Sawn lumber ^c	29.6	2,650	9.4	1,150	39	3,800
Plywood and veneer ^d	1.2	360	18.8	6,016	20	6,376
<i>Sub-total</i>	30.8	3,010	28.2	7,166	59	10,176
	<i>tons</i>		<i>tons</i>		<i>tons</i>	
Fiberboard ^e	0.7	168	9.3	2,232	10	2,400
<i>Grand total</i>		3,178		10,098		13,276
1950 Production		1,500		2,522		4,022
<i>Gain over 1950</i>		1,678		7,576		9,254

^aMainly from Corantine River to British Guiana mills. Export of round logs to Europe to be replaced by manufactured products of higher unit value.

^bMainly toredo-resistant woods for marine construction. Could possibly be increased.

^cLocal production at about twice the 1950 level. Exports equivalent to 11% of imports of hardwoods from all sources by the Netherlands in 1950, plus 5% of imports of hardwoods from all sources by the Caribbean area in 1950.

^dExports at about three times their 1950 levels and two times the 1951 level. Local production 6% of total output, or twice the 1950-51 level.

^eBased on one 10,000-ton capacity plant.

A breakdown of estimated expenditures for forestry under the recommended Ten Year Program is given in Table IX in the main Report. Total estimated expenditures by years are as follows:

TABLE III
ESTIMATED EXPENDITURES BY YEARS
(Thousand Surinam Guilders)

<i>Year</i>	<i>Ten Year Program</i>	<i>Supplementary Program</i>
1st	1,112	
2nd	1,076	
3rd	545	
4th	533	
5th	477	
6th	292	320
7th	292	320
8th	291	120
9th	291	120
10th	291	120
<i>Totals</i>	5,200	1,000

TABLE IV

ESTIMATED CAPITAL EXPENDITURES OF THE PRIVATE SECTOR FOR
 MODERNIZATION AND EXPANSION
 (Thousand Surinam Guilders)

<i>Logging</i>		
Swamp mechanical logging equipment	300	
Dry land forest logging equipment and capital investment in roads	2,500	
River transport equipment, tugs and barges	1,200	
<i>Total</i>		4,000
<i>Plant</i>		
Modernization of sawmills	1,000	
Plywood expansion	1,500	
Sliced veneer plant	1,000	
Fiberboard plant	5,000	
<i>Total</i>		8,500
<i>Grand Total</i>		12,500

MINING, INDUSTRY AND POWER
(EXCLUDING BROKOPONDO)

A. MINING

MINERAL RESOURCES. An aerial survey of the northern half of the country was completed in 1948. The data obtained, when checked by ground work, will be the basis for a badly needed geological map. The map is not expected to disclose new minerals, but rather will show the extent and location of those which are known to exist, thereby greatly facilitating the work of the mining engineers in proving their commercial value.

Mining activities other than bauxite are not substantial. Considerable capital was at one time invested in the production of gold but, after a brief boom at the end of the 19th century, gold production declined rapidly. In 1950 the total value of all gold mined was about Sf. 300,000. Surface investigations by mining engineers indicate that there are also some deposits of diamonds, copper, cobalt, platinum, quartz, low grade iron ore and perhaps other minerals. Whether any such deposits are commercially exploitable, however, remains undetermined. So far as the Mission is aware, no substantial mining concessions have yet been granted for any of these other minerals.

Although Surinam has no coal or petroleum resources for fuel, it does have large reserves of timber suitable for making charcoal, and also substantial hydroelectric

power potentialities (see Technical Appendix No. 4).

Proven reserves of high quality bauxite which may be economically mined and shipped have been estimated at 50 million tons. There are additional known deposits of bauxite which have not been proven because of their inaccessible location and there may well be other deposits in areas not yet fully explored.

Bauxite Mines. The mining of bauxite by the Surinam Bauxite Company (a subsidiary of Alcoa Mining Company) and by the Billiton Mining Company is the leading nonagricultural economic activity in Surinam. Together these companies employ approximately 3,000 workers.

Mining operations at Moengo are rather simple, since there is little or no overburden and since the purity of the ore is such that no washing operations are required. In other localities, however, mining operations require the removal of a substantial overburden and subsequent reduction of impurities by washing.

The training of many different types of skilled labor by the mining companies is of great importance to other segments of Surinam's economy. This will become even more important as mechanization in industry and agriculture increases.

The wages paid to labor, which average from 50 to 60 cents (Surinam) per hour, and the other benefits received, are also important to the country's economy and tend to set a pattern for industry as a whole.

Royalties and taxes on bauxite are now sizeable and are equivalent to about one fourth of the annual Government budget. This, of course, will be more pronounced in the future should mining operations increase. At the time of the Mission's visit, 1951 exports were estimated at 2.6 million tons. Exports in 1952 are likely to exceed

3 million tons; in 1953 and the years immediately following, they are not likely to be lower than 3 million tons and may substantially exceed that figure.

1. BUREAU OF MINES

Present Status. The Bureau of Mines was started in 1943 and until 1947 consisted of just one man. The Bureau now has, in addition to the head of the Bureau, a staff of five, of whom three are geologists, and two are mining engineers. The program of the Bureau is three-fold:

1. to get a good geological map of the northern part of the country by making ground checks on the recently completed aerial survey;

2. to determine whether exploitation of any mineral deposits discovered through the geological survey is economically justified; and

3. to complete the draft of a new mining law.

At present, emphasis is being put on the geological survey. Even this work, however, is going forward slowly. To accelerate the whole program it is now planned to increase the Bureau's personnel.

Concessions. A change in the method of granting concessions is not included in the Bureau's program. Concessions are now granted to private companies only after the Bureau of Mines has fully explored the area and has become fully aware of the extent, quality and estimated mining costs of deposits therein. With the limited number of men available, this becomes a time-consuming process. The Mission recommends that reputable private concerns be given the privilege of doing their own exploratory work, provided they give the Bureau full access to all data, and provided final terms of the conces-

sions are based on the data obtained from the exploratory work. This would permit Surinam's minerals to be exploited more rapidly and thereby accelerate the country's over-all development.

B. INDUSTRY

Industry is as yet little developed. This is to be expected in view of the very limited domestic market. In recent years, however, in addition to the Bruynzeel plywood factory and the sawmills discussed in Technical Appendix No. 2, several small enterprises have been started, some of which are operating on a profitable basis, and some of which can, we believe, be profitably expanded.

Haeven Ltd.—Brick Factory. This is a very small plant producing only 18,000 bricks per week. The quality of brick is very good and operation of the plant in general is quite efficient. Lack of mechanization, however, gives a high labor cost.

This plant could be doubled in size and semi-mechanized, and possibly make other clay products, especially tile roofing and flooring, to advantage.

British American Tobacco Company. This company, which has been in operation since 1937, makes various brands of cigarettes from imported tobacco. The quality of cigarette produced is good and sells for about two thirds the price of imported international brands. Despite these favorable circumstances, the company has been unable, however, to obtain more than one third the available market.

The factory has ample facilities to increase production as needed.

Leo Victor Cigar Co. This enterprise, until 1951, cen-

tered its operations chiefly on the making of cigars using domestic tobacco as a filler and imported wrappers. In 1951, however, with the market for cigars steadily diminishing, it was decided to enter the field of printing.

Printing operations have just started, with the Government as the major potential customer.

Garment Factory. About two years ago, a Dutch family moved to Surinam and started a garment factory. The concern makes many types of ladies', men's, and children's clothes from imported cloth. The industry, unlike the others in Paramaribo, sells but 3% of its output in the local market, exporting the remainder to Caribbean markets. There are about 50 workers, all of whom have been trained on the job. Some consideration has been given to the possibility of enlarging this facility by adding weaving and printing equipment.

Shoe Factory. There is but one modern shoe factory in Surinam making high quality shoes from imported leather. The present output is about one sixth of the market or 20,000 pairs per year of the most popular types. The remaining shoes are either imported or made by hand in small home industries. The factory has ample capacity to increase production well above its present output.

Rice Milling. There are two large and very modern rice milling plants in Surinam. One is at Nickerie, the other at Paramaribo. These plants operate only one shift and have ample capacity to mill all of the rice which may be produced in the near future. While there is no need for expansion, there is a need for better maintenance, which would considerably reduce the percentage of broken grain.

An adequate source of bags for the export of rice is a

pressing problem of the milling industry. An industry to meet this need could be easily justified, providing a suitable fiber crop could be grown economically.

There are several new industries now under construction and several others are being studied. The more important ones are as follows:

Oil Extraction Plant. A new oil extraction plant under the control of the Royal Oil Factories at Wormerveen, Holland, is now under construction at Paramaribo. As now planned, it will use locally grown coconuts as a source of raw material. Other vegetable seeds such as peanuts could also be used to advantage in the event of a coconut shortage.

The designed capacity is 800,000 liters of oil per year, which should meet Surinam's normal requirements. Production costs should be low and the enterprise should be quite profitable providing the supply of coconuts is sufficient to permit the plant to operate near full capacity.

The company plans to construct a soap plant to operate in conjunction with the oil extraction plant. This would be a desirable addition but not until the oil plant has reached stable operations. The soap plant, estimated at Sf. 200,000, would increase the capital investment to Sf. 600,000 and give employment to about 50 workers.

Concentration of Orange Juice. A plan to build a factory for the extraction and concentration of orange juice next to the citrus-packing plant at Soekibaka in Paramaribo is being studied. The promoters of this project, estimated to cost Sf. 1,500,000, hope to secure financing for it from the Surinam Government, the Herstelbank and other banks. The Technical and Sales Departments of the Dutch Chemical Manufacturers at Naarden, Holland would supply the necessary personnel to operate the

plant and market its products.

As now planned the concentration plant would utilize oranges for which export markets are difficult to find, especially fruit which is small and off color. On the other hand, it would, when operating at normal capacity, process about 25 million oranges per year or more than one half of Surinam's present production. This project could, therefore, operate as projected only if the production of oranges were greatly expanded.

Milk Pasteurization Plant. Milk is now delivered directly to the consumer in Paramaribo by the milk producer. None of the milk is pasteurized nor does it have to meet any standards of quality.

A plan is now being studied which it is hoped would remove the present inefficient and unsanitary method of milk distribution. As now contemplated, the project would be a cooperative. The quality and price of the milk would be fixed and the enterprise would be operated on a profit basis, with the milk producers sharing in the profits.

The Mission believes this project, estimated to cost Sf. 500,000 including trucks to gather milk from the farmers, is highly desirable. It is anticipated that the necessary financing will be sought from private sources.

Distillery. Plans have been completed to modernize and expand the present rum distillery at Marienburg from 500,000 liters to 700,000 liters per year.

The new facilities, now estimated to cost Sf. 300,000, would not only be capable of making a higher grade product than at present but would also permit about 200,000 liters per year to be exported through the main office of the Dutch Trading Company in Holland.

The Mission is of the opinion that this would be a desirable project for Surinam.

Charcoal Plant. Charcoal is one of the main domestic fuels in Paramaribo. It is now being made by crude and inefficient methods. A modern plant having a capacity of about 10 tons per day would cost about Sf. 100,000 and make lower production costs possible.

1. LABOR

Skilled. As surface transport, mechanization of agriculture, and industry increase, there arises a need for many more skilled workers. The training of skilled labor has so far been done primarily by the mining companies, forest products companies and the technical school.

Improvement and expansion of the technical school are obviously needed to meet the future demand for skilled labor. Its facilities are totally inadequate even for the present. The Education Department is aware of the need and hopes to obtain ECA assistance in properly equipping the school. The Mission agrees with the high priority which the Department of Education has placed on the expansion and improvement in the technical school and recommends that its present plans be carried out.

Unskilled. The total unskilled labor force in industry does not exceed more than 1,500 workers, with about one half of this number employed in a single major forest product plant. Existing industries are quite small and the extent of future industrial expansion is not likely to be so large as to drain off any considerable amount of rural labor in the foreseeable future.

Labor rates are relatively high in Surinam. In fact, some enterprises, which were built around cheap labor, have great difficulty under present labor conditions in showing a profitable operation. The answer is obviously

to increase the productivity of labor through mechanization.

2. PROTECTION OF INDUSTRY

Almost all consumable items now imported are subject to import duties, while heavy machinery, construction equipment and similar capital goods are imported duty free. Industry therefore appears to be adequately protected against foreign competition and any increase in duty to permit the profitable operation of a small and basically uneconomic enterprise should be avoided unless the indirect benefits are so great that a subsidy is warranted. On the other hand, new industries almost always require the importation of materials which are not available within the country and which, under normal conditions, are not imported. The importation of such material duty free is fully warranted and should be promoted.

The Government has under consideration the draft of a law to encourage new industries by granting them certain tax advantages during the first years of their operation. The Mission believes the extension of appropriate incentives to new industries in Surinam is highly desirable and that the formulation of legislation to this end should be made a matter of priority.

C. POWER AND GAS

The electric power and gas plant in Paramaribo is a fully owned subsidiary of *Oversease Gas en Electriciteitsmaatschappij* of Rotterdam, Holland.

Power Plant. The power plant was started about 20 years ago and consists of four 1,250 kw. and two 3,600 kw. diesel generators, giving a combined capacity of 5,720 kw.

The engines are slow speed, heavy duty and conservatively rated.

The load during the past five years has shown a very rapid growth and will at the present rate require the installation of an additional generating unit within three years. This is best shown by the following table:

ANNUAL GENERATION OF POWER

<i>Year</i>	<i>Kw-hr</i>	<i>% Increase</i>
1945	3,127,346	7.0
1946	3,379,305	8.0
1947	3,874,952	16.6
1948	5,118,938	31.6
1949	7,391,387	43.5
1950	8,446,418	14.5

Rates are on a sliding scale at from 16 to 8 Surinam cents per kw-hr. This is rather high, but reasonable for the size of the plant. However, unless fuel prices increase, rates will probably be adjusted downward when the next diesel unit is installed.

Gas Plant. The gas plant which uses coal in the making of gas is about 40 years old. While the plant is well operated, it nevertheless shows a very high cost of production, chiefly because of obsolescence.

The gas produced consists of a mixture of coke-oven and water gas having about 450 btu. per cubic foot. It is used almost entirely for domestic fuel in competition with charcoal, kerosene and butane and sells on a sliding scale at from 18 to 12 Surinam cents per cubic meter.

The demand for gas has increased very little in the past five years and will probably decline in the future unless steps are taken to make a cheaper gas through modernization of facilities.

Capital Improvements. The rapid growth in the market for electric power, combined with the high production cost of gas, has brought about a need for modernization and expansion of facilities. These capital improvements may cost as much as Sf. 1,500,000 during the next three years, depending on what improvements the company decides to make.

It is anticipated that whatever expansion of electric facilities or of the gas plant may prove necessary will be financed out of revenues or through private sources.

