AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION

A. PRIMARY: ECONOMICS

B. SECONDARY: AGRICULTURAL ECONOMICS

2. TITLE AND SUBTITLE

GUYANA'S FOODCROP SYSTEMS: AN ANALYSIS FOR DEVELOPMENT PLANNING

3. AUTHOR(S)

ROBERT R. NATHAN ASSOCIATES, INC.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
JUNE 1974	579 pages	ARC GY-630.9581-N274

7. REFERENCE ORGANIZATION NAME AND ADDRESS

ROBERT R. NATHAN ASSOCIATES, INC.
1200 18th STREET N.W.
WASHINGTON, D.C. 20036

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

As a contribution to more effective planning for achievement of Guyana's objectives for the foodcrop sector, this study examines the sector's resources, production and marketing opportunities, constraints, policy choices, and possible steps toward program formulation and implementation. This examination is done through the development of an economic policy decision model, which recognizes the economic relations that dominate production, consumption, marketing, and the supply of inputs, and the associated institutional and policy framework. Various measures from which the Government of Guyana can select in formulating a strategy for attaining 1976 targets and longer range goals are set forth in the final chapter (VII). These alternatives give emphasis to expanding foodcrop acreage through the establishment of new production units; to developing small-or medium-scale facilities for processing citrus juices, tomatoes, cassava, and a few additional products; to developing export markets for a few commodities such as pineapple; and to selective efforts for yield increases, particularly in cases where improved water management can be effected. The suggested measures tend to be land- and labor-intensive rather than capital-intensive, and can be implemented with moderate inputs of capital and foreign exchange so as to create moderate benefits for employment and income distribution in the economy as a whole.

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAA-712	

12. DESCRIPTORS

Resources, production, marketing, constraints, policy choices, export markets, water managements

13. PROJECT NUMBER: 504-11-120-039

14. CONTRACT NUMBER: AID/LA-C-1035

15. TYPE OF DOCUMENT: RESEARCH ANALYSIS

AID 590-1 (4-74)

GY
630.9881
N274

Aid Reference

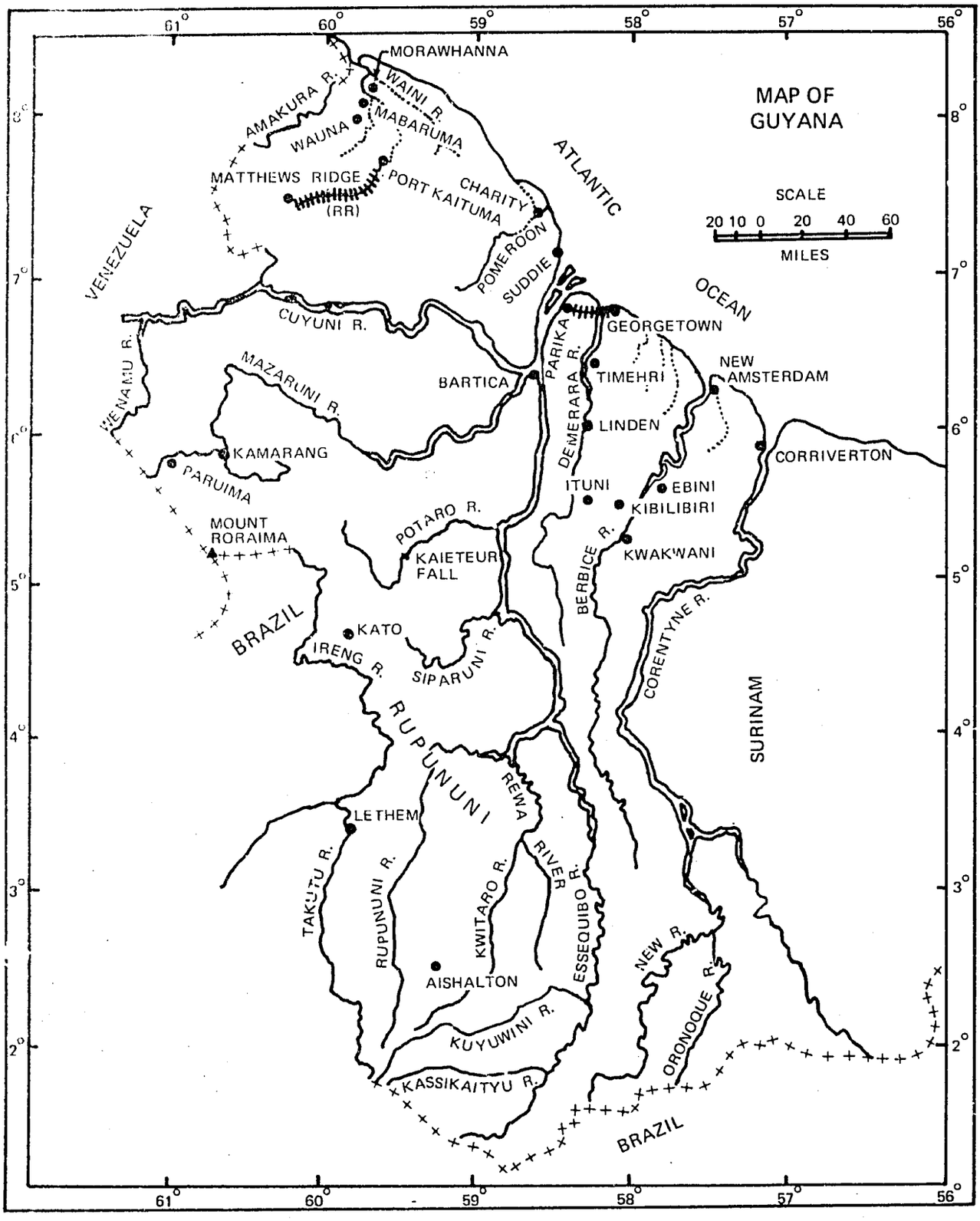
GUYANA'S FOODCROP SYSTEMS: AN ANALYSIS FOR DEVELOPMENT PLANNING

FOR THE AGENCY FOR INTERNATIONAL DEVELOPMENT
UNDER CONTRACT AID/LA-C-1035 (GUYANA)

BY ROBERT R. NATHAN ASSOCIATES, INC.
WASHINGTON, D.C.

JUNE 30, 1974

A.I.D.
Reference Center
Room 1656 NS


MAP OF GUYANA
SCALE
20 10 0 20 40 60
MILES
ATLANTIC
OCEAN
VENEZUELA
BRAZIL
SURINAM
MORAWHANNA
WAINI R.
AMAKURA R.
WAUNA
MABARUMA
MATTHEWS RIDGE
(RR)
PORT KAITUMA
CHARITY
POMEROON
SUDDIE
CUYUNI R.
MAZARUNI R.
BARTICA
PARIKA R.
GEORGETOWN
TIMEHRI
NEW AMSTERDAM
DEMERARA R.
LINDEN
CORRIVERTON
ITUNI
EBINI
KIBILIBIRI
KWAKWANI
BERBICE R.
CORENTYNE R.
KAMARANG
PARUIMA
MOUNT RORAIMA
POTARO R.
KAIETEUR FALL
KATO
IRENG R.
SIPARUNI R.
RUPUNUNI
REWA
RIVER
LETHEM
TAKUTU R.
RUPUNUNI R.
KWITARO R.
ESSEQUIBO R.
NEW R.
ORONOQUE R.
AISHALTON
KUYUWINI R.
KASSIKAITYU R.
61° 60° 59° 58° 57° 56°
8° 7° 6° 5° 4° 3° 2°

GUYANA'S FOODCROP SYSTEMS: AN ANALYSIS FOR DEVELOPMENT PLANNING

Submitted to the
Agency for International Development
Contract AID/la-C-1035 (Guyana)

by

Robert R. Nathan Associates, Inc.
Washington, D.C.

June 30, 1974

CONTENTS

FOREWORD..... vii

OVERVIEW..... ix

I. THE SETTING..... 1

Purpose and Scope..... 1
Analytical Framework..... 4

II. TOWARD A DEVELOPMENT STRATEGY..... 9

The Second Development Plan: 1972-76..... 9
The Outlook for 1976 and 1981: An Overview.... 12
An Appraisal of Foodcrop Targets in the Second Development Plan..... 16
Program and Policy Choices..... 23
Steps Toward Implementation..... 35

III. THE OUTLOOK PROJECTIONS..... 39

The Procedure..... 40
Domestic Foodcrop Demand: Current and Prospective..... 45
Export Demand for Guyana's Foodcrops..... 74
The Interaction of Demand and Supply Prospects. 83

IV. THE FOODCROP PRODUCTION SUBSECTOR..... 115

The Production Subsystem..... 117
Land and Water Resources..... 118
Labor for Agriculture..... 136
The Strategic Role of the Farm Operating Unit.. 144
The Farm Operating Units of Guyana's Agriculture..... 145
Characteristics of Foodcrop Farms in Established Areas..... 148
Management Problems on Foodcrop Farms..... 164

V. MARKETING..... 179

An Integrated Concept of Marketing..... 180
The Local Direct System..... 185
The Distant Marketing System..... 188
Facilities..... 202
The Structure of Competition..... 214
Current Government Marketing Programs..... 219

VI. INSTITUTIONS AND PERFORMANCE OF THE FARM INPUT SUBSECTOR..... 231

A Conceptual Model..... 231
Key Ministries and Administrative Units..... 233
The National Budget for Agriculture..... 239
Knowledge for Agriculture..... 248
The Control of Water and Land Use..... 261
Cooperative Organization in Agriculture..... 285
Credit for Foodcrop Production..... 291
The Supply of Production Materials..... 297

VII. ACHIEVING FOODCROP GOALS..... 307

Alternative Production Targets..... 308
Production Potentials of Foodcrop Farms in the Established Areas..... 311
Employing Redundant Workers On New Units for Provision and Mixed Farming..... 322
Expanding Oilcrop Production..... 327
Competitive Relationships Among Foodcrops, Rice and Sugarcane..... 333
Cassava for Processing..... 337
A Multipurpose Processing Plant in the Northwest..... 338
Other Processing Facilities..... 341
Reducing Marketing Margins..... 343
GMC Price Policies..... 348
Transportation..... 348
Developing an Export System..... 352
Programs for Research and Extension..... 355
Improved Water Management..... 362
Agricultural Credit..... 369
Alternative Regional Sources of Additional Output..... 370
Personnel for Staffing Technical and Economic Programs..... 377
A Data Base for Program Management and Accountability..... 381
Improving Capability in Agricultural Planning.. 388