THE BROKOPONDO PROJECT

A^N AERIAL SURVEY of approximately two thirds of Surinam was completed in 1948. This survey was primarily for the purpose of making geological, forestry and mining studies. An analysis of the survey data indicated a potential hydro site on the Suriname River at a point generally referred to as Brokopondo (Broken Pond), approximately 100 kilometers upstream from Paramaribo. Accordingly, Dr. N. J. van Blommestein visited the site and, after verifying the aerial observations, prepared what is generally referred to as the van Blommestein Plan.

Engineering studies of the van Blommestein Plan have brought about various modifications since its inception. In its present form, it is known as the Brokopondo Project.

Topography. A recently completed ground survey confirmed all aerial contour lines to be accurate within the limitations of the scale used. The 50 meter contour, which is the highest to be considered at this time, would give an effective head of approximately 43 meters at Brokopondo. This would require, however, some small auxiliary earth dams at several locations.

The potential reservoir within the 50 meter contour is, fortunately, very large because of the relatively wide and gradually sloping basin. Elevations, however, are very irregular, with many points within the reservoir area above 50 meters.

A ground survey also shows the possibility of dam-

ming the Tapanahony river and diverting part or all of its flow to the Suriname River by means of a canal. The initial stage of development, however, does not include this phase of the original van Blommestein Plan.

Geology. There are surface outcrops of rock along the river for a distance of about 10 kilometers above and below the dam site, which by analysis proved to be metamorphic quartz, calcite, chlorite and albite schist with some inclusion of igneous bands. Cores taken in the vicinity of the dam site show weathering and fissures to extend to an average depth of above one meter, and show no danger of pervious layers of sand, limestone, gypsum, etc. The rock strata is almost vertical and extends for practical purposes perpendicular to the normal flow of the river.

The river bed is covered in certain localities with large quantities of hard, sharp and clean quartz sand. Although there is no gravel, there are several potential quarry sites from which rock may be obtained to take its place. These sites, however, have not been proven by drilling.

Large areas of clay are found near the dam, many samples of which have been tested and found to be suitable for use in making impervious cores in small earth dams along the 50 meter contour line of the reservoir.

Hydrology. Records of rainfall at Paramaribo and other areas outside the basin have been compiled over a period of 85 years. These records show the average rainfall to be from 2,150 to 2,350 mm. Observation stations have recently been established at Affivisti, Boto Passe, Dam, Sika Kamp, Kabel, Brownsweg and Brokponde, all within the watershed. Readings from the several stations, while not conclusive because of the short period of observation, are much higher than those of

previous records near Paramaribo. This, of course, is to be expected because of the location of the mountain range and the direction of prevailing winds.

The greatest portion of the annual rainfall is in the so-called major rainy season (May to August, inclusive). This season is followed by two dry months, referred to as the major dry season. The remaining months show an evenly distributed rainfall pattern. Even in the so-called dry season there is always some rainfall with monthly lows of not less than 60 mm.

No stream flow data were available when studies were first made of the project. Accordingly, assumptions of runoffs have been used, which give an average yearly stream flow of 284 M³/sec based on a runoff coefficient of 35%. It is certain that the flow of the Suriname River decreases appreciably in the dry season to approximately 75 M³/sec. The maximum flow probably lies between 2,500 and 3,000 M³/sec. A gauging station has been established at the dam site and records are available from August 1, 1951. So far, stream flow is considerably greater than originally estimated.

Reservoir. The reservoir which would be created by a dam at Brokopondo would have a surface of approximately 1,000 square kilometers. A drawdown of but three meters, of 7% of the maximum head, would give 3×10^9 M³ of effective storage, or approximately 2,400,000 acre feet.

This relatively large storage will permit the generation of firm power at from 95 to 100% load throughout the year. A hydro power station which has such a high utilization factor generates power at a relatively low cost, making it valuable for use in the reduction of alumina to aluminum, for which power that is both firm and cheap is essential.

The reservoir area is relatively unexplored and only sparsely settled by Bush Negroes. Its preparation should cost very little since it would involve no relocation of roads or railroads, no resettlement of urban centers, no inundation of mines or other valuable property and no need to procure a right of way.

Main and Auxiliary Dams. Original estimates were premised on making the main dam of either earth or rock. Either design is technically feasible; both, however, present difficult problems of construction. The long heavy rainy season would periodically interrupt work on an earth dam. This would extend the construction period and would increase construction costs. Building either an earth or a rock dam would present a difficult problem in case of large floods, estimated to be 3,000 M³/sec, but probably greater. Logs and other debris clearly indicate that crests have reached 10 meters.

A concrete gravity dam in the main river section would simplify the handling of floods and would shorten construction. The spillway and power house could be incorporated in the dam, thereby eliminating separate spillways, large penstocks and a separate structure for the power house. Provision for installing additional turbines when the Tapanahony is used would also be facilitated by the use of a gravity dam.

A rock dam would require much more stone than a concrete gravity dam. One quarry would be suitable for a concrete dam while two and maybe three would be needed for a rock dam. While a rock dam would need only about one quarter of the cement required in a concrete dam for the impermeable layer, penstocks, spillways, power house, etc., cement would still have to be imported and form work arranged for. There would also be need for batching plants and cement handling equipment. In

short, no operation would be eliminated by a rock dam while some operations, such as quarrying, would be greatly increased.

The length of time required for construction is an important factor in favor of the type of dam requiring the least handling of materials. Interest on investment and overhead reach sizeable proportions and must be taken into consideration when estimating the cost of the dam.

For the reasons outlined above, the mission is of the opinion that, before deciding on the type of facility best suited for the Brokopondo project, a concrete dam of gravity design should be studied in detail as an alternative to an earth or rock dam. Auxiliary dams along the 50-meter contour, because they are small and because no question of water diversion is involved, should obviously be of earth construction.

The main dam, if of gravity design, would have an over-all length of approximately 600 meters and would have the following elevation in meters.

Crown of dam.....	+50.0
Highest permissible water level.....	+47.0
Crown of spillway.....	+46.0
Highest effective level for water power.....	+46.0
Lowest effective level for water power.....	+42.0
Mean water level.....	+43.5
Water level in the lower course of the Suri- name River	+ 4.2

Power. By using the conservative figure of 284 M³/sec, firm power of approximately 100,000 kw. at 95% to 100% load factor would be assured throughout the year. This would be equivalent to an annual generation of 830 million kw-hrs.

By diverting the waters of the Tapanahony River into the Suriname basin firm power could be increased to approximately 400,000 kw. This is not, however, contemplated at the present time as it would increase considerably the capital investment and would no doubt require a treaty between Surinam and French Guiana.

Market. The only possible use in Surinam for the amount of power which would be generated at Brokopondo would be in the production of aluminum. Aluminum offers a logical outlet since Surinam is now the world's chief producer of bauxite. Moreover, large reserves of bauxite assure a source of raw material for many years.

The production of a pound of aluminum from alumina requires approximately 10 kw-hrs of electric energy. The first phase of the Brokopondo hydro development would therefore have the potential capacity to produce 83,000,000 pounds, or approximately 40,000 tons, of primary metal per year. This is equivalent to two pot lines. In comparison with reduction plants in the United States and Canada, this is quite small. Nevertheless, it is large enough to be both technically and economically feasible.

Status of Investigation. During 1951, a camp was built at the dam site for the field engineers who have been assigned the responsibility of making ground surveys, obtaining earth and rock samples for laboratory analysis, taking regular stream flow readings and making periodic inspections of rain station recorders.

Field work has been progressing rather rapidly. Over 300 samples of clay have been gathered and sent to the Netherlands for tests to determine the suitability of clay as an impervious material for earth dams. About 12 cores 10 meters deep have been taken in the vicinity of the proposed dam location to check foundation condi-

tions. Additional cores will be taken to check the entire area. Likewise cores will be taken at potential quarry sites to determine the best location and quality of rock for use as an aggregate.

Hydrological data in the field has been gathered since August 1, 1951 with all operations now well established. After about 12 more months of field work, it will be possible to begin a final analysis of the project and to consider entering the detail engineering stage.

Contract for Sale of Power. One of the most important steps to be taken at this time is the formulation of a preliminary contract for the sale of power. This step should, if possible, be completed before detail engineering work on the hydro facilities is commenced.

Before an aluminum industry is established in Surinam, there are a number of problems which will have to be resolved in addition to an agreement on the cost of power. Among them are: the setting aside of bauxite reserves and the location of these reserves; new concessions; taxes; transfer of profits; terms, conditions and length of contract; guarantees of power use and supply; import duties or waivers on raw material to be imported; and the currency to be used in the purchase of power and in the payment of salaries to foreign technicians. The negotiation of such a formidable contract will require considerable time and effort. The Mission suggests, therefore, that the Netherlands and Surinam Governments, after they have determined their respective interests in the project, jointly designate a single individual or agency as in charge of the project on their behalf and furnish that individual or agency, as necessary, with experienced technical, financial and legal advisers.

Capital Cost Estimates. The best estimate at this time of capital costs may be broken down into the following

broad categories:

1. Dams (main and auxiliary).....	\$21,500,000
2. Power house equipment.....	4,500,000
3. Transmission line (100 km.).....	5,000,000
4. Engineering	1,500,000
5. Contingency	2,500,000
<i>Total</i>	US \$35,000,000

Cost of Power. Hydro projects of the Brokopondo type have a very long life. For purposes of setting rates, United States agencies depreciate similar projects over a period of 40 years. By applying the same rate to Brokopondo, annual production costs may be estimated as follows:

1. Depreciation and interest	\$1,902,000
2. Maintenance, salaries and wages ...	120,000
3. Insurance	100,000
<i>Total</i>	US \$2,122,000

Gross sales may be assumed to be 800,000,000 kw-hrs

Production cost/kw-hr = US 2.65 mills.

It is highly improbable that the project could be financed on a 40-year loan basis. Assuming that it were financed on the basis of a 25-year loan at 4½% interest, annual charges would require a gross income of US \$2.85 million equivalent to US 3.2 mills/kw-hr on the basis of gross sales of 800 million kw-hrs.

The final rate at which power should be sold depends on many factors and can only be arrived at by negotiation. The Mission has not attempted to make any recommendation in this respect.

Construction Schedule. Hydrology studies must be continued until January 1953 before detail design can be started. The earliest date of completion, therefore, based on one year for engineering and four years for construction, would be January, 1958. The project during the construction period will require about 1,500 workers.

Secondary Values. While Brokopondo could only be justified by the development of an aluminum industry, it would nevertheless improve shipping on the Suriname, permit the use of river water for irrigation, accelerate development of the interior and permit a broader scale of fish culture.

(a) *Shipping.* At the present time, only log rafts and very small craft move on the Suriname as far inland as Brokopondo. The steady flow of water from the power plant would raise the average level of the river by approximately four feet, permitting barge traffic throughout the year. The reservoir extending inland approximately 60 km. would offer additional water transportation to the interior, now inaccessible because of numerous rapids.

(b) *Fishing.* The water in the Suriname above Brokopondo is free of silt. The lake would undoubtedly be clear and would probably be highly suitable for fish culture, although experiments would be necessary to confirm this assumption.

(c) *Irrigation.* The construction of the Brokopondo dam is important from the point of view of irrigation, in that it would cause a shift of the salt water limit. At present, in the major rainy season the salt content in the various rivers is troublesome only in the immediate vicinity of the coast; but, as the flow diminishes in the dry season, the salt water limit shifts a considerable distance inland. Since this is the case in the Suriname River, it is impossible for the district south of Paramaribo, where the Lelydorp plan has been projected, to draw water from the river for irrigation purposes during the dry season. The discharge of a strong, uniform flow would change this situation, since the position of the salt water limit would remain the same as in the rainy season.

By lowering the salt content the dam will also make it possible to use the Suriname River as a source of fresh water for the City of Paramaribo.

CONCLUSIONS

1. It is now certain that it will be possible to build a dam and power station in the Suriname River at Brokopondo.

2. Capital costs will not be excessive as against the amount of power developed.

3. Power rates can be within the limits required for use in the economical production of aluminum.

4. Firm power of 100,000 kw. at from 95 to 100% load factor can be assured. There is every reason to believe that further stream flow data will increase the maximum firm power rate to 125,000 kw.

RECOMMENDATIONS

The Mission recommends that:

1. Examination of the feasibility of the Brokopondo project be pushed forward vigorously.

2. The business aspects of the project be explored promptly with potential aluminum producing companies. To this end, it suggests that the two Governments jointly designate a single individual or agency as in charge of the project on their behalf and furnish that individual or agency, as necessary, with experienced technical, financial and legal advisers.

3. No detail engineering be started until there are stream flow data for two dry seasons (one is now available) and until it is clear that a power contract will be consummated.

4. Detailed studies be made on a concrete dam of gravity design.

TRANSPORTATION

A. THE PRESENT TRANSPORTATION SYSTEM

SURINAM's present facilities for moving internal and external trade include:

1. A network of navigable rivers, running east-west and north-south, which interconnect all the productive regions and serve as direct arteries of ocean shipping.

2. About 280 km. of main roads radiating out of Paramaribo into the nearby agricultural hinterland, to the Zanderij airfield and to the Paranam-Billiton bauxite installations.

3. About 125 km. of main road in other regions, e.g., from Coronie-Burnside to the Coppename River and from the Moengo bauxite installations to Albina.

4. A local mesh of farm-to-market roads in the Paramaribo region, plus some local roads in other agricultural regions such as Coronie and Nickerie.

5. A railway running south from Paramaribo over a total length of 133 km. to Kabel on the Upper Surinam River.

6. A large airfield at Zanderij, the only airfield in all Surinam, used exclusively for international traffic.

7. An ocean port for import, export and interregional general cargo at Paramaribo on the Surinam River.

8. Local ports for general cargo at Albina on the Marowijne River, at Nickerie and Wageningen on the Nickerie River and at Coronie on the coastal strip.

9. Specialized ports for moving the exports and imports of the bauxite industry deep inland at Moengo on the Cottica River and at Paranam on the Suriname River.

10. Overseas, Caribbean and coastal shipping services out of Paramaribo, Moengo and Paranam.

Inland Waterways. The navigable rivers, supplemented by some coastal lanes, are the main arteries of both external and internal trade.

All the export bauxite is river-hauled by ocean going ore carriers and freighters which run directly from loading docks at Moengo and Paranam to transit dumps at Trinidad or to U.S. ports. Inbound, these vessels bring back fuel and diesel oil, equipment and operating supplies for the bauxite industry. They also haul some general cargo both ways.

The bulk of the timber output, including logs for export, for manufacture into export plywood and for processing by home market sawmills, is river-floated or river-hauled on rafts downstream to Paramaribo from forestry workings along the streams. Most of the export rice, citrus, coconuts, coffee, etc., is also brought down the rivers (or along the coast) to Paramaribo for transshipment to ocean freighters.

A large fraction of Paramaribo's food supply from the surrounding hinterland comes in along the rivers by launches, lighters, barges and *corials* (dug-out canoes). The river routes are also used for the downstream haulage to Paramaribo of stone, gravel and sand, mainly for road-building purposes. Almost all general cargo imports for outlying communities such as Moengo, Albina, Nickerie and Coronie is carried by river or coastal craft following transshipment from ocean freighters at Paramaribo.