APPENDIXES..... 391

A. THE DEMAND ANALYSIS: METHODS, PROCEDURES AND INTERPRETATION..... 393

B. AN EXAMINATION OF AVAILABLE SUPPLY-UTILIZATION DATA FOR FOODCROPS..... 431

C. TRADE IN FOODCROPS BY CARICOM COUNTRIES.... 457

D. RESULTS OF FARM SURVEY..... 469

E. SURVEY OF 1973 FOODCROP YIELDS IN THE POMEROON..... 515

F. DRAINAGE AND IRRIGATION PROGRAMS IN GUYANA..... 537

G. SUGAR ESTATE EXPANSION PLANS..... 547

H. COMPARISON OF AGRICULTURAL CENSUSES..... 553

I. FARM PRODUCTION EXPENSES..... 555

J. TOTAL AGRICULTURE AND RELATED GOVERNMENT EXPENDITURES, 1973 REVISED ESTIMATES..... 557

K. GMC PRICING..... 561

BIBLIOGRAPHY..... 565

FOREWORD

This study of Guyana's foodcrop sector, financed by the U.S. Agency for International Development, is intended to serve the planning and policy needs of the Government of Guyana, and particularly of the Ministry of National Development and Agriculture. For this reason this report is written specifically for Guyanese policy-makers and the agencies involved in the development of Guyana's foodcrop sector.

The study team included five RRNA staff members who were in Guyana for periods of 4 to 5 months, plus two short-term specialists who participated for shorter periods. While in Guyana the study team was assisted by the economics and statistical staff of the Ministry of National Development and Agriculture. Mr. Mohammed Naseer, Senior Economist, and three of his associates in economics and statistics -- Mr. I. Seeraj, Mr. M. Sookdeo, and Mr. Bertram Singh -- worked ably with the study team throughout its stay in Guyana. Mr. Benjamin Carter, Chief Agricultural Officer, provided ready counsel and assistance during the study. The Ministry also provided valuable support in the form of transportation, secretarial assistance and equipment services. RRNA expresses appreciation to the Ministry for the services and assistance it provided.

We also would like to thank the USAID Mission in Georgetown for outstanding assistance and services the Mission staff provided to the study team throughout their stay in Guyana.

While many Guyanese and others have made significant contributions to the study, they do not necessarily share all the conclusions of the study, which are wholly the responsibility of RRNA.

OVERVIEW

As a contribution to more effective planning for achievement of Guyana's objectives for the foodcrop sector, this study examines the sector's resources, production and marketing opportunities, constraints, policy choices, and possible steps toward program formulation and implementation. This examination is done through the development of an economic policy decision model, which recognizes the economic relations that dominate production, consumption, marketing, and the supply of inputs, and the associated institutional and policy framework. Various measures from which the Government of Guyana can select in formulating a strategy for attaining 1976 targets and longer range goals are set forth in the final chapter (VII). These alternatives give emphasis to expanding foodcrop acreage through the establishment of new production units; to developing small- or medium-scale facilities for processing citrus juices, tomatoes, cassava, and a few additional products; to developing export markets for a few commodities such as pineapple; and to selective efforts for yield increases, particularly in cases where improved water management can be effected. The suggested measures tend to be land- and labor-intensive rather than capital-intensive, and can be implemented with moderate inputs of capital and foreign exchange so as to create moderate benefits for employment and income distribution in the economy as a whole.

A summary of the study's approach and major conclusions is provided by chapters I and II, which are also intended to serve as an introduction to the more detailed descriptive and diagnostic analysis presented in subsequent chapters. Chapter III presents a series of outlook projections on food-crop consumption and production, anchored in normalized 1972 experience and projected to 1976 and 1981 on the assumption that current economic trends will persist and that programs and policies in evidence today will be pursued without major change of course. Chapters IV, V, and VI examine the institutions related to the delivery system for inputs. The detailed analysis of alternative policies, programs, and projects is examined in terms of commodities, economic functions, and regional development in chapter VII.

Unless otherwise specified, dollars refer to Guyanese dollars throughout the report. The early 1974 exchange rate varied within the range of US$1.00 = G$2.00 to G$2.30

I. THE SETTING

In Guyana's Second Development Plan for the years 1972-76 the Government has expressed a set of basic development goals. Included in these goals is Guyana's aspiration to achieve self-sufficiency in foods by 1976. This basic goal in turn led to the specification of acreage and production targets for many foodcrops.

This study had its roots in some basic questions that were raised, both within and outside the Guyanese Government, regarding some of the agricultural aspects of the Second Development Plan. The questions were largely in three categories: (1) they concerned the magnitudes of the specific targets that had been set for some of the foodcrops; (2) they related to the overall strategy, that is, combinations of projects, programs and policies, that would be needed to achieve the stated targets; and (3) they concerned the role which the foodcrop sector could play in achieving other development goals: increasing per capita consumption, increasing employment opportunities, and developing Guyana's interior.

Purpose and Scope

This study is a first step toward answering some of these basic questions. It provides an analytical basis for

determining a realistic set of targets, attempts to isolate some of the major issues and constraints that relate to target achievement, and presents alternative program, project and policy actions that appear to be feasible and that can be formulated into a development strategy for achieving the priority targets set by policy-makers.

The alternatives for Government action presented in this report are analyzed only to the depth that is necessary to determine whether or not there is a reasonable probability that they may, after further analysis, prove to be feasible in terms of budgetary costs and in terms of effectiveness with respect to the development goals and concerns of Guyana's policy officials. This prefeasibility analysis of the different alternatives should permit the choice of projects to be subjected to either formal or informal full feasibility tests before they are implemented.

A related objective of the study was to assist the Ministry of National Development and Agriculture to improve its capability for program and policy analysis. This objective had several facets. One was to assess the information base for planning, augmenting the coverage and quality of data where feasible. Thus, a major focus of the report concerns information needs for planning. A second facet concerned the participation of key Ministry staff in the study. A third facet involved a recommendation of both information and human resources needs for improved program and policy analysis for Guyana's foodcrop sector.

The study concerns itself only with the foodcrop sector, which has been purposely restricted to vegetable oil crops, provision crops, vegetables, fruits, and pulses and nuts.

This was considered to be the "neglected" sector in Guyanese agriculture, in terms of information available for planning. The choice was especially critical at the time when the Government was in the midst of a campaign for Guyana to feed, clothe and house itself by 1976.

Although major segments of Guyana's agriculture -- rice, corn, sugar, livestock, and wheat flour imports -- were not incorporated in the list of foodcrops to be studied, neither were they ignored. Wheat flour, rice, sugar, corn and livestock were examined in perspective since many investment and policy issues relating to their production, marketing, and consumption have an important bearing on the foodcrop sector. The interrelationships of the major segments of Guyana's agriculture with the foodcrop sector -- competitive claims on land, water, capital and managerial resources, shifts in consumption patterns, and the like -- are all the more important since the foodcrop sector is dwarfed by the rest of Guyana's agriculture.

The time frame for the analysis is from the beginning of the study through 1981. Initially, emphasis was to be placed on the period of the Second Development Plan (1972-76), but it was agreed at an early stage that the utility of the study would be greater if it looked beyond the 2 remaining years of the current plan. Many program options would have been foreclosed by confining the analysis to what could be done before 1976. Three key reference points used throughout the study are the 1972 base year (the first year of the Second Plan), 1976 (the end of that planning period), and 1981 (which allows for completion of another planning period).

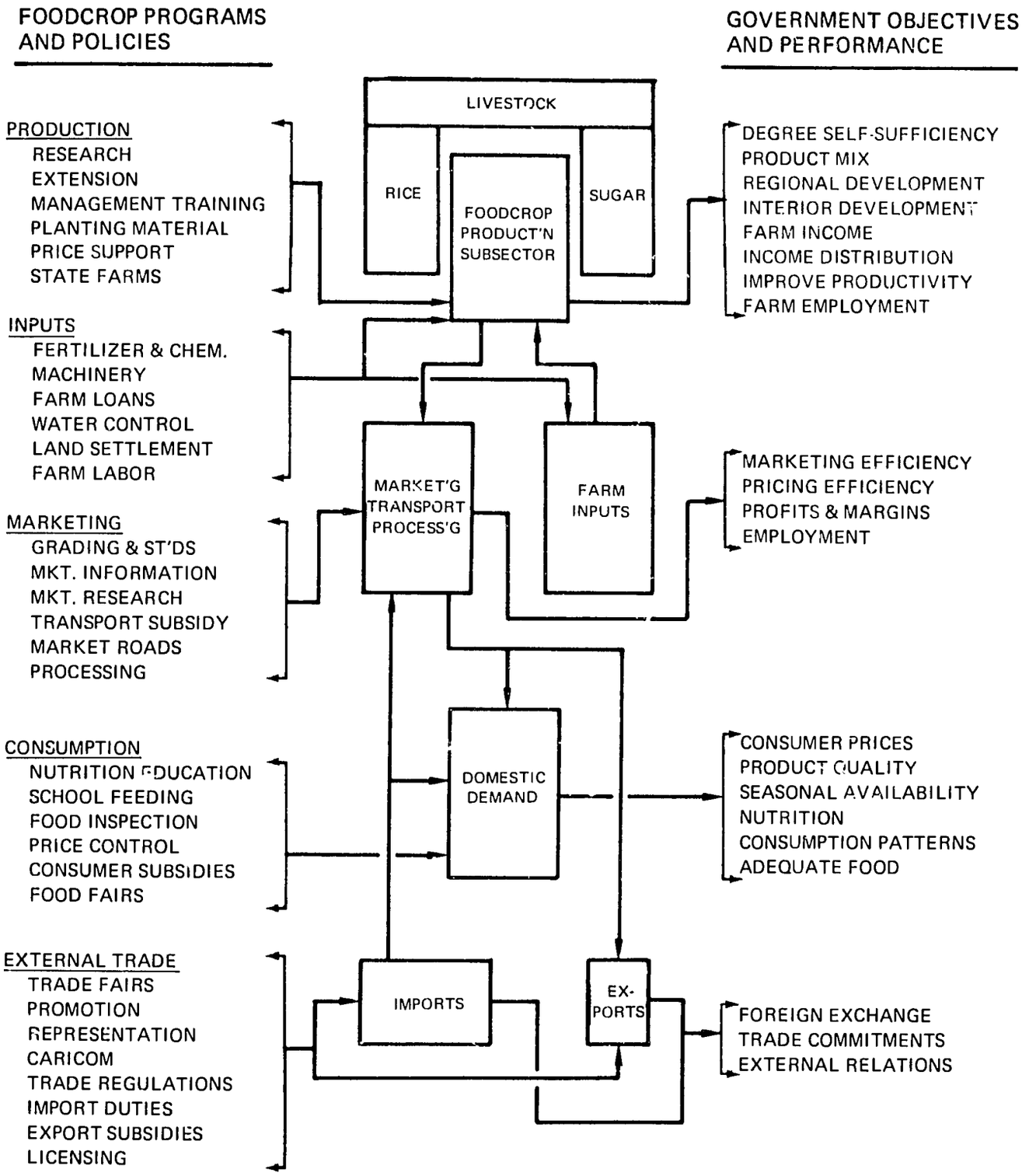
Analytical Framework

The study was developed in the context of the targets and objectives specified for foodcrops in the 1972-76 plan. As such, the analysis centered on an economic policy decision model that includes (1) a basic description of the factors and economic relations that dominate production, consumption, marketing and the supply of farm inputs, (2) the major programs, policies and activities that are used by the Government of Guyana to influence the foodcrop economy, and (3) the objectives and performance variables that are of concern to policy-makers, in addition to the achievement of the targeted production levels that have been specified in the plan.