Roads. Surinam's few main roads are essentially

local routes for moving traffic to and from the larger towns. These routes are densest in the Paramaribo region where they serve as arteries for: (a) donkey cart and motor truck haulage of inbound food to the town, outbound supplies to the countryside, and some export-import goods moving through the port; (b) autobus transport of bauxite workers who live in Paramaribo but who work at Paranam-Billiton, and of farm and village children who go to school in Paramaribo; and (c) passenger transport by motor vehicle between Paramaribo and Zanderij airfield, and between Paramaribo and the surrounding communities. There is a substantial volume of bicycle traffic, particularly close to town.

Outside the Paramaribo region the main roads carry strictly local traffic for the most part; e.g., bringing in food to Coronie and Nickerie from the local farms and carrying back consumer goods, producer equipment and operating supplies. To some extent, however, they also serve as initial links of interregional or even international traffic; e.g., log haulage along the Moengo-Albina road as the first step toward floating rafts downstream to Paramaribo, and foodstuff haulage along the Nickerie and Coronie roads for subsequent transport to Paramaribo. Near Moengo and Paranam, the main roads also carry some operational traffic between the various bauxite installations.

The main roads out of Paramaribo reach into the surrounding farms and plantations over a considerable network of access routes. Most of the goods traffic on these main roads originates or terminates on their farm-to-market feeders.

Railway. The State-owned line from Paramaribo to Kabel is Surinam's only common carrier railroad. It handles both freight (only 50,000 tons a year) and pas-

sengers (only 7 million passenger-km. a year). About two thirds of the revenues come from freight, about one third from passenger traffic. The railroad's essential functions are: (a) downline haulage of sand for building purposes and timber for the plywood plant and sawmills at Paramaribo; (b) upline haulage of aviation fuel and lubricants for the Zanderij airfield; (c) school train service, each morning and afternoon, for rural children who go to school in town; and (d) ordinary passenger service between Paramaribo and the countryside.

Ocean Ports. Practically all of Surinam's foreign trade, the great bulk of its interregional trade and much of its local trade move through river-ocean ports.

Paramaribo is by far the main port for general cargo. Virtually 100% of the non-bauxite exports such as rice, plywood, timber, citrus, coffee and coconuts clear here, as do practically all imports except equipment and supplies for the bauxite industry. All but a minor fraction of the interregional traffic along the river and coasts either starts or ends at Paramaribo, or goes through the port. Additionally, a sizeable fraction of the local interchange of goods between the town and its hinterland along the Suriname, Saramacca and Commewijne rivers is handled at Paramaribo.

The regional ports at Nickerie, Wageningen, Coronie and Albina are minor installations dealing with extremely small amounts of general cargo. Most of their traffic is export and interregional freight to and from Paramaribo.

The bauxite ports at Moengo and Paranam are large, modern and well-equipped installations, handling outbound ore and inbound materiel. The facilities at each are privately owned and are operated as an adjunct of bauxite mining.

Zanderij Airfield. All air traffic between Surinam and the outside world necessarily passes through Zanderij since Surinam has no other airfield. Zanderij is the private property (on a long-term lease) of the Surinam subsidiary of a foreign airline, Pan American Airways, but functions as a common facility for all the air carriers which service the country.

Overseas, Coastal and Caribbean Shipping. Ocean carriage between Surinam and the overseas world is handled by several shipping lines operating scheduled services, some freighters on charter for bauxite haulage and occasional tramp ships. There are services to and from: North America (mainly to haul bauxite and general cargo); Europe (chiefly general cargo and passengers); Trinidad (bauxite and petroleum); and other Caribbean countries (rice and plywood). Coastal shipping is mostly carried on by the specialized craft of a state-owned fleet.

Department of Public Works and Traffic (OWV). The OWV is the chief governmental agency concerned with transport. It has operational as well as civil works responsibilities over a wide range of transport functions.

1. It is responsible for the construction, improvement and upkeep of all main roads, most secondary roads, Paramaribo city streets and inland waterways.

2. It operates the railroad, local bus service in Paramaribo and pilotage and traffic control services on the rivers.

3. It operates the Beekhuizen Works as a centralized repair shop for railway rolling stock, road-building equipment and other construction machinery and also as a centralized equipment pool for draglines, tractors, bulldozers, graders, etc.

Provincial Commissioners. Each Provincial Commis-

sioner outside Paramaribo is responsible for the repair and upkeep of minor local roads and certain river stretches.

Surinam Navigation Company (SMS). The SMS is a state-owned common carrier which is organized and functions as a commercial enterprise. It owns river craft, coastal vessels and small ocean freighters which operate on scheduled runs at fixed tariffs on the navigable rivers, on the coastal lanes and between Surinam and other Caribbean countries. SMS also operates ferry services, e.g., across the Suriname River at Paramaribo.

KNSM and Alcoa Shipping. Most of the ocean transport between Surinam and the overseas world is performed by KNSM (a Dutch operator) and Alcoa Shipping Company (a U.S. operator). Each runs scheduled services for the carriage of both passengers and freight: KNSM to and from Europe, the Caribbean and the United States; Alcoa Shipping to and from the U.S. and Canada via Caribbean ports. KNSM is solely a shipping enterprise, but Alcoa Shipping is a transport subsidiary of the Aluminum Company of America, the parent of Surinam's main bauxite enterprise (SBM).

PAA and KLM. Most of the international air transport out of Surinam is done by Pan American Airways, a U.S. carrier, and KLM, a Dutch carrier. Between them, they provide frequent, direct services to the U.S. (PAA), to Europe (KLM), to Brazil, Argentina and Uruguay (PAA), and to Venezuela and the Caribbean area (PAA and KLM).

River Carriers (except SMS). Non-bauxite traffic on the rivers is mainly hauled by craft belonging to and operated for the use of private owners such as farmers, planters, Bush Negroes and Carib Indians, or public

owners such as the OMV (transport of gravel and sand) and the Stichting (transport of supplies for the Wageningen and Slootwijk projects). Occasionally some of the private craft accept passengers, cargo or both to be carried for a fee.

Road Carriers (outside Paramaribo). Part of the traffic on the main roads is hauled by motor vehicles owned by individual proprietors who operate them for hire. Typical examples are bus transport of Paramaribo and Billiton workers; truck haulage for rice mills, wholesale merchants and big farms; and taxi transport between Paramaribo and outlying communities. Farm produce, however, is largely brought in by farmer-owned vehicles, mainly donkey carts, which also carry back supplies. Near and in town, the predominant means of personal transport is the bicycle. For the country as a whole, including public and private vehicles in and out of Paramaribo, there are about 1,000 automobiles, 500 trucks and 250 busses or station-wagons, compared with almost 25,000 bicycles.

B. MOTIVATION OF TRANSPORT INVESTMENT PROGRAM

Surinam's desire to expand and improve its transport facilities is motivated by a complex of interacting factors:

1. The need for better, cheaper means of moving the present volume of traffic.
2. The lack of certain transport facilities without which no economy can function at high efficiency.
3. The heavier workload ahead as the Ten Year Program becomes effective in agriculture, forestry and light manufacturing.

4. The developmental stimulus bound to arise from routes which open new areas, link isolated areas or do both.

5. The desire to interlock dispersed productive regions for administrative, social and welfare reasons.

By helping to reduce haulage and handling charges, improved transport facilities will aid in bringing down costs of production, thus stimulating output and trade. Freight rates, measured per ton-mile, are extremely high at present, particularly for inland haulage; they are much higher, in fact, than in most other underdeveloped countries. To illustrate, the average ton-mile charges for truck, rail and barge haulage in Surinam compare with those in Ethiopia and the Belgian Congo as follows:

TABLE I
COMPARATIVE HAULAGE COSTS FOR GOODS
(U.S. Cents per U.S. Ton-mile)

<i>Country</i>	<i>Rail</i>	<i>Truck</i>	<i>Barge</i>
Surinam	6.3¢	15-20¢	2.5¢
Belgian Congo	3.0	11-14	1.1
Ethiopia	4.2	5-10	

The high cost of moving goods internally is a serious obstacle to Surinam's domestic and internal trade. It cuts back the profits which producers can realize from what they sell, raises the prices they have to pay for what they buy and tends to drive up wages as an offset to expensive food, clothing and shelter. The high costs of internal transport are the result, primarily, of the small volume of goods to be hauled and the poor facilities available to move them. The planned investment program for increasing agricultural, forestry and industrial

production, will therefore have to be accompanied by investment to improve Surinam's roads (better surfaces, drainage and bridges) and waterways (widening, deepening and clearing certain channels). Specific proposals along these lines have been worked up by the Government.

Ocean transport is also more expensive than it need be, thus causing balance of payments strain, curtailed profit margins and higher costs of living. This is chiefly due to the extremely small volume of Surinam's foreign trade—of the order of 150,000 tons a year, excluding bauxite exports. A contributing cause is the heavy excess of inbound over outbound freight through Paramaribo—approximately 4-1 ratio at present. In addition, payloads are restricted by sandbars across the river mouths which can be removed only at excessive cost. Even so, better port facilities, which would make possible faster loading and discharge, might result in a measurable reduction in the unit charges of ocean transport. The Government intends to provide such facilities in the form of a new port.

According to the Surinam Government, the international air services are not as good as they should be because Zanderij is an inadequate airfield. It is argued, specifically, that Zanderij is too far from town, improperly maintained and run for the special benefit of P.A.A. To correct these alleged defects, the Government wishes to build a new international airfield, Zorg en Hoop, which would be state-owned.

Surinam's complete lack of internal air transport reacts adversely on efficient production, smooth administration and proper functioning of the public services. Since long distance traffic is necessarily by river and coastal craft all or most of the way, entire days have to be spent on trips which could be accomplished in a few hours or less by plane. This is a serious inconvenience

for business, official and personal travel as well as a serious barrier to rush shipments of medical supplies, spare parts and other emergency goods. To correct these flaws, the Government proposes to construct a nationwide system of airstrips.

If the present proposals to broaden and intensify the exploitation of Surinam's resources work out reasonably well, the volume of gross national production is apt to increase by 50-75% in the next 10 years. With a swelling national income, the traffic workload will increase proportionately or perhaps even more. If Surinam had to rely on her present roads, waterways and ports, the expansion of output might soon be interrupted by haulage and handling bottlenecks. To avert them, measures have to be taken at once to expand the traffic capacity of the main routes, the cargo capacity of the main ports and the haulage capacity of the main carriers. As regards bauxite, SBM is already pressing forward with port and fleet expansion projects which will permit the shipment of much more tonnage than is presently sent out. For the national economy as a whole, the Government has worked out road building, river improvement and port construction projects specifically shaped to handle the expected growth of output from public investment in agricultural and forestry projects and from private investment in manufacturing projects.

Partially, however, the aim is to stimulate rather than anticipate economic development, particularly by road building. Extending certain main roads will, it is hoped, attract settlers into fertile and cultivable areas which lie fallow at present mainly because of their inaccessibility. Building certain new roads, it is argued, will stimulate the interregional exchange of goods and services as a direct consequence. Moreover, if Surinam is to exploit

its forest resources more widely and intensively than at present, the first and indispensable step is to build penetration roads and penetration canals.

The exigencies of good public administration also call for investment in better routes. Surinam has a highly centralized Government, closely administered from Paramaribo. The same roads, waterways and airstrips which would help to integrate the nation's economy would help to integrate its administrative organization as well.

C. APPRAISAL OF TRANSPORT INVESTMENT NEEDS

Given the specific circumstances of the Surinam national economy, the broad principles which might reasonably guide the transport investment effort are:

1. Every project is *prima facie* sound which promises to maximize production and trade through increased transport capacity, reduced transport costs or the opening of new productive areas; but

2. There should be no investment in specific facilities for local, interregional or international transport—(a) beyond foreseeable traffic needs; (b) beyond manifest possibilities of regional growth; or (c) which do not mesh with definite projects to expand agriculture, forestry or industry, except as the isolation of individual productive regions might justify certain interregional routes to foster national unity.

3. As between alternative means of transport to do the same job, investment should be made in those which minimize original investment costs plus subsequent working expenses; but transport facilities which might be incapable of paying their own way commercially should nevertheless be deemed suitable for public investment if

they will manifestly stimulate production and trade.

4. No transport project should be undertaken: which is a mere make-work scheme; which yields no significant benefits in the form of increased productivity, expanded trade or improved public services; which imposes a sizeable investment burden for no appreciable return of public welfare. On the other hand, no transport project which would clearly promote development need be rejected on the sole ground that it might require some subsidization from the public budget.

Applying these broad criteria, the Mission believes that, on the whole, the Government's transport program is soundly conceived. We are convinced, however, that a few of the projects included in the program ought to be cut back or completely eliminated and that a few others need some reworking of details. We are also of the opinion that the investment effort should be widened to provide for some projects not included within the Government's proposals.

The discussion which follows omits a few projects, assigned to the transport sector in the Government's original investment program, which the Mission has considered in connection with other sectors; e.g., penetration roads to open logging areas, Technical Appendix No. 2, *Forestry*, and a new Central Market for Paramaribo, Technical Appendix No. 6, *Marketing*.

Improvement of Local Roads. The Government has worked up a far-reaching program to improve, by better surfacing and drainage, the existing farm-to-market roads. Total costs are estimated at Sf. 6,170,000. Of this, Sf. 4,235,000 is for the improvement of certain local stretches, aggregating 188 km., of the main roads to the Commewijne, Saramacca and Kwatta districts and across the Nickerie polders; Sf. 1,935,000 is for the im-

provement of the entire mesh of country roads, aggregating 204 km., which feed into the highways out of Paramaribo. Broadly, the aim is readier traversability and year-round serviceability with the incidental benefit, for the public budget, of reduced maintenance costs. All of the roads to be improved definitely need better surfacing, better drainage or both, to reduce vehicle wear and tear, speed vehicle turnaround and relieve rainy-season bottlenecks.

The Government also proposes to invest Sf. 1,260,000 for resurfacing, widening and straightening about 42 km. of the bauxite-base road alongside the Suriname River from Paramaribo to Paranam via Domburg. This is both an industrial route for the transport of Paranam-Billiton workers and an agricultural route for the transport of local produce. Its use for both purposes is hampered at present by a rough surface, narrow width and inconvenient curves over much of the run.

We are convinced that the road improvement project deserves a very high priority, since it promises an immediate return in public welfare which is large in relation to the cost involved. Each of the roads in question traverses or gives access to some major region for the production of food. Each is a capillary route for some definite project or projects to expand the output of rice, oilseeds, vegetable oils, dairy produce, meat, etc. The Paranam road, in particular, is a transport adjunct of the bauxite industry as well as of agriculture.

The funds which Surinam is proposing to invest for agricultural development might fall short of achieving their purpose without better farm-to-market roads, capable of carrying a larger volume of goods at lower costs of haulage. Furthermore, it would be wasteful to extend the existing network of main roads without simultane-

ously improving their feeder spurs into the countryside and their access stretches into town. Last, but not least, part of the investment for improving the local roads will be offset by a reduction in maintenance and upkeep costs.