The principal components of the economic policy model, and their interrelationships, are illustrated in figure 1. This figure diagrams the basic elements of the foodcrop sector system. Each of the basic elements -- such as marketing, production, demand, and farm inputs -- are further broken down into subsystems; these subsystems are illustrated in later chapters of the report. The most critical parts of the foodcrop system are the interrelationships among the subsystems, and in turn among their components, the development goals, and Government programs and policies affecting the foodcrop sector.

Ideally, it would be desirable to quantify the key interrelationships, expressing them in a formal model. However, the nature of some of these relationships is such that they are not readily quantifiable. In addition, major elements of such a model could not be developed empirically -- partly because time did not permit, but also because the

FIGURE 1. FOODCROP SECTOR POLICY DECISION MODEL



data base in Guyana is not well developed and many aspects of it were found to be unreliable.

Nonetheless, wherever data were available that proved to be internally consistent, they were applied; in other cases data were generated through indirect estimating procedures. In many instances judgments were made by drawing on the experiences and views of informed observers and of the team members themselves. In some cases, the development of the model had to rely on assumptions without much basis. The absence of a formal quantification of the foodcrop system model and all its interacting parts, however, need not detract from the utility of the analytical framework. The economic policy model has provided the basis for our examination of the foodcrop sector and the analysis of potentially feasible programs. It can also be an aid to Guyana's decision-makers, alerting them to the potential interactions on the rest of the system of their decisions concerning specific foodcrop variables.

It is worth noting that the empirical analysis in the report is probably stretched considerably beyond normally acceptable limits for situations in which the data base is so limited. This was done deliberately -- not to imply an accuracy that does not exist nor to hide the large element of judgment, but rather to make explicit the assumptions and the bases for deriving some of the major conclusions.

The empirical framework developed for this analysis concerns primarily the production (supply) and consumption (demand) subsectors and shows how these are integrated in the 1972 base year. From there, projections of supply and demand for major foodcrops are developed to indicate the

outlook for 1976 and 1981, assuming that current economic trends persist and that current programs and policy changes will influence the future course of the foodcrop economy.

In this context they can be used as a benchmark from which to measure the economic impact of alternative program and policy actions that might be taken to accelerate the attainment of specified foodcrop goals. The framework can also be used to measure the impact of external policies that have a direct bearing on the foodcrop sector; for example, what would happen to the foodcrop economy if the retail price of wheat flour or rice were raised from its currently fixed level, or if restrictions were placed on major foodcrop imports such as potatoes. A third major use of the outlook projections is to measure the changes in the rates of flow of commodities through the marketing system and the increased demands that will be placed on the farm input sector and on the institutions that serve the foodcrop sector, in turn enabling an identification of potential constraints to further sector development.

II. TOWARD A DEVELOPMENT STRATEGY

The analysis of the present study focuses on current and potential performance of the foodcrop sector, in the context of national objectives expressed in the 1972-76 plan. The broad objectives may be assumed to have significance for the next decade or more, although the self-sufficiency objective has also been translated to specific foodcrop production targets for 1976. At this point, it is relevant to examine the broad objectives and the specific targets, to compare those targets with our outlook projections for 1976 and 1981, and to provide a very brief prognosis of the kinds of policies, programs, and projects which the Government of Guyana may want to consider in formulating its strategy for development through 1981 and beyond.

The Second Development Plan: 1972-76

The Second Development Plan focuses on a broad set of national problems and expresses an overall development philosophy. The plan outlines four major problem areas that set the general tone for a development strategy. These are:

Unemployment and its associated problems of unequal distribution of income

. Excessive dependence on sugar and bauxite, which suggests a need for diversification to exploit national resources more fully

. A rate of economic growth which is judged to have been insufficient in relation to the high rate of investment that has concentrated largely on infrastructure development

. The mobilization of financial resources, which also has been judged to be inadequate.

The intent of the plan is to place greater emphasis on the sectors of the economy that have been identified as growth points. Whether or not the foodcrop sector was judged to be among these is not clear from the plan or from Government actions since the plan was developed. Aside from a number of small isolated projects and two large-scale, state-type farm operations that have other important objectives, there has been no noticeable turn of Government expenditures toward the foodcrop sector, despite the moral suasion of the campaign for Guyana to feed, clothe and house herself.

The plan also identifies a set of social objectives that requires changes in attitudes and habits acquired largely from "imported" sources. Two of these relate directly to the foodcrop sector. It is contended that imported production and consumption patterns must be changed to be more consistent with the Guyanese environment and that the Guyanese affinity for living in the "urbanized shelter" of the coastal areas must be traded for the "potentially more rewarding hinterland."

In the setting of the above goals for major social and economic change the plan hopes to achieve in agriculture:

- The development of self-confidence and self-reliance in the Guyanese people

- The establishment of efficient cooperative systems in crop and livestock production, and in processing and marketing activities

- The settlement of newer areas in the Northwest District, the Intermediate Savannahs and along the Soesdyke-Linden Highway

- The fulfillment of the national goal of feeding the nation by 1976 with food of high nutritive content

- The creation of 10,000 new agricultural jobs.

The significance of these achievements is carried through to the secondary goals of reducing the cost of raising livestock, developing thriving rural communities based on agricultural industries, arresting the movement of population from rural to urban areas, reducing income disparities and spreading economic opportunity geographically.

In addition to these goals, the plan sets specific targets for crops and livestock. Agriculture is asked to contribute a total of $52 million to GDP by 1976 -- an

increase of almost 63 percent in real terms.[1/] The foodcrop sector's share of this is to be $8.2 million, figured from a 1970 base of $15.5 million. This is an increase of 64 percent -- about the same as for rice, sugar, and other crops. The target set for livestock and livestock products was an increase of only 40 percent.

The plan also contained specific targets for individual foodcrops (table 1). The percentage increases for the groups of table 1 range from 26 percent for provisions, excluding potatoes, to 2,300 percent over the very small base for pulses and nuts. The average increase for three major fruits is 84 percent; for four specified vegetables, 76 percent; and for vegetable oil crops (coconuts and soybeans), 58 percent.

The Outlook for 1976 and 1981: An Overview

An indication of the outlook for foodcrop production and consumption in 1976 and 1981 will provide useful background for assessing the 1976 foodcrop goals and for determining the efforts needed during the remainder of the present planning period and also in the subsequent 5 years. The "outlook" projections presented in chapter III and summarized here are anchored in "normalized" 1972 experience and projected to 1976 and 1981 on the assumption that current economic forces and trends persist, and that public programs and policies in evidence today are pursued without major change of course.

1/ Unless otherwise specified, dollars refer to Guyanese dollars throughout the report. The early 1974 exchange rate varied within the range of US$1.00 = G$2.00 to G$2.30.

Table 1. Foodcrop Production Targets as Specified in the Second Development Plan, 1972-76

Crops	1970 production	1976 target production	1970-76 increase
	-- millions of lbs. --		-- pct. --
Oil crops			
Coconuts (oil equivalent)	12.1	14.1	16
Soybeans (oil equivalent)	0	5.0	--
Oil palm (oil equivalent)	0	0	0
Total	12.1	19.1	58
Provisions			
Plantain	48.9	55.6	14
Ground provisions ...	56.6	88.1	56
White potatoes	0	0	0
Total	105.5	143.7	36
Vegetables			
Cabbage	.7	1.6	128
Tomatoes	3.5	5.0	43
Onions	0	.2	--
Carrots	0	.6	--
Other	n.s.	n.s.	0
Total	4.2	7.4	76
Fruit			
Citrus	21.8	41.0	88
Banana	23.3	28.9	24
Pineapple	2.8	18.5	560
Other	n.s.	n.s.	0
Total	47.9	88.4	84
Pulses and nuts			
Black-eyed peas	.3	3.8	1,166
Peanuts	.1	3.5	3,400
Red kidney beans	0	.2	--
Cashew nuts	0	2.1	--
Other	n.s.	n.s.	0
Total	.4	9.6	2,300

n.s. = not specified.

The outlook projections, as more explicitly interpreted in the next chapter, lead to the conclusion that Guyana will reach near self-sufficiency in provisions and fruits by 1976 and sustain this relationship through 1981 (table 2). Inasmuch as it is assumed that any major consequences of present exploratory efforts for soybean and palm oil production are more likely to be felt after 1981 than before, no substantial gain in self-sufficiency with respect to vegetable oils is projected.

Furthermore, no early breakthrough in import substitution for onions or tomato paste is foreseen, so the outlook shows almost no change in the rate of self-sufficiency for the vegetable group, where virtual self-sufficiency already prevails except for the two items mentioned. The apparent lack of an acceptable local substitute for split peas accounts for both the present low rate of self-sufficiency and the lack of substantial change in the group comprising pulses and nuts.

Wheat flour (not reflected in table 2) will continue to be a major imported food item.

A constant rate of self-sufficiency implies similar rates of change in production and domestic disappearance (consumption plus allowances for seed and waste). The increase in self-sufficiency for provisions implies a considerable but not complete substitution of local products for potatoes formerly imported but now banned unless from CARICOM[1/] sources. The fruit projections, which surpass

1/ CARICOM, the Caribbean economic community, is comprised of Guyana, Barbados, Trinidad and Tobago, Jamaica, and the smaller east Caribbean islands.

Table 2. Foodcrop Production-Utilization Balances for 1972 and Equilibrium Outlook for 1976 and 1981

Crops and year	Production	Domestic disappearance[a]	Imports (-) or exports (+)	Retail price index	Degree self-sufficiency
	---------- million lbs. ----------			----- percent ------	
Vegetable oils					
1972 normal	15.0	21.7	-6.7	100	69
1976 outlook	16.8	23.2	-6.6	165	72
1981 outlook	17.4	27.5	-10.1	164	63
Provisions					
1972 normal	61.4	79.9	-18.5	100	77
1976 outlook	69.1	71.1	-2.0	123	97
1981 outlook	73.6	76.6	-3.0	152	96
Vegetables					
1972 normal	44.8	51.6	-6.8	100	87
1976 outlook	49.2	56.9	-7.7	107	86
1981 outlook	54.0	62.4	-8.4	127	87
Fruit					
1972 normal	37.3	40.0	-2.7	100	93
1976 outlook	41.3	42.3	-0.8	112	98
1981 outlook	46.6	45.1	+1.5	125	103
Pulses and nuts					
1972 normal	2.0	11.8	-9.8	100	17
1976 outlook	2.2	12.6	-10.3	108	18
1981 outlook	2.5	13.6	-11.1	119	16

a/ Includes allowances for seed and waste -- farm weight basis.