Although the Mission does not question the broad accuracy of the official cost estimates, we believe that they may be mistaken in assuming that no waste bauxite will be obtainable for road projects close to Paramaribo other than for the Paranam road. Waste bauxite is the best and cheapest of all materials for laying a road base in Surinam. At Sf. 2.50 a ton, the price now paid by the OWV for the small amounts the mining companies release for improving the public routes which serve their own properties, the use of bauxite cuts the total costs of building or reconstructing a given stretch of road by 30-35%. If the OWV were willing to pay a somewhat higher price, the mining companies might be willing to release a larger amount. The increased price would not be high enough to make the use of waste bauxite much more expensive. For this reason, the Mission has reduced the official estimates for road improvement other than the Paranam project by 5%, which suggests a total outlay of Sf. 7,150,000 to carry out the entire program.

Construction of East-West Highway. Although the time may eventually come when Surinam can profitably undertake to construct an interregional network of main roads, it is as yet too early to contemplate such a scheme. Neither the present volume of goods traffic nor the expected volume to result from the Ten Year Program is large enough to justify building trunk highways to duplicate the waterway routes, particularly in view of the cheapness of river transport for the bulk haulage of rice, timber and oilseed.

An interregional highway stretching about 220 kilo-

meters from Paramaribo to Wageningen and Nickerie, by way of Coronie is, nevertheless, a sound idea. Much of the route already exists; its completion requires only—(a) the construction of a 20-kilometer stretch to extend the Garnizoenspad to the Saramacca River; (b) the acquisition of a car ferry and the installation of landing stages at Coppename Point; and (c) the construction of a 68-kilometer road from Coronie via Wageningen to Nickerie.

The Garnizoenspad extension is desirable in and of itself as a penetration road to open new farmlands and as a farm-to-market short cut. The Coppename ferry project is also inherently worthwhile; in return for a relatively small investment, through motor traffic would become possible from Paramaribo as far west as Coronie. Although a road linkage between Coronie and Wageningen-Nickerie is not urgent from the viewpoint of immediate traffic potential, and was presumably excluded from the provisional program for this reason, the Mission believes that there are sound economic, administrative and social reasons for undertaking that project.

The Garnizoenspad project, estimated to cost Sf. 1,200,000, has a top priority rating from the Government. An existing main road out of Paramaribo which runs 19 kilometers toward the Saramacca River and then stops would be extended 20 kilometers to reach the stream. This would be developmental in a triple sense. It would stimulate the further growth, all the way to the Saramacca River, of an agricultural belt which has already come into being over the entire length of the present road. It would create at no extra cost, a shorter, more direct artery to the Groningen area across the Saramacca River than the present road via Uitkijk. Finally, it would provide a span in an eventual East-West trunk highway joining

Paramaribo with Coronie-Burnside (coconut cultivation, pig breeding), and Wageningen-Nickerie (export rice and oilseed).

The Government also envisages the purchase and installation, at an estimated cost of Sf. 235,000, of car ferry facilities at Coppename Point. Although a main road runs out to each bank of the Coppename at this point, through haulage is impossible because there is no means of moving motor vehicles across the stream. The project would provide a car ferry plus pontoon landings on both banks.

The Mission believes the Government might be well advised to include the Coronie-Wageningen-Nickerie road in its investment program for the next 10 years. According to OMV estimates the project would cost about Sf. 1,380,000. Of this, Sf. 1,300,000 is allotted for 60 kilometers from Coronie to Wageningen and Sf. 80,000 for 8 kilometers from Wageningen to a junction with the present local network out of Nickerie. Apart from its possible significance for East-West trade, the new road would be a worthwhile investment because of its effect on both the Coronie and the Wageningen-Nickerie region. It would tend to extend the cultivated area in each region and help to promote more local interchange of goods and services. The road would also facilitate more efficient administration of the public services by making it easier to travel between the towns and into the outlying farmlands; and it would help to create a stronger sense of common national welfare among the different racial groups of these dispersed and isolated communities.

Although no great volume of road traffic between Paramaribo and the Northwest or between Coronie and Wageningen-Nickerie is apt to develop immediately, the links to complete an East-West highway should be built

as promptly as Surinam's finances will permit. They are needed to accommodate an eventual multiplication of traffic from the continuing growth of some of the richest but most isolated agricultural regions, to stimulate that growth and to speed the regional unification of a dispersed economy in a country which is just beginning to govern itself in domestic affairs.

Improvement of Inland Waterways. Surinam has been endowed by nature with an ideal means for the cheap transport of bulk goods; i.e., a far-flung network of navigable rivers and coastal lanes. Properly exploited, they could accommodate an indefinite growth of traffic without much capital outlay and at minimum operating expense. Every effort should therefore be made to reap the fullest possible benefit from this precious natural asset.

The inland waterways cannot be utilized to full advantage, however, without correcting a few defects which presently hamper river and coastal shipping and which might become serious obstacles to the future expansion of interregional traffic. The main flaws are the limited traversability of certain stretches such as the Saramacca Canal and the Arrawara Creek, and an inland fleet which is not suitable for efficient, low-cost haulage of an increased volume of goods.

Projects to improve both the Saramacca Canal and the Arrawara Creek have been prepared by the Government. Both are essential and fully warrant the necessary investment to carry them out. Taken together, they will permit the passage of larger barges and will speed barge movement, thus removing latent bottlenecks to river traffic between Paramaribo and the Northwest, and helping to make river haulage cheaper. Individually, also, the projects have great merit. Improvement of the Sara-

macca Canal should promote an increased interchange of goods between Paramaribo and the Saramacca region, while improvements on the Arrawara Creek will probably stimulate the development of forestry along the main streams it connects.

Although the Government has not yet formulated such a project, the Mission believes that Surinam ought to be programming the expansion and improvement of the river-coastal fleet. More goods will have to be moved with the realization of the Ten Year Program; the Saramacca Canal and Arrawara Creek as improved will be able to accommodate larger, faster craft, capable of working at lower unit costs; the present barges are too small and too slow for high efficiency, low-cost operation on the improved waterways. Presumably, since the state-owned SMS is the only common carrier, it is the SMS fleet which ought to get all or most of the additional craft.

Saramacca Canal Project. The improvement of the Saramacca Canal between Paramaribo on the Suriname River and Uitkijk on the Saramacca River, as envisaged by the Government, is both an agricultural and a transport project. Agriculturally, the aim is to improve the drainage of a major productive area. From a transport point of view, the object is to improve the depth, width and barge capacity of a vital waterway which links Paramaribo directly with the Saramacca hinterland and indirectly with the Wageningen-Nickerie region. With the impending expansion of agricultural output the Canal would be much more heavily used for local and international traffic if it could handle larger barges with more dispatch. This requires deepening and widening of the channel and larger locks at a total cost estimated by the Government at Sf. 800,000. Of this amount Sf. 130,000 might be expected to come from the Prosperity Fund.

Arrawara Creek Project. This project aims to increase the barge-bearing capacity of a critical stretch on the inland streams joining the Nickerie River with the Coppename River. The Arrawara Creek in its present state is a serious hindrance to river haulage out of the extreme Northwest and threatens to impede the agricultural development of the region. The stream ought to be cleared of the fallen trees and logs which presently clog it, as the OMV has already started to do. It may also have to be widened and deepened at a few points. The total cost of the work is officially estimated at Sf. 200,000.

SMS Fleet Project. No definite plans have been worked out as yet to equip the SMS with the kind and size of inland fleet which would take full advantage of the waterways as a developmental stimulus. Nor has the Mission formulated a judgment as to how many or what types of craft should be bought. Considering, however, that internal traffic is apt to grow at least 50% over the life of the Ten Year Program, and allowing for replacement as well as expansion needs, we believe that the effective capacity of the existing SMS fleet craft might reasonably be increased by 50%. Applying this ratio to the present depreciated value of the SMS investment in river and coastal craft, the necessary outlay for new motor barges, tugs, coasters, etc., would approximate Sf. 750,000. The strained financial situation of the carrier, however, precludes any possibility that the SMS might be able to pay for the craft out of its own resources. Their purchase would therefore require public investment in the form of additional equity capital, additional loans or both.

New Ocean Port at Beekhuizen. The Government is convinced that new piers, warehouses and sheds should be built and equipped on the industrial waterfront of

Paramaribo to replace the present installation (KNSM and SMS) on the commercial waterfront further downstream. Specific plans have accordingly been drafted for a new port which, compared with the existing port, would be able to load and discharge more goods more rapidly and would have several times as much storage capacity.

Paramaribo handles the existing workload without serious delay or congestion. If the volume of freight were expected to continue indefinitely at its present level (about 125,000 tons a year including raw materials and operating supplies as well as general cargo proper), there would be no urgent need to enlarge Paramaribo as an ocean port. Some investment, however, might be justified for improvement of piers, pilings, cranes, etc., to reduce cargo-working costs and for additional warehouse space to avert possible peakload strains. (Warehouse capacity is now only 10,000 cargo tons.)

Much larger and much more efficient facilities are nevertheless essential because the existing piers, warehouses and cargo-working equipment will be grossly inadequate to handle the multiplication of traffic likely to result from the Ten Year Program. Since the layout of the town and the narrowness of the waterfront preclude any large expansion and improvement of the present port, a new port at a well-located site such as Beekhuizen seems to be the proper solution.

The key question is how large and how expensive a port to install. Unfortunately, the rate of traffic growth in response to the Ten Year Program cannot be precisely predicted. It might therefore be prudent to start planning for the less expensive Smit project (Sf. 3.5 million) rather than for the more expensive Franx project (Sf. 6.1 million) which was presented to the Mission. The Franx project with piers of a size and strength to bear ware-

houses would provide a better port (faster loading and discharge) than the Smit project with its smaller, lighter piers serving warehouses ashore. It remains to be demonstrated, however, that the resulting advantages of faster vessel turnaround would be great enough to justify the additional capital expenditure. Should this prove to be the case, after a thorough study of the problem and if Surniman's public revenues permit, then a new port built to the Franx specifications would be the proper choice, rather than one meeting the Smit specifications.

Considering the complexity of the decision which has to be made, the Mission believes that a minimum of Sf. 3.5 million (of which Sf. 1,250,000 is already available from the Prosperity Fund) should be definitely allotted, plus a contingent allowance of Sf. 2.6 million if necessary and practicable.

Airfield for International Traffic. In the belief that Surinam needs a new international airfield as well as a new ocean port, the Government has drafted a project to build and equip a public field at Zorg en Hoop on the outskirts of Paramaribo to replace the PAA field at Zanderij, 50 kilometers south of the town. The necessary expenditure would be of the order of Sf. 3 million. In support of this outlay the Government argues that the public interest in air transport between Surinam and the outside world can be more effectively served by a public than by a private field; that PAA, operating DC-4s out of Zanderij, is neglecting the upkeep of the only runway capable of taking KLM's DC-6s; that the total cost of purchasing, overhauling and maintaining Zanderij would exceed the expense of building and maintaining a complete new field at Zorg en Hoop; and that an international

airfield close to Paramaribo is better located than one an hour's drive away.

Instead of undertaking to build and equip Zorg en Hoop, the Mission believes the Government ought to concentrate on ways and means of having Zanderij brought back into top condition.

In the opinion of the Mission, there is no compelling need for a new field at Zorg en Hoop or any other site. Although Zanderij has some limitations and inconveniences, it would be technically a simple job, and not too expensive, to rehabilitate the main runway; a close-in field like Zorg en Hoop might eventually create serious difficulties from the viewpoint of city planning, future expandibility and ultimate safe capacity. Furthermore, repair of the main runway at Zanderij would be a much cheaper way to assure proper landing and take-off facilities for big, heavy aircraft than building and equipping a completely new field at Zorg en Hoop. Even if Zanderij has to be bought from PAA to assure a proper job of rehabilitation, the entire job could probably be done for half or less of the envisaged outlay on Zorg en Hoop, considering that the right to take over the field for a reasonable compensation is expressly reserved to the Government by the terms of the Zanderij concession. Although operational and maintenance costs might be cheaper close to town than 50 kilometers away, the resultant savings would be much less than the increased charges for depreciation and interest incident to Sf. 1.5 million of additional investment amortization in 10 years at most.

It is also possible that the main runway may be rehabilitated in the next few years at no cost to the Surinam Government. According to the Surinam representatives of PAA, the carrier is planning to initiate DC-6 flights on the New York-Rio run with a traffic stop at

Paramaribo. In this event, Zanderij will have to be brought into proper shape as an indispensable preliminary. Even if DC-6 service is not initiated, there might be some possibility of improving Zanderij as a PAA project at PAA cost by exercise of those terms of the concession which subject the concessionaire to such control as the Government may deem necessary for the "safety of persons and goods."

Since Surinam does need a better international airfield than it now has, the Mission believes that Sf. 1.5 million should be earmarked for the acquisition and repair of Zanderij. This amount should be considered a contingent allotment which may not have to be used in full or at all.

Construction of Internal Airstrips. There can be no question of Surinam's urgent need of a network of minor airfields so that internal service can be started. The Government is thus on sound ground in proposing to build a few such fields near Paramaribo, Wageningen-Nickerie, Coronie, Moengo-Albina and perhaps Brokopondo. Each would be a simple grass strip built to DC-3 standards or lower. They would be used initially by small, light craft, seating two or three passengers only, on charter flights to be run by a private commercial operator.

In the Mission's view, this is a high priority project which promises to yield maximum benefits for minimum costs. In return for a trifling outlay—only Sf. 100,000 according to OWV estimates—Surinam would no longer be handicapped and inconvenienced by the lack of any means for fast travel and rush freight.

Construction Equipment for Beekhuizen Works. Instead of charging the cost of construction equipment against the specific transport projects which require them, the Government has prepared a lump estimate of

the necessary import of tractors, bulldozers, draglines and the like. This is consistent with the prevailing practice of operating the Beekhuizen Works as a centralized pool of equipment for lease to the various departments as needed.

According to the Government's original estimates, the Beekhuizen Works would have to be supplied with Sf. 2.0 million worth of construction equipment, mainly road-building machinery, in addition to some equipment for waterway civil works. No heavy machinery for port or airfield construction is included in this figure on the theory that the equipment would be brought in by the Dutch contractors who might be expected to do the work.

From what the Mission could learn, the estimate of Sf. 2 million may be seriously inflated, perhaps several times over. Insufficient allowance was seemingly made for the existing equipment pool at Beekhuizen; a larger construction program may be envisaged than will actually be carried out; and some equipment needs outside the transport sector may be included. For this reason, we believe that an allocation of Sf. 1 million, or half the Government's proposal, might be the right order of magnitude pending a thorough survey of equipment needs and availabilities.