100-percent self-sufficiency by 1981, imply some exports of pineapple from an enterprise which has been expanding rapidly in the Soesdyke/ Linden area. On the other hand, citrus juices will continue to be in deficit.

The price projections hinge on a 16-percent increase in the general price level; hence, increased self-sufficiency in provisions is achieved at the expense of a rise in real prices to consumers. A substantial rise in the real consumer price of vegetable oils also appears in the outlook projections. This will tend to discourage consumption; the steps recently taken to raise prices to producers of coconuts and copra are expected to bring an appreciable short-term response in yields and marketings.

The detailed outlook projections suggest that the additional output shown in table 2 would be produced through combination of about 8,000 acres of additional land -- either on present farms, or on new farm units -- and minor yield improvement for selected foodcrops. The outlook projections suggest that total acreage of foodcrops would increase from 65,300 to 73,500 (table 3).

An Appraisal of Foodcrop Targets in the Second Development Plan

The 1972-76 Development Plan provides a clear statement of the goals that underlie the hopes of the Guyana Government in its pursuit of economic development. The orientation of social and economic objectives is clear and seems to be reflected in the directives and actions of the Government in recent months. It is only in the specific foodcrop targets and strategies that the plan falls short. Basically,

Table 3. Foodcrop Acreage and Yield Change: Estimates for 1972 and Outlook for 1976 and 1981

(Acres in thousands and yield changes as index, 1972 = 100)

Crops	1972 acres	Normal yield	1976 acres	Outlook yield	1981 acres	Outlook yield
Vegetable oils.....	33.5	100	34.1	109	35.5	110
Provisions.....	13.5	100	14.9	101	15.7	103
Vegetables.....	6.0	100	6.5	101	7.1	102
Fruit.....	9.1	100	10.0	101	11.2	102
Pulses.....	3.2	100	3.5	101	4.0	101
Total foodcrops....	65.3		69.0		73.5	

the foodcrop targets reflect an absence of sufficient information and analysis on what can be achieved with Guyana's limited resources and on what can be marketed at home or abroad. Each of the plan's foodcrop targets is considered in the following discussion.

Vegetable Oil Targets

The targets for vegetable oil crops were set realistically in relation to the 1976 outlook for domestic oil disappearance (table 4). If the targets were to be achieved there would be a deficit of only about 1.3 million pounds. However, the outlook projections suggest that soybean production will not even approach the target level as soon as 1976, so the projected outlook for combined oilcrop production (in oil equivalent) falls short of the target by 5.2 million pounds. Apparently the plan underestimated the technical difficulties likely to be encountered in introducing a new crop on some 21,000 acres. This is a formidable undertaking, requiring the accumulation of experience and sizable investments. It is by no means certain that this target can be achieved by 1981, or that it should be, in view of the prospects which may emerge from current tests with oil palm. This choice is one of the major issues to be addressed as soon as the pilot plantings of oil palm can demonstrate their potentials at bearing -- sometime within the next 3 to 5 years.

Targets for Provisions

The plan does not make explicit any assumption with respect to possible imposition of a ban on potatoes from other than CARICOM countries. If the targeted expansion

Table 4. Vegetable Oil Crops: An Appraisal of Planned Targets, 1976

(In millions of pounds, oil equivalent)

Oil crop	Production, 1976			Outlook for domestic disappearance[b]	Targeted surplus(+) or deficit(-)
	Adjusted target[a]	Projected outlook[b]	Shortfall(-) or excess(+)		
Coconuts....	16.6	16.5	-0.1	17.8	-1.2
Soybeans....	5.3	.1	-5.2	.1	+5.2
Oil palm....	0	.1	+ .1	.1	- .1
Other.....	0	0	0	5.2	-5.2
Total...	21.9	16.7	-5.2	23.2	-1.3

a/ The target adjustment is purely statistical. It applies the same growth rate as is in the plan to the 1972 production base used in this report.
b/ From table 24, chapter III.

took account of substitution of local provision crops for banned potatoes, it may have overestimated this effect, perhaps because other possible commodity substitutions were not considered. Hence, the outlook for domestic disappearance of the provision group is 7 million pounds less than the combined target (table 5). However, the outlook for production is a shortfall of 9 million pounds as compared to the combined target. In the absence of the ban on potato imports, the outlook projection for domestic disappearance would have been some 12 million pounds higher, and the adjusted target would have been well below the projected disappearance.

Vegetable Targets

Targets were set for only four vegetables which, in the aggregate, account for only about 20 percent of Guyana's vegetable consumption (table 6). The plan apparently recognized the probable difficulty of moving beyond the experimental stage in onion production by 1976, and the tomato target was not much higher than the outlook for 1976 production, although somewhat below projected domestic disappearance. The target for carrots -- a minor item of consumption -- appears large relative to the outlook for domestic disappearance, and the same is true for cabbage. Since the targets were set, sizable fluctuations of cabbage prices have been reported, indicating the substantial pressures on price which can result from modest production increases.