Machine Tools for Beekhuizen Works. The repair shop at the Beekhuizen Works needs some new machine tools because much of the existing equipment is overage or obsolete, and because realization of the Ten Year Program will require the maintenance of more trucks and tractors, more draglines and bulldozers, etc., for road, waterway, drainage, empolderment and other civil works. The motive power and rolling stock of the railroad will also have to be kept in good shape as long as it continues to operate. As a further benefit, Beekhuizen's

present operating deficit of Sf. 100,000-150,000 a year might be greatly cut back or completely eliminated by re-equipment of the shop.

Although no official project to re-equip the repair shop has been drafted as yet, the Mission believes that an appropriate allotment should be made. Our best estimate of the necessary outlay, based on discussions with the Beekhuizen management, is about Sf. 400,000.

Re-equipment of the Railroad. It is arguable that operation of the railroad ought to be suspended as soon as practicable because of the deficits it sustains relative to the work it performs. Collecting only 40-50 cents of operating revenue for each guilder of operating costs, the carrier loses about 300,000-400,000 a year (before depreciation) which has to be made good out of the public budget. All that Surinam gets in return is some goods and passenger transport that could be provided more efficiently and cheaply by road haulage.

It would be premature, however, to suspend operation immediately, since at present the line is the only means of access to the logging area it traverses south of Zanderij. It might also be a useful transport adjunct for the construction of a hydroelectric plant at Brokopondo if the Government decides to go ahead with that project. Although the line does not reach Brokopondo directly, it passes close by and could be connected with the plant site by a short rail spur or a short service road, whichever is more convenient. This would make it possible to haul equipment, materials and supplies by rail to a site which cannot be readily reached at present by barge or by truck.

If the railroad is to be continued for any considerable period, the present fleet of wood-burning steam locomotives (Borsig engines dating back to 1904) will have to

be replaced by a few diesel-electrics. These 50-year-old Borsigs with their limited tractive effort, excessive fuel consumption and high upkeep expense are a primary reason why the present operation is so costly. As wood-burners, moreover, they compel the carrier to devote an exorbitant share of its total haulage to fetching and carrying timber to supply the engines with fuel. Unless they are replaced by low cost, high efficiency diesel-electrics, there can be no hope of transforming the railroad into a fit tool for doing much useful work, or of reducing the present huge operational deficits.

The Government must thus choose between suspending operation of the railroad as soon as the existing line south of Zanderij can be converted into a motor road or continuing to operate the railroad as a convenient auxiliary of the Brokopondo project. If operation is completely stopped or greatly curtailed pending ultimate abandonment, no question of capital expenditure to re-equip the carrier can arise. Assuming temporary continuance because of Brokopondo, the transport investment budget will have to be charged with the cost of a few diesel-electrics to replace the present Borsig fleet.

The Mission believes that an allotment of Sf. 750,000 contingent on Brokopondo would be enough for the time being. This is only a third of the outlay for new locomotives, passenger coaches and freight cars estimated by the carrier's management as necessary if full operation is to continue. It represents five-sixths, however, of the amount which the management would like to spend for diesel-electrics alone.

Since re-equipment is advisable only if the Government goes ahead with the Brokopondo project, the cost might conceivably be charged against the hydroelectric project rather than be included in the transport budget. The

Mission thinks it should be carried as a transport charge, because the railroad would presumably continue to function as a common carrier hauling passengers, timber, sand and aviation fuel as well as a project carrier hauling equipment, materials and supplies for the realization of Brokopondo.

Extension of Telephone Services. The project which the Mission was asked to consider is a much-reduced version of an earlier program, prepared by the *Lands Telegraafen Telefoon Dienst* (a state-owned public utility), for the nationwide expansion and improvement of the telephone services. Although the reduced project aims at realizing all the essential purposes of the LTT program, it trims the original cost estimates by two thirds, on budgetary grounds, with no selective screening.

If the full-scale program were to be carried out, the existing lines and cables out of Paramaribo would be extended further into the local hinterland and certain new lines would be built between outlying communities such as Wageningen-Nickerie, Coronie-Coppename Point and Moengo-Albina. The total area of telephone service would thus be greatly enlarged, particularly in the agricultural region centering on Paramaribo. Moreover, instead of relying on radio-telephone circuits for inter-regional calls, as at present, Surinam would have made a good start toward a nation-wide network of land lines. As a consequence, the argument runs, there would be better, more reliable communications than are presently available; additional subscribers would be attracted from farms and plantations which now have no service; and the net income of the LTT as a state-owned enterprise would increase.

The Mission believes that the fundamental idea behind the LTT program is sound in the sense that Surinam would benefit economically, administratively and culturally from better telecommunications serving more people over a wider area. Yet the proposed implementation raises certain questions of investment cost which only a thorough technical survey could resolve; e.g., the necessity of additional lines and cables into particular districts of the Paramaribo hinterland; the desirability of land lines instead of radio-telephone circuits for interregional traffic; and the true effective demand for telephone service among Surinam farmers and planters. It is possible that all the essential purposes of the LTT project might be realizable for much less investment than the LTT has in mind. For this reason, the Mission suggests a provisional allotment of Sf. 215,000, the full amount of the reduced estimate, pending a complete review by the competent authorities.

D. RECOMMENDED PROGRAM OF TRANSPORT INVESTMENT

The transport projects which the Mission recommends for public investment are listed in the following table. In all, they are estimated to cost Sf. 19,180,000. Of this, Sf. 5,835,000 would be foreign exchange expenditure and Sf. 13,345,000 would be local currency disbursement.

Of the total amount of Sf. 19,180,000, about Sf. 1,380,000 is already available in the form of earmarked but unutilized allocations from the Prosperity Fund—Sf. 1,250,000 for constructing and equipping a new ocean port and Sf. 130,000 for improving and enlarging the Saramacca Canal. This leaves a balance of Sf. 17,800,000 to be financed as part of the Ten Year Program.

TABLE II
RECOMMENDED TEN YEAR PROGRAM OF TRANSPORT INVESTMENT
(Thousand Surinam Guilders)

<i>Project</i>	<i>Total</i>	<i>Foreign Exchange</i>	<i>Local Currency</i>
<i>Improvement of Existing Roads^a</i>			
Domburg-Paranam road	1,260	200	1,060
Local stretches, main roads	3,955	420	3,535
Country roads, Paramaribo	1,935	140	1,795
<i>Total</i>	7,150	760	6,390
<i>Construction of East-West Highway^a</i>			
Garnizoenspad to Saramacca River	1,200	200	1,000
Coppename ferry	235	140	95
Coronie-Wageningen	1,300	200	1,100
Wageningen-Nickerie	80	—	80
<i>Total</i>	2,815	540	2,275
<i>Improvement of Inland Waterways^a</i>			
Saramacca Canal	800	120	680
Arrawara Creek	200	—	200
River-Coastal craft	750	600	150
<i>Total</i>	1,750	720	1,030
<i>Construction equipment for roads and waterways</i>			
.....	1,000	800	200
Machine tools for repair shop work	400	320	80
<i>Total</i>	1,400	1,120	280
Repair of Zanderij Airfield ^b	1,500	500	1,000
Construction of internal airstrips	100	10	90
<i>Total</i>	1,600	510	1,090
Beekhuizen ocean port	3,500 ^c	1,500	2,000
Railway motive power ^d	750	600	150
Transport proper	18,965	5,750	13,215
Extension of telephone services	215	85	130
<i>Grand total</i>	19,180	5,835	13,345

^aExcept construction equipment shown as a separate project.

^bMight be realizable without much or any public investment.

^cMinimum project which might have to be extended to Sf. 6.1 million.

^dConditional on continuance of the railroad.

These estimates are conditional, however, on certain specific assumptions, namely that: (a) a Sf. 3.5 million instead of a Sf. 6.1 million port at Beekhuizen is all that Surinam needs or will be able to finance; (b) the Zanderij airfield cannot be brought into first-class shape for DC-6 service without public expenditure for its purchase and repair; (c) the railroad is to continue in full operation, as a useful adjunct of the proposed hydroelectric plant at Brokopondo; (d) the bauxite companies are willing and able to make more of their waste ore available for road-building purposes; and (e) the LTT program for the expansion of telephone services can be cut back two thirds without impairing its essential purpose.

Allowing for the possibility that any or all of these assumptions may be mistaken, the desirable budget of transport investment would range from a minimum of Sf. 17.4 million to a maximum of Sf. 22.1 million as follows:

TABLE III
MINIMUM AND MAXIMUM BUDGET OF TRANSPORT
INVESTMENT
(Thousand Surinam Guilders)

<i>Project</i>	<i>Minimum Outlay in sight</i>	<i>Maximum Outlay in sight</i>
Roads	9,965	10,275
Waterways	1,750	1,750
Construction equipment	1,000	1,000
Ocean port	3,500	6,100
Railways	—	750
Repair shops	400	400
International airfield	—	1,500
Internal airstrips	100	100
Telephone services	645	215
	17,360	22,090

Since the Mission's investment program can be no sounder than the cost estimates for each project, it may be helpful to summarize their derivation.

Construction and Improvement of Roads. All costs (except a minor adjustment for the possible use of slightly more bauxite) are as estimated by the OWV. They reflect previous OWV experience on comparable work taken at present unit costs and with due allowance for specific technical complexities.

Construction Equipment. The original OWV estimates have been arbitrarily reduced about 50% on the theory that they may envisage a larger program of civil works than the Government will actually undertake, and that they fail to give due weight to a large stock of construction equipment in the Beekhuizen pool.

River and Coastal Craft. The required expenditure for new equipment has been taken as equal to roughly 50% of the present depreciated value of the SMS investment in ships, tugs, and barges.

New Ocean Port. The costs of both the minimum and maximum project are expert engineering estimates, several years old, for a specified complex of piers, sheds, cranes, etc.

Railway Locomotives. The necessary procurement of motive power and rolling stock as assessed by the railroad management has been reduced two thirds by eliminating all vehicles except a few diesel-electric locomotives.

Repair Shop Equipment. Requirements as shown stem from quasi-official estimates by the Beekhuizen management without allowing, however, for possible added expenditure to improve the plant layout or possible cutbacks if operation of the railroad is curtailed.

Repair of Zanderij Airfield. The estimate includes

repair costs proper according to recent technical surveys plus an allowance for the presumable purchase price if the property has to be bought.

Internal Airstrips. These are provisional estimates by the technical staff of the OWV.

Telephone Services. The LTT proposals have been reduced two thirds in line with a cutback for budgetary reasons as proposed by the Government itself.

E. OTHER RECOMMENDED ACTION

In addition to an appropriate investment program, there are other measures which would considerably improve Surinam's transport structure. Specifically, the Mission recommends:

1. Prompt action to cut back the operating services of the railroad to the haulage of essential freight pending an eventual decision for or against the hydroelectric project at Brokopondo.

2. Eventual abandonment of the line and its replacement (South of Zanderij) by a motor road over the existing right-of-way if the Brokopondo project is discarded, but conversion of the carrier into a transport auxiliary of Brokopondo if that project goes ahead.

3. Introduction of modern methods of accounting, budgeting, inventory control and the like to improve the operational efficiency of the OWV, the Beekhuizen Works, the Paramaribo bus lines and the railroad.

4. Adherence to a clear-cut policy of concentrating public investment for ocean ports on expenditures to enlarge and improve the general cargo facilities of the Paramaribo waterfront.

5. Closer public control of the upkeep of the Zanderij

airfield through administrative orders and regulations consistent with the terms of the existing concession.

6. Thorough exploration with SBM and Billiton of the possibility of increasing the OWV's purchase of bauxite ore as a roadbuilding material.

7. Interdepartmental action to assure full use, over the entire range of civil works, of Beekhuizen's existing pool of heavy construction equipment.

8. Intensified negotiations with the KNMS, other vessel operators and fruit companies as well, to have refrigerator shipping assigned to the Paramaribo run.

9. Future appropriations for the upkeep and maintenance of roads and waterways on a scale commensurate with the programmed growth of these networks.

10. Prompt negotiation of an appropriate operating concession with the private interests which wish to start internal air services.

11. Enactment of appropriate regulations to persuade owners of donkey carts to switch from iron-rimmed to rubber tire wheels, thus greatly easing the wear- and-tear on roads.

12. Making provision, within the framework of city planning as now budgeted, for bicycle paths to be built alongside the main roads in the close vicinity of Paramaribo.

13. A thorough review of existing tariffs for the internal transport of essential goods by truck, barge and rail, to reduce the general level of haulage charges as far as practicable and to transform their structure into a more efficient tool for the realization of the Ten Year Program.

MARKETING

BY AND LARGE, the methods of agricultural marketing in Surinam are antiquated and disorganized. As a result, the producer earns less than he should, the consumer pays too much for low-quality food, and there is considerable waste and spoilage of perishables. If Surinam is to step up agricultural production as envisaged by the Ten Year Program, the present marketing methods will have to be overhauled. The necessity of improving them is expressly recognized by the Government.

A. MARKETING OF RICE

The most important crop in Surinam today is rice; it is the staple diet of the people and a source of export earnings as well. One of the major aims of the Ten Year Program is to increase the production of rice so as to feed a growing population and at the same time multiply the existing volume of exports. At present Surinam is producing all the rice she needs for her own subsistence, plus a small margin for export to Europe, Venezuela and the Caribbean. In 1950, for example, the output of paddy approximated 50,000 tons. The equivalent yield in rice was 32,000 tons, of which 27,800 tons (worth about Sf. 6.1 million wholesale) were consumed internally or added to internal stocks, and 4,200 tons (valued at about Sf. 1.2 million f.o.b.) were exported to Germany, Venezuela, Curacao and the Netherlands.

Operation of Marketing System. Most of the paddy is

produced by peasant cultivators who operate farms of the subsistence type, selling only whatever surplus is left after satisfying their own needs. A small part of the paddy comes from medium-size farms, operated commercially by family groups who raise rice as a cash crop, but there are no large rice plantations in Surinam.

Each farmer who has paddy for sale sells it as an individual. No producers' cooperatives exist as yet, not even the simplest type of sales cooperative. The farmers are free to sell as they wish to private millers and merchants (who own all storing and milling facilities except for those operated by the Government), or to official buyers acting for the Government-owned stockpile. In either case, the paddy has to be sold at a fixed price of 9 Surinam cents per kilogram. No premiums are paid for grade, condition or cleanliness although the paddy does have to meet minimum standards of acceptability.

The miller or merchant who buys paddy from the grower is not free to dispose of the rice after milling. He must sell it on the home market for local consumption at Government-fixed ceiling prices. These are presently Sf. 21.50-24.00 per quintal wholesale, depending on quality, to which Sf. 1.0 should be added for by-product revenues. Out of a gross return of Sf. 22.50 for rice of ordinary domestic grade (60% brokens) about Sf. 15 has to be paid for the equivalent paddy and Sf. 7.50 remains for storage, milling and transport expenses plus profit-margin.

Rice is exported from Surinam by the private millers and merchants, not by the Government. Exportable grain, however, cannot be obtained except by purchase from Government stockpiles under a system of competitive bidding by which the top bidder qualifies for an export license. Taking an average f.o.b. value of Sf. 31 per quintal for export rice itself (30% brokens) and adding

Sf. 2 for bran and other by-products, the gross return is Sf. 33 per quintal of export rice. Subtracting about Sf. 8 to allow for working expenses and normal profit, the exporter can afford to pay up to Sf. 25 per quintal of rice content and can thus afford to bid up to Sf. 15 per quintal for the paddy available from the Government stockpile.

The Government's stock of paddy is held as a kind of "ever-normal granary" for assuring internal supply first and foremost. The Government decides the minimum amount which ought to be held in reserve at all times and sells the surplus at prices in line with the ceiling prices on domestic rice to millers and merchants supplying the home market. When no further domestic requirements have to be met, and if some surplus still remains, the Government then invites bids for the purchase of exportable grain.

In principle, the Government's profits from the purchase of paddy at cheaper prices than it sells the export grain are repayable to the rice farmers as compensation for the 9 Surinam cents per kilogram they get in a controlled market as compared with the 12-15 Surinam cents they might be getting in a free market. The repayments would be a partial compensation, at best, considering that only 10% to 15% of Surinam's rice crop is normally exported. In practice, for reasons which the Mission was unable to determine, there have been no repayments at all in the past few years.

Evaluation of Results. The state-imposed controls are an attempt to realize economic and social aims which many governments besides that of Surinam consider basic to the national welfare. They help to stabilize the cash income of farmers through fixed prices for paddy, and the living costs of wage earners through fixed prices for rice. Since prices are kept rigid, the farmer is pro-

tected against a collapse of earning power during commodity slumps and the wage earner against soaring food costs during commodity booms. The farmer has a sizeable margin above out-of-pocket expenses to recompense him for his labor, while the wage earner is always able to feed his family even if his earnings are small. Thanks to the stockpile system, in bad crop years as well as good, Surinam's stocks of grain for internal consumption never fall below domestic requirements regardless of world demand for rice.

There is thus much to be said for the present system of controlled marketing on the grounds of economic and social stability in particular. Yet the system for a country in Surinam's stage of development may have outlived a good deal of its usefulness. Surinam is eager to expand the production of rice both to feed a growing population and to export more rice. If the goal is maximum production and multiplied exports, then the existing controls are inconsistent with that aim for the following reasons:

1. They tend to discourage intensified and additional cultivation since the price the farmer gets for paddy is fixed to accommodate urban family budgets rather than to stimulate agricultural output.

2. They discourage careful harvesting and cleaning of paddy since the prescribed price to the farmer is uniform regardless of grade, provided the grade meets minimum standards of acceptability.

3. They limit the volume of exports since rice can be shipped abroad only if the Government decides to release grain from the stockpile.

4. They deter export trade since merchants and millers are handicapped in making firm commitments for sale abroad by a competitive bidding procedure under which no one knows in advance whether the price he is

willing to pay will be the top bid for the exportable grain.

It seems likely that, by applying different techniques of control, many of the advantages of the present system could be realized without the disadvantages which have been listed. If the farmers who raise paddy have less bargaining strength than the millers and merchants who buy it, an effective means of equalization is to form growers' cooperatives with their own milling, drying and storage facilities and with adequate sources of cheap credit at their disposal. If urban wage earners have to be protected against unduly high costs of food, they can be protected by direct consumer subsidies at the expense of the entire national economy instead of by price-fixing at the expense of the rice growers alone. And finally, if Surinam needs a minimum stock of grain to assure her food supply, the normal granary could be maintained by governmental purchases and sales in a free market without price fixing or export restrictions; this might require a larger gross outlay but would not necessarily result in any smaller net return.

Recommended Action. The Mission is convinced that the present system of rice marketing needs to be reformed along lines which would stimulate production, particularly export production. We believe that the ultimate aim should be a free market where the Government intervenes only to encourage output and safeguard supply, although we recognize that decontrol will have to be gradual instead of abrupt. Specifically, we recommend:

1. Higher prices to the farmer for his paddy, within limits set by the f.o.b. value of export rice, until such time as full decontrol may be practicable.
2. Premium prices for high-grade paddy which meets official standards of quality, for as long as the Govern-

ment sees fit to prescribe the prices which the farmer shall get for his grain.

3. Higher ceiling prices on rice for domestic consumption with offsetting subsidies, if the Government considers them desirable, to relieve the strain on the family budgets of low-income wage-earners.

4. Eventual conversion of the Government stockpile into a normal granary with no purpose except the accumulating, replenishing and holding of minimum reserves to avert a sudden shortage of rice.

5. Operation of the Government stockpile, in the interim, so as to encourage the largest volume of exports consistent with normal granary purposes, even if home market prices might become harder to restrain as a result.

6. Revision of the terms by which exportable grain is released from the stockpile, pending ultimate decontrol, so that would-be exporters can have clear knowledge in advance of the amount they are likely to get and the price they will probably have to pay.

7. Governmental action in the form of educational campaigns, initial subsidies and technical assistance to encourage the establishment of rice-growers' cooperatives starting, perhaps, from the existing communal organizations through which the farmers in some of the main productive regions take care of the polders.

8. Equipment of these cooperatives, by means of long-term loans from public agencies at low rates of interest, with the milling, drying and storage facilities they need to function effectively.

9. Establishment of larger and better organized credit facilities—cooperative, public or both—to finance the working capital needs of the small rice farmers who grow most of the present crop and who are expected to produce

much of the additional output contemplated by the Ten Year Program.

10. Provision of governmental or Herstelbank loans, if necessary and requested, to finance the acquisition of plant and equipment by private millers and merchants, particularly where the facilities in question would reduce grain waste, improve rice quality and increase by-product yields.

B. MARKETING OF CITRUS FRUIT

Although soil, climate and rainfall are well-suited to large production of export citrus, Surinam's actual exports of citrus fruit are very low. In 1950, for example, they totalled only Sf. 590,000, equal to 2% of the value of total exports and 10% of the value of non-bauxite exports. Oranges and grapefruit comprise more than nine tenths of the aggregate shipments, almost all of which are sold to the Netherlands.

Like other branches of Surinam's agriculture, citrus cultivation is handicapped by relatively expensive farm labor and the high costs of inland transport. Also, although Surinam produces good quality oranges, grapefruit and lemons, until recently they have not been the type (color, skin, juice, etc.), for which there is a strong consumer preference in the main overseas markets. The profitability of the export trade has been further cut back by heavy losses from spoilage and deterioration en route due to shipping the fruit in nonrefrigerated freighters.

Marketing Methods. Most of the export fruit is produced and shipped by a few large growers, entirely on an individual basis. The separate plantation operators not only grow and gather the fruit but also prepare, pack and ship it to Paramaribo. However, these growers do cen-

tralize their export selling in the Citrus Fruit Growers Association (CFGAs), a sales cooperative which performs no other services for its members.

Although Paramaribo has a packing plant, it is a Government-owned facility of which the CFGA members make little or no use. Instead, they prefer to do their own packing on the grounds that the charges at the public plant are higher than the costs of private packing. None of the existing installations, private or public, are equipped with cold storage facilities. Both the fruit for home use and for overseas shipment have to be sold as raw fruit because there are no juicing and canning facilities. There are no regulations to prevent the export of fruit below a certain minimum quality, to define clear-cut grades of exportable fruit or to require proper international packing. Neither the CFGA nor the Government engages in any advertising or other publicity abroad to make consumers conscious that Surinam does produce wholesome, tasty fruit.

Most of the actual export sales are made at public auction in the Netherlands following the arrival of the fruit in KNSM ships. It is carried in the cooled holds of ordinary passenger-freighter vessels, since the present volume of shipments is much too small to attract refrigerator craft to the Paramaribo run.

The major weaknesses of this system are self-evident. Consumer acceptance has been slow to develop because of the hitherto variable quality of the export fruit together with the lack of effective publicity. The result has been that little fruit can be sold regardless of price. To add to the exporters' problems, spoilage losses in transit run as high as 30-35%.

Yet the limited volume of production is itself the root cause of the low export sales. If production were larger,

the growers could afford to invest in better plant and equipment, particularly cold storage facilities, as a collective venture if not individually. If larger shipments could be made with more year-round regularity, the KNSM, other shipowners or even some of the fruit companies might be persuaded to operate refrigerator vessels on the Paramaribo run.

Necessary Reforms. Although the burden of increasing production and rearranging marketing methods will be on the growers themselves, they will need active Government support in initiating and continuing the necessary changes.

In the first place, the export growers who comprise the membership of the CFGA might be well advised to consider its transformation from a mere sales agency into a complete cooperative instrumentality for improving the quality of Surinam's export citrus. As a first step, the CFGA and the Government jointly should try to work out minimum standards of quality, uniform grading specifications, prescribed rules of export packing and effective sales promotion machinery. As a further measure, the CFGA might approach the Government to help finance an export packing plant with cold storage facilities. An alternative measure might be the re-equipment of the present public plant on terms which would also permit its use by the small farmers who supply the home market. (These growers produce half the total output of citrus fruit.) Finally, to reduce losses from spoilage and deterioration en route, the Government, the CFGA or preferably both, should press discussions with shipowners and fruit companies as to the feasibility of using refrigerator craft on the Paramaribo run; this should be possible if arrangements could be made to assure a larger and steadier volume of shipments.

C. EXPORT MARKETING OF OTHER CROPS

As indicated in Technical Appendix No. 1, other possible export crops are coffee, cacao, coconuts, soybeans, bananas and pineapples. Of these, only coconuts and coffee are actually exported in appreciable amounts but even so, the present sales are extremely small; e.g., only Sf. 479,000 worth of coconuts in 1950, and Sf. 437,000 worth of coffee.

For the time being, the production of these crops is limited by shortage of manpower, relatively high wages and the unwillingness of laborers to work on the plantations from which, up to now, most of the non-rice exports have come. Within the existing limits, however, a much larger volume could be produced for export if certain marketing flaws were corrected, namely the absence of producers' cooperatives, of organized export mechanisms and of proper storage facilities. These flaws cannot be overcome without Government assistance to the growers through appropriate legislation, effective counsel and advice, widened and intensified field services and an adequate credit service.

D. INTERNAL MARKETING OF LOCAL PRODUCE

One of the main purposes of the Ten Year Program is to multiply Surinam's output of animal proteins and dairy produce for local consumption. At present, the average person in Paramaribo eats only 3 kilograms of fresh meat and 6 kilograms of fresh fish a year, drinks only 0.1 liter of fresh milk daily, and has a single fresh egg each three or four days. Surinam is thus obliged to import large amounts of canned meat, dried fish, pre-

served milk, etc., in order to maintain minimum nutrition standards. If the production goals of the Ten Year Program can be achieved, much of these imports would be replaced by local produce.

Causes of Low Output. The present inadequate production of protective foods is largely the result of technical factors such as poor pasture drainage, lack of feed supply, inferior types of livestock and lack of fishponds (see Technical Appendix No. 1). Part of the trouble stems from unorganized methods of marketing, intensified by inadequate facilities for processing and storing local produce. Excessive costs of distribution thus interact with waste and spoilage of food to make local produce too expensive relative to the income of wage earners. Use of fresh meat, fresh fish, fresh milk, fresh eggs and the like as staples of the daily diet is necessarily limited to the wealthier elements of the population.

To illustrate, the ordinary wage earner in Paramaribo earns Sf. 2.5-3 a day as against the following retail prices for selected fresh foods:

Sirloin Steak	Sf. 3 per kg.
Steak and liver	1.8
Meat	1.4
Fish	1-1.5
Poultry	1.5
Milk .....	.25 per liter
Eggs .....	.1 each

Marketing Methods and Facilities. The discussion which follows is limited to the distribution and sale to Paramaribo of vegetables, fruits, meat, fish and milk from the surrounding agricultural regions.

The growers themselves, as a rule, bring the produce to town in their own vehicles, characteristically, don-

key carts for road haulage and dugout canoes for river transport. The fruits and vegetables are brought to the Central Market, an open-air installation on the commercial waterfront; part of the fish is delivered to the Central Market and part to a special fish market. The meat arrives as livestock and is bought by the butchers who take the animals to the local slaughterhouse. The meat is then sold by the butchers at their small, retail shops. Milk is distributed directly to the consumers at their own homes, each farmer carrying a few liters for a few customers.

There are no wholesale markets in the proper sense of the term. The Central Market is in substance a set of small stalls at which individual consumers do their food shopping. Here the producer has a stall of his own where he waits for customers; or, more typically, he sells his produce on the spot to the proprietor of a stall.

There are no proper facilities for treating, cleaning and storing produce despite the hot, humid climate. Neither the Central Market nor the fish market is equipped with adequate cold storage; only two of the town's 18 butcher shops have a refrigerator. The public slaughterhouse is a simple butchering installation with no cold storage at all. There are no dairies, individual or collective, for pasteurizing and sterilizing the raw milk or for processing it into butter, cheese and other produce.

Marketing is thus a purely individualistic process. As small entrepreneurs with extremely limited means, the farmers, cattle-raisers and fishermen must sell their goods at once for whatever they can get. The stall owners and butchers with whom they deal are themselves petty merchants, without much working capital as a rule, and are thus frequently obliged to finance their purchases by high-interest borrowings from small moneylenders.

E. CONCLUSIONS AND RECOMMENDATIONS

The main defects of the present marketing system are: *organizational*—producers and merchants have no organizations through which they can sell efficiently; *technical*—proper facilities for treating, processing and storing perishable food are lacking; *administrative*—closer and more stringent public control of quality, standards and grades is needed; and *financial*—small merchants and producers do not have access to working capital through adequate credit facilities.

The Government has made a start toward correcting at least the technical faults by working out projects for: a) construction of a new Central Market on the site of the present open-air property; b) modernization of the existing slaughterhouse; c) improvement of facilities to handle and sell fish; and d) building a central milk depot. The new Central Market would be a covered two-story structure with sanitary installations, cold storage and public amenities. The total cost of Sf. 450,000 would be treated as a social sector cost in the Mission's recommended program of public investment. The slaughterhouse is to be modernized by adding a cold storage department and a bone-meal plant at a combined cost of Sf. 450,000 (our schedule of agricultural investment considers this facility a necessary adjunct of the cattle-breeding project). The projected development of fisheries, as set forth in that same schedule, includes an allotment of Sf. 275,000 for a new fish market complete with modern refrigeration. Finally, the Government hopes that private capital will be forthcoming to set up a central milk depot, but it is prepared to establish a public depot if necessary, presumably by drawing on the reserve fund for agricultural development.

All of these projects are essential and urgent, in the Mission's opinion, because they will help to reduce the present waste and spoilage of food. They need to be supplemented, however, by appropriate action to correct the organizational, administrative and financial defects of the present marketing system. Specifically, we recommend:

1. Formulation of more stringent public rules and establishment of tighter public controls than now exist, to assure the purity, quality and wholesomeness of local food for local use.

2. Governmental assistance to help the dairy farmers of the Paramaribo region to organize a producers' cooperative, possibly equipped with its own dairy and perhaps operating the projected milk depot.

3. Appropriate measures to broaden the scope of action and strengthen the resources of the People's Credit Bank as a specialized tool for providing short-term credits to small farmers, petty merchants, butchers, fishermen and other individual entrepreneurs.

4. Provision of more adequate means, via the Herstelbank or analogous sources, to help finance private ventures for equipping Surinam with modern facilities to treat, process and store perishable food.

INDEX

- Administration (of public investment program): 73-74; *see also* Development Board
- Aerial surveys: 7, 43, 107-108, 163, 172-73, 193, 195, 204
- Africa: 115ff., 136ff., 176, 180
- African oil palms: *see* Oil palms
- Agriculture: 6-7; allocation of program funds, 37-38, 42, 45, 48, 50ff.; area under cultivation, 7, 103; Bureau of Rural Development, 38; coastal area, 103, 108; cooperative farming, 119, 124; cover crops, 150, 153; credit, 15, 38, 54, 71, 93, 99, 124, 251-53; crop yields, 124-38; equipment, 54; expansion of cultivated area, 6-7, 87-88, 108, 142; expansion of production, 18, 54, 77, 88, 98, 103-104, 113, 118-19, 254-55; extension work, 54, 90, 159, 161-62; farm income, 123-24; government controls, 248-53; in the interior, 103, 105-106; land improvement, 6, 38, 44ff., 54, 70, 76-77, 113, 140ff.; labor, 26, 87, 112-15, 118-19, 126, 129, 131, 133-34, 154-55; mechanization, 26, 44ff., 107, 110-11, 113-14, 119, 126-27, 134, 142, 145-48, 152-55, 160-61, 194, 200; old coastal plain, 6-7, 51, 105, 107, 124, 142, 148; plantations and large farms, 4, 14-16, 25-26, 46, 48, 108, 112, 114-21, 131-32, 135, 149, 248, 253-54, 256; private investment, 28n., 34, 71-72; productivity, 44-45; public investment, 44ff.; racial groups and, 112-14; research, 38, 47, 54, 90, 111, 140, 146, 159-62; Reserve Fund, 48, 51, 55, 259; Saramacca canal and, 231; small farms, 4, 15-16, 26, 38, 44, 112-14, 120-24, 135, 141-42, 144, 146, 248, 252-53, 255; soils, 6-7, 103, 105ff., 119, 129ff., 141, 144-45, 147, 149ff., 253; tree crops (*see* oil palms, coconuts, cacao, citrus); tropical farming, 6, 103-104, 126-27, 138-39, 146; value of total agricultural production, 7; wages and salaries, 25-26; young coastal plain, 6, 51, 105-106, 125, 142; *see also* names of agricultural projects
- Agricultural College: 161
- Agricultural Extension Service: 161-62
- Agricultural products: domestic consumption, 84; estimated increase in value, 76-77, 78n; exports, 21, 83-84, 149, 247-53, 256; low output of animal proteins, 257; marketing, 98-99, 119, 133, 160-61, 247-60; prices, 146, 247-53; processing and storage, 11, 38, 53, 118, 124, 131, 149, 160-61, 197-99, 252, 257, 260; produced on small farms, 15-16; suitable for old coastal plain, 107; transportation, 58f., 114, 214ff., 228ff.,

- 257-58; waste and spoilage, 98-99, 247, 253-55, 260; *see also* names of products
- Air services: 2-3, 40, 62-63, 100, 214, 218-19, 222-23, 234-36, 242ff.; *see also* Zanderij, Zorg en Hoop
- Aluminum: *see* Bauxite
- Aluminum Company of America (ALCOA): 9, 158, 194, 219; *see also* Surinam Bauxite Company (SBM)
- Aluminum industry: 209, 210, 213
- Animal husbandry: 122, 138-39
- Antilles: 169
- Arrawara Creek: 40, 60, 230-32, 242
- Austria: 174
- Baboen (Banak): 7, 163, 165, 167, 168, 173, 186
- Balance of payments: 17, 19-21, 24, 47, 83-85, 94
- Balata: 8, 16
- Bananas: 6, 45, 114, 116-18, 122, 125, 130-32, 144, 150, 152, 161, 256
- Banks, and banking: 18, 21, 72, 78, 90-93; *see also* Herstelbank, Nederlandsche Bank, Peoples' Credit Bank, Postal Savings Bank, Surinamsche Bank.
- Barbados: 133
- Basra Locus (Angeliqne): 7, 164, 168, 186
- Bauxite: xxi, 2, 8-10, 16-17, 21, 28n., 34, 71-72, 77, 81, 83-85, 88, 100, 113, 193-95, 209-10, 214ff., 223, 227, 243ff.
- Beans: 125
- Bebe: 186
- Beef: 48, 52, 138
- Beekhuizen: 40, 61, 63-64, 100, 218, 232-33, 236-38, 242-43, 246
- Belgian Congo: 221
- Billiton Mining Co.: 9, 12, 194, 246
- Birth rate: 4
- Brazil: 116, 136
- Bricks: 11, 196
- British American Tobacco Co.: 196
- British Guiana: 1, 106, 111, 115, 127, 133, 146, 155, 164, 168, 175-76, 187
- British West Indies research organization (at Barbados): 133
- Brokopondo Project: xxi-xxii, 204-13; administration of, 210, 213; and transportation, 61, 238-39, 243; capital costs, 210ff.; construction schedule, 211; cost of power, 211; experts, 210; finance, 211; geology of project site, 205, 209-10; hydrology of project area, 205-206, 210-11; indirect benefits of, 212; labor requirements of, 211; main and auxiliary dams, 207; power, 208-209, 213; reservoir area, 206-207; sales of power, 209ff.; status of investigation, 209; topography of project site, 204-205; van Blommestein plan, 204-205; *see also* Power
- Bruynzeel Co., Netherlands: 179, 196
- Budget: 16, 18-19, 47, 75, 80-83; *see* National Accounts

- Bureau of Mines: 43, 96, 195-96
 Bureau of Rural Development: 38, 54-55, 140
 Burma: 171
 Bush Negroes: 2-4, 8, 106, 112, 165-66, 171, 176, 207
- Cacao: 6, 106, 114-16, 118-19, 124-25, 134-36, 141, 144-45, 150-52, 155, 160, 256
 Canada: 183, 209
 Canals: 2, 40, 56, 60, 142, 148, 154, 173-74, 205, 230-31; *see also* Inland Waterways
 Capital: 18, 22ff., 71-72, 79-80, 85, 99, 131, 180, 252, 259, 260
 Caribbean: 136, 167-68, 247
 Casava: 125, 161
 Cattle and cattle breeding: 11, 38, 52-53, 76-77, 121-22, 138, 140-41, 143, 157-61, 259
 Cedar: 7, 164, 168, 186
 Central America: 127, 136, 149, 170
 Central Bureau for Aerial Mapping: 172
 Ceylon: 127
 Chinese: 3, 5
 Citronella grass: 155
 Citrus fruit: 6, 45, 98-99, 106, 114-15, 117, 119, 122, 125, 130, 132-33, 151, 154, 161, 198-99, 253-56
 Citrus Fruit Growers Association (CFGAs): 98-99, 254-55
 Climate: 6, 103-104, 126, 253; *see also* Rainfall
 Clothing industry: 197
 Coastal area: 1-2, 6-7, 51, 103, 105-106, 112, 138-39, 142
- Coconuts: 6, 45, 113, 125, 127-29, 136, 143, 150-51, 155, 198, 256
 Coffee: 6, 114-16, 118, 125, 129-30, 151, 155, 256
 Colonial Forest Service, 187-88
 Commewijne: 38, 68
 Communications: 40, 64-65, 177-78, 240-43, 245
 Construction: 40, 63-66, 77-78, 85-86, 88, 143, 169, 207-208, 211, 236-37, 242, 244, 246
 Consumption: 22-24, 26, 27n., 27-30, 71, 79, 84, 256-57
 Contour plowing: 153
 Cooperative enterprise: 99, 119, 124, 131-32, 148-49, 248, 251-52, 254, 256
 Cooperative Water Board: 120
 Coronic: 1, 3, 5, 38, 68, 113, 124, 128, 139, 140, 142-44, 149, 217
 Cover crops: 150-53
 Creoles: 3, 4, 5, 24, 88, 112-13, 141, 144-45, 165
 Credit: 34-35, 60, 90-93, 99, 184, 198, 251-53, 256, 259, 260
 Crop rotation: 127
 Cuba: 169
 Curacao: 247
- Dairy farming: 52-53, 99, 113-14, 121-22, 138-40, 142, 144, 157-59, 259-60
 Dairy products: 99, 199, 258-59
 Dams: 204ff., 213; *see also* Brokopondo project
 Death rate: 4
 Department of Agriculture: 44-45, 124, 136, 158-61
 Department of Education: 200
 Department of Public Works and

- Traffic (OWV) : 100, 218, 227, 244-46
- Development Board (proposed) : 73-75, 101
- Distilling : 11, 199
- Dollar area : 21, 85, 94
- Draft animals : 54, 123-24, 138, 143
- Drainage and irrigation : 6, 15-16, 18, 26, 34, 44ff., 105ff., 112, 114, 118, 120-23, 126ff., 140ff., 148, 154-55, 158, 160, 212, 231, 257
- Drying and storage : 53, 99, 161, 251-52, 256-57, 259-60
- Dutch : 3, 114; and empoldering, 108; contractors, 237; farmers, 46, 47, 50, 110, 112, 114, 138, 141, 145-46; technicians, 17, 89, 97, 107, 178
- Dutch Chemical Manufacturers, Naarden, Holland : 198-99
- Dutch Trading Company, Holland : 199
- East Indians : 165
- East Indies : 15
- East-West Highway : 40, 59-60, 227-30, 242
- Economic Cooperation Administration (ECA) : 46, 200
- Economic development program : and need for transportation improvements, 223; major objectives, 27-30; stimulation of economic development, 223-24
- Education : 4, 29n., 41, 43, 67-68, 96-97, 178-79, 188-89, 200
- Emigration : 27n., 113
- Employment : 5, 11, 24, 25-26, 85-89; *see also* Labor
- Erosion : 153; *see also* Soils
- Erythrina : 150
- Ethiopia : 221
- Europe : 14-15, 167-68, 247
- Europeans : 3, 5, 114
- European Payments Union (EPU) : 12, 21, 85, 92, 94
- "Ever-normal granary" : 249, 252
- Experimental Station : *see* Paramaribo Agricultural Experimental Station
- Experts : 17, 39, 53ff., 89, 97, 107, 146, 158-161, 178-79, 183, 188-89, 210
- Exports : 8ff., 14-15, 17, 19-21, 24, 30, 34, 47, 57, 83-85, 98-99, 101, 117-18, 125, 127ff., 132, 134, 149, 151, 164, 167ff., 182-83, 185-86, 190, 194-95, 215, 217, 222, 247ff.
- Eysvoogel Mission : 46
- Eysvoogel, Professor : 45
- Feed : 257
- Fernandez, Dr. D. S. : 129
- Ferries : 59, 219, 229
- Fertilizers : 6-7, 103, 106-107, 115, 127, 129, 132, 137, 151, 153-54, 157
- Fiber : 155, 161, 179-80, 186-87, 198
- Fiscal policy : 90-91
- Fish and fisheries : 38, 52, 76-77, 99, 140, 156-57, 212, 257, 259
- Food and Agriculture Organization (FAO) : 137
- Foreign borrowing : 82
- Foreign exchange : 70-71, 85, 90, 92-94, 184
- Foreign Exchange Board : 92

- Foreign private capital: 94-96
- Foreign trade: *see* Trade
- Forests: 7-8; access to, 7, 39, 56, 171-78; administration and management, 39, 56, 164, 187-89; allocation of program funds, 37, 39, 42, 55-57, 171ff., 182ff., 188; and agriculture, 105, 136, 142, 144-45, 149-50, 152; and communications, 177-78; annual cut, 7, 163; anticipated increase in production, 77; anticipated results of public investment program, 189-92; dry land, 7, 39, 56, 163-64, 174-76; estimated expenditures, Forestry Sector, 191; exploitation of, 7-8, 17; inventory, 39, 55, 164, 172-73, 175, 188; mixed tropical forests, 164, 171, 187; private investment, 182; reforestation, 39, 56, 171, 184; research, 39, 56, 164, 171, 179-82, 186; size and types of, 163-64; stumpage royalty, 164; swamp, 7, 39, 56, 163, 173-74, 186; total timber stand, 163; variety of woods, 7; *see also* Logging, Wood, and Wood Products
- Forest Service: 55-56, 164-65, 172ff., 177-78, 181, 187-89
- Foundation for the Development of Mechanized Agriculture in Surinam: *see* Stichting; *see also* Agriculture, Mechanization
- France: 180
- French Guiana: 1, 209
- Fuel: 10-12, 169, 193-94, 200-202, 239-40
- Gas: 201, 202-203; *see* Fuels
- Germany: 247
- Gold and gold mining: 2, 10, 16, 28n., 92, 193
- Gonggryp, J. W.: 163n.
- Government controls: 84, 90-91, 93ff., 98-100, 248ff., 260
- Government expenditures: 16, 18-19, 23-24, 29-30, 33, 80-83, 91
- Government farms: 114, 120, 122-23
- Government ownership: 222, 245, 254; *see also* Beekhuizen works, Lands, Telegraafen Telefoon Dienst, Surinam Navigation Co.
- Government personnel: 25, 29, 82, 87-88, 159-61, 195
- Government revenues: 10, 16ff., 22-23, 62, 80ff., 91, 184, 194
- "Government settlements": *see* Government farms
- Greenheart: 168
- Gronfoeloe: 186
- Groningen: 38, 140-42
- Groundnuts: 6, 151
- Haeven Ltd.: 196
- Handicrafts: 11
- Health: 4, 29n., 41, 66-67, 78, 257
- Herstelbank: 35, 72, 198, 253, 260
- Hindustani: 3-5, 24, 49n., 112-14, 141
- Hospitals: 41, 43, 66-67
- Housing: 32, 41, 43, 65-68, 71-72, 93
- Hydroelectric power: *see* Power, Brokopondo project
- Immigration: 4-5, 27n., 87, 114, 131, 133, 154

- Imperial College of Tropical Agriculture, Trinidad: 135
- Imports: 19-21, 21n., 34, 52, 71, 84-85, 92, 94, 101, 136, 138, 156, 197, 201, 215, 217, 256-57
- Indians, aboriginal: 2-4, 112
- India: 183
- Indonesia: 17, 104, 139, 156, 178
- Indonesians: 3-5, 24, 49n., 112, 114, 127, 141-42
- Industry: 11, 87, 196-201; anticipated increase in production 77; capital available for expansion 72; export industries, 11; for domestic consumption, 11; government credit and, 198; government protection, 201; mechanization, 194-201; private investment, 34-35, 71-72; *see also* Agricultural products, Aluminum industry, Wood products industries, private enterprise, Private investment
- Inland waterways: 2-3, 40, 60, 111-112, 174, 215, 218-19, 222-23, 230-32, 242; *see also* Canals
- International Bank: xix-xx
- International Pulp and Paper Conference: 180-81
- Institute of Paper Chemistry, Appleton, Wisconsin: 180
- Italy: 127
- Jamaica: 130
- Japan: 123, 127
- Kan Kan (Ceiba): 186
- KLM (Dutch air carrier): 62, 219, 234
- KNSM (Dutch shipping company): 219
- Koffie-mama: 135, 186
- Kopie: 168
- Krappa (Andiroba): 71, 163, 168, 186
- Kwatta: 38, 114, 122, 138, 140-41, 144
- Labor: active labor force (1950), 5; actual labor force, 86; and agricultural production, 26, 129, 131, 133-34, 143; bargaining power, 25-26; bauxite production, 10, 194; between 1863-1900, 14-15; Brokopondo project, xxii, 211; clothing industry, 197; cost of, 25-26, 253; estimated labor force (1962), 86; estimated requirements of public investment program, 86-89; potential labor force, 86, 88-89; productivity of, 26; shortages, 86, 89, 96-97, 118-19, 256; skilled, 5, 89, 200; statistics, 85-86, 101; unskilled, 200-201; wages and salaries, 10, 15, 24-26, 85, 118, 194, 200-201, 256; wood products industry, 11, 171, 180, 185, 189; *see also* Employment, Wages and Salaries
- Lands Telegraafen Telefoon Dienst (LTT): 64-65, 240-41, 243, 245
- Laws: 195, 201, 246, 256, 260
- Lelydorp: 38, 50-51, 107, 117, 119, 124, 128-29, 136-37, 139-40, 145, 148-54
- Literacy: 4

- Livestock: 138-39, 161, 257
 Locus (Courbaril): 171
 Logging: 2, 7-8, 112; annual cut, 7; concessions and cutting rights, 7-8, 165, 175, 184-85; engineers, 39, 56, 171, 178; expansion of production, 8, 35, 57; hand methods, 8, 165-66, 176; labor, 171; mechanized operations, 8, 39, 165-66, 171, 174ff., 185, 187; opening of new areas to, 56; private investment in, 77, 172; timber production, 1950, 168; transportation of logs, 166; unit costs, 187; wastage, 165-66: *see also* Forests, Wood and Wood products
- McLaren outfit: 155
 Maize: 109-10, 125, 145, 152, 161
 Malaya: 127, 149
 Manbarklak: 7, 164, 168
 Marienburg: 115, 133-34, 199
 Markets and marketing: 39, 52, 98-99, 133, 157, 160-61, 167-68, 169-71, 182-83, 196, 209-10, 247-60
 Matakkie: 168
 Matches: 11
 Mediterranean: 170
 Mierenhout: 186
 "Milpa": 112
 Mineral resources: 8-10, 193-95
 Mining: 43, 100, 193-96; anticipated rise in value of product, 78n.; concessions, 95-96, 193, 195-96; labor, 25, 87-88, 194; *see also* Bauxite, Gold and gold mining
- Mission to Surinam: xix-xxi; recommendations for public investment program, 31ff.
 Mixed farming: 124, 149
 Money: 21, 90, 92-93
 Mora: 164
 Motor vehicles: 100, 220: *see also* Tractors and trucks
 Motormuli: 174
- National accounts: 23-25, 27-30, 72, 78-79, 80-83, 91, 101; *see also* Budget
 Near East: 170
 Nederlandsche Bank: 92-93
 Netherlands: 14, 21, 85, 94, 132, 169, 210, 247, 253-54
 Netherlands government: and political structure of Surinam, 12-13; and mechanized agriculture, 46, 50; financial assistance to Surinam, 16, 19-20, 23-24, 32, 47, 75; military establishment in Surinam, 80; *see also* Development Board, Prosperity Fund
 New York State College of Forestry, Syracuse, New York: 180
 Nickerie: 38, 41, 44, 49, 68, 109, 113-14, 120, 124, 145, 152, 167, 197, 217
- Oil extraction plants: 198
 Oil palms: 117-18, 119, 124-25, 128, 136-39, 150-51, 155, 160; *see also* Vegetable oil
 Oil seeds: 6, 161; *see also* Vegetable oil
 "Outside settlements": 120, 123; *see also* Government farms
 Oxen: *see* Draft animals

- Pan American Airways (PAA): 62-63, 219, 234ff.
- Pan American Sanitary Bureau: 66
- Para: 38, 113, 140, 144-45
- Paramaribo (capital of Surinam): 3, 5, 52, 104, 105, 112, 113, 114; agricultural area near, 121, 122, 140; as entrepot, 215; domestic fuel, 200; food processing, 117, 159, 197, 198, 254; food supply, 156, 215; headquarters of proposed Development Board, 73; health services, 66; housing, 65-66; industry in, 28n.; labor, 86, 87, 88, 129; markets, 52, 157, 257-60; population, 5, 5n.; port facilities, 61-62, 214, 217, 232-33, 245; roads, 216; schools, 67-68, 97, 189, 216-17; town improvement, 41, 69; water supply, 41, 68-69, 212; electric power and gas, 11-12, 201-203
- Paramaribo Agricultural Experimental Station: 118, 125-26, 132, 135, 139, 154, 159
- Pasteurization: 159, 199
- Pasture: 106, 107, 121-22, 140ff., 150ff., 158ff.
- Peanuts: 125, 198
- Peoples' Credit Bank: 99, 260
- Pest control: 115-16, 118, 126, 128, 130, 132-33, 135, 137, 143, 160-61, 177, 185-86.
- Pfeiffer, Dr. J. T.: 181
- Philippines: 156, 176
- Pigs: 128, 139, 143
- Pineapples: 131, 152, 256
- Pioneer Mill: 137-38
- Plant diseases: 15, 104, 116ff., 126, 128, 130, 132ff., 143, 160-61
- Plantains: 125, 150
- Plantations: 6, 14-16, 25-26, 51, 108, 112, 114ff., 129, 135, 149, 248, 253, 256
- Plywood: 7, 8, 11, 18n., 57, 163, 167-69, 179, 186, 196
- Polders: 6, 18, 38, 44ff., 106, 108ff., 113-14, 120-21, 124, 140ff., 152, 252
- Popular Credit Bank: 54, 93
- Population: centers of, 1; compared to that of the Netherlands, 1; early lack of, 3; growth of, 4-5, 22-24, 27-28, 86-88, 247; in relation to size, 103; of Paramaribo, 5, 5n.; of the interior, 1, 2, 103; on plantations, 112; on small holdings, 112; outside of Paramaribo, 112; racial composition of, 1-2, 3-4, 84, 112-14, 229; statistics, 101
- Port facilities: 40, 61-62, 214-15, 217, 222-23, 232-34, 244-45
- Possentrie (Possumwood): 7, 163, 168, 173, 186
- Postal Savings Bank: 18
- Potatoes and Yams: 125, 152
- Power: xxi-xxii, 10-12, 201-213; *see also* Brokopondo project
- Prices: 27, 34, 52, 92-93, 98, 132, 146, 156, 248ff., 257
- Prince Bernhard Polder: 47, 48, 110, 111, 147
- Private enterprise: 37, 99, 172, 183-84, 189, 192, 248
- Private investment: 10, 15, 17, 34-

- 36, 57, 65-66, 71-72, 77, 79-80, 84, 91, 94-96, 170, 192, 203
- Professions: 28n., 78
- Prosperity Fund: *xix n.*, 17ff., 24, 33-34, 37ff., 45, 50-52, 60, 62, 66-67, 74, 87, 231, 234
- Provincial Commissioners (of transportation): 218-19
- Public investment program: and gross investment 79-80; anticipated results of, 76-89; allocation of program funds, 42-69; administration of, 37, 73-74; cost estimates for transportation sector, 244-45; Development Board (proposed), 73-75, 101; disbursement of funds, 69-71, 74, 75; estimated expenditures, forestry sector, 191; existing developmental expenditures, 33; flexibility of program, 35-36; foreign exchange requirements, 69-71; housing, 65-68; plans for, *xx-xxi*; recommendations of mission (tables), 36-42; river carriers, 232; size of program, 31-33; sources of funds, 74-75; to support private enterprise, 72; transportation, 58-64, 221-24, 224-46; *see also* names of various sectors
- Pulp and paper: 180-81
- Quaruba: 186
- Railroads: 3, 40, 60-61, 214, 216ff., 238-40, 242ff.
- Rainfall: 6, 103-105, 108, 110, 122-23, 126, 155, 205-206, 253; *see also* Climate
- Refrigeration: 100, 130-32, 156-57, 246, 253-55, 258-89
- Rents and leases: 78, 120, 148
- Reservoirs: 204, 206-207
- Rice: 6, 17, 45ff., 98, 106ff., 119, 121-23, 125-27, 139ff., 151-52, 197-98, 247-53
- Rivers: 2, 58, 60, 111-12, 156, 174-75, 177, 214-15, 219-20, 222, 230-32, 242-43, 244
- River-coastal craft: 40, 60, 242, 244
- Roads and highways: 3, 40, 56, 58-60, 70, 100, 121, 173-76, 187, 214-16, 218-20, 222-23, 225-30, 239, 242-46
- Root crops: 6; *see also* Cassava, Potatoes and Yams
- Rotation of crops: 47, 122
- Royal Oil Factories, Wormerveen, Holland: 198
- St. Lucia: 133
- Saramacca area: 38, 40, 60, 127, 140-41, 144, 159, 230-31, 242
- Sawmills: 8, 11, 166-67, 185-87, 196
- Savings: 24, 24n., 29, 29n., 30, 34, 71-72, 80, 84, 91, 93
- Scandinavia: 129
- Schools: 41, 43, 67-68, 78, 97, 188-89, 200, 216-17; *see also* Education, Technical training
- Shipping: 2, 15, 130ff., 144, 161, 212, 215, 218-19, 222, 230, 255; *see also* Transportation
- Shoes: 11, 197
- Simaruba (Bitterwood): 7, 164, 168, 186

- Slaves and slavery: 4, 14, 115-16, 120
- Slootwijk: 38, 51-2, 119, 129, 140, 154-56, 220
- Soap: 198
- Social services: 16, 27, 27n., 28n., 37, 41, 43, 65-69, 78, 252; *see also* Hospitals, Health, Housing, Education
- Soft drinks: 11
- Soils: 6-7, 103, 105ff., 119, 129ff., 137, 141, 144-45, 147, 149ff., 159-60, 253
- South America: 127
- Soya: 6, 45-46, 48, 106-107, 109-10, 122-23, 125-27, 140ff., 147-48, 151, 256
- Statistics: 85-86, 100-101
- Stichting (Foundation for the Development of Mechanized Agriculture in Surinam): 46-47, 50-51, 74, 87, 140, 154, 220
- Sugar: 6, 106, 108-109, 114-15, 118, 125, 133-34, 154-55
- Sumatra: 117, 136
- Supplementary Program: 32-33, 35, 37-41, 43, 57, 62, 67ff., 72, 75, 174, 178, 182, 191; *see* Public Investment Program, Ten Year Program
- Surinam: agricultural land, 6-7; dependence on foreign capital, 29-30; economic background, xix, 14-16; forest resources, 7-8, 163-64; financial means, 32; geographical features, 1-3; government and politics, 12-13, 170; interior, 1-2; internal communications, 2; mineral resources, 8-10, 193-95; principal productive resources, 5-11; rice culture, 127; settled, 3; size, 1, 103; soil and climate, 6-7; *see* Surinam Government
- Surinam Bauxite Co. (*SBM*): 9, 12, 194, 219, 223, 246; *see* Aluminum Company of America
- Surinam Government: capital outlays, 195-60, 33; contribution to public investment program, 74-75, 82-83; economic development program, 26-30; market research and trade promotion agency, 183-84; personnel, 25, 82, 87-88, 159-61, 195; promotion of agriculture, 46, 50, 116-17, 120; *see also* Bureau of Mines, Bureau of Rural Development, Department of Agriculture, Department of Education, Department of Public Works and Transportation, Development Board, Forest Service, Public investment program, Ten Year development program
- Surinam Navigation Company (*SMS*): 60, 219, 231
- Surinam Planning Bureau: xix, xix n., xx, 26, 32, 42, 53, 74, 171, 174, 184, 188
- Surinamsche Bank: 21, 92-93
- Surveys: topographical and soil, 141; *see* Aerial surveys, Forests
- Sweden: 180, 186
- Tariffs: 161
- Teak: 171
- Technical training: 29n., 41, 43, 68, 89-90, 96-97, 152, 178-79,

- 188-89, 194, 200; *see* Schools, Education
- Technicians: *see* Experts
- Ten Year Development Program: xix-xxii, 26, 32-33, 35, 37ff., 50, 55, 58, 60ff., 64, 67ff., 82-83, 86ff., 93, 96, 98-99, 140, 171-72, 174-75, 178ff., 185, 187-88, 191, 220, 227, 231-33, 237, 247
- Timber: *see* Logging, Wood and Wood Products
- Tobacco: 11, 196-97
- Tobago: 187
- Tout Lui Faut: 38, 140, 142
- Town improvements: 69
- Tractors and trucks: 165, 174ff., 185, 187, 218, 237
- Trade: 2, 16, 19-21, 71, 78, 83ff., 87-88, 93, 222
- Trade associations: 167, 183-84
- Transportation: 58, 88, 214-20; allocation of program funds for, 37, 40, 42-43, 59ff., 241; and agricultural investment, 34; and stimulation of economic development, 223-24; and the Brokopondo project, 61; costs of, 58, 100, 161, 221-22, 230, 246, 253; employment in, 87; expansion of transport system, 58, 78, 99-100, 223-35; government responsibility for, 218-19; of agricultural products, 58-59, 149, 214ff., 228ff., 257-58; of bauxite, 8-9; of logs, 8, 166; public investment program for, 224ff.; revenues from, 81; *see also* Air services, Canals, Ferries, Inland waterways, Motor vehicles, Port facilities, Railroads, Rivers, River-coastal craft, Roads and highways, Shipping
- Treaty: 209
- Tree crops: *see* names of crops
- Tree poisoning: 148-50, 182
- Trinidad: 116, 135, 164, 187, 215
- Tropical Forest School, Wageningen, Holland: 188
- Tropical agriculture: 67, 103-104, 138-39
- Unemployment: *see* Employment
- United Fruit Company: 116
- United Kingdom: 85
- United States: 21, 127, 170, 174, 175, 178, 180-81, 183, 185, 187-88, 209, 211, 215
- United States Forest Service: 180, 182, 188-89
- United States Tropical Forest Experimental Station, Rio Piedras, Puerto Rico: 181
- University of Washington, Seattle: 179, 181
- Utilities: 78
- van Blommestein, Dr. N. J.: 204
- Vegetables: 6, 122, 125, 145, 152
- Vegetable oil: 136, 198; *see also* Oil palms, Oil seeds
- Veneer: 170, 186
- Venezuela: 247