Table 5. Provision Crops: An Appraisal of Planned Targets, 1976

Provision crop	Production, 1976			Outlook for domestic disappearance[b]	Targeted surplus (+) or deficit (-)
	Adjusted target[a]	Projected outlook[b]	Shortfall (-) or excess (+)		
Plantains	24.7	23.6	-1.1	23.6	+1.1
Ground provisions	53.4	44.3	-9.1	44.3[c]	+9.1
White potatoes	0	1.2	+1.2	3.2[d]	-3.2
Total	78.1	69.1	-9.0	71.1	+7.0

a/ The target adjustment is purely statistical. It applies the same growth rate as is in the plan to the 1972 production base used in this report.
b/ From table 25, chapter III.
c/ Excludes demand for processing into cassava flour as a possible substitute for wheat flour and for its use as a bauxite flocculent.
d/ Assuming restriction of imports to those from CARICOM countries.

Table 6. Vegetables: An Appraisal of Planned Targets, 1976

(In millions of pounds)

Vegetable	Production, 1976			Outlook for domestic disappearance b/	Targeted surplus(+) or deficit(-)
	Adjusted target a/	Projected outlook b/	Shortfall(-) or excess(+)		
Cabbage.....	1.6	1.0	-0.6	1.0	+0.6
Tomatoes (fresh basis).....	3.7	3.2	- .5	5.2	-1.5
Onions.....	.2	c/	- .2	5.0	-4.8
Carrots.....	.6	.2	- .4	.2	+ .4
Other.....	d/	45.0	--	45.1	--

a/ The target adjustment is purely statistical. It applies the same growth rate as is in the plan to the 1972 production base used in this report.
b/ From table 26, chapter III.
c/ Negligible.
d/ No target set.

Fruit Targets

The level of the targets for citrus and pineapple production apparently reflects considerable optimism about Guyana's ability to divert sizable quantities to processing and/or export (table 7). The outlook projections for domestic disappearance do not allow for the emergence of large processing demands for these fruits by 1976, nor is it anticipated that Guyana will find export markets for some 5.7 million pounds of citrus or 7.3 million pounds of pineapple. Achievement of the targets would therefore imply sizable price declines -- perhaps amounting to as much as 40 to 60 percent. However, the projected outlook for production is, in each case, well below the target level. Discrepancies in the case of bananas are minor.

Targets for Pulses and Nuts

The plan makes no explicit reference to finding an acceptable substitute for split peas -- a product now entirely imported and one which represents the major component of the pulse and nut group. The targets for black-eyed peas and peanuts are far above the outlook for domestic disappearance, and also above the outlook levels of production (table 8).

Program and Policy Choices

The outlook projections of foodcrop production and utilization suggest that an additional 8,000 acres of foodcrop production and modest yield improvements will be required by 1981. In one sense, it can be assumed that

Table 7. Fruit Crops: An Appraisal of Planned Targets, 1976

(In millions of pounds)

Fruit crops	Production, 1976			Outlook for domestic disappearance b/	Targeted surplus(+) or deficit(-)
	Adjusted target a/	Projected outlook b/	Shortfall(-) or excess(+)		
Citrus.....	27.0	19.8	-7.2	21.3	+5.7
Bananas.....	10.9	10.3	- .6	10.3	+ .6
Pineapple...	10.5	3.7	-6.8	3.2	+7.3
Other.....	c/	7.6	--	7.6	--

a/ The target adjustment is purely statistical. It applies the same growth rate as is in the plan to the 1972 production base used in this report.
b/ From table 27, chapter III.

Table 8. Pulses and Nuts: An Appraisal of Planned Targets, 1976

(In millions of pounds)

Pulses and Nuts	Production, 1976			Outlook for domestic disappearance b/	Targeted surplus(+) or deficit(-)
	Adjusted target a/	Projected outlook b/	Shortfall(-) or excess(+)		
Black-eyed peas.....	4.0	1.5	-2.5	1.4	2.6
Peanuts.....	3.5	.2	-3.3	.9	2.6
Split peas..	0	0	0	9.7	--
Other.....	c/	--	--	--	--

a/ The target adjustment is purely statistical. It applies the same growth rate as is in the plan to the 1972 production base used in this report.
b/ From table 29, chapter III.
c/ No target set.

the realization of these projections will require no major departures from current policies and programs, since the outlook projections are based on a continuation of current economic and policy forces. In another sense, existing policies and programs must be given specific content if the outlook projections are to be realized.

In addition to providing specific content and new dimensions to existing programs to achieve the outlook projections, there will remain deficits for certain foodcrops -- oils, tomatoes, onions, split peas -- as well as wheat flour. Additional program actions for expanded acreage or yields will be required to reduce these deficits directly or through substitute foodcrops. Moreover, greater foodcrop production than suggested by the outlook projections could mean more favorable consumer prices or larger exports than contemplated.

Realistic choices of programs and policies for the next decade or more to achieve increased foodcrop production depend on examining alternative measures for achieving national and other goals in accordance with opportunities, on the one hand, and constraints, on the other. Guyana is fortunate in having a broad range of opportunities for improving performance of the foodcrop sector, and doubly so in that some of the more serious constraints can be relieved by appropriate action.

Opportunities

The descriptive analysis of this study shows that Guyana has ample resources of both land and labor to permit

a large expansion of foodcrop output. It also shows that the economic technology for attaining expansion in desired directions does not necessarily need to be capital intensive -- or put more strongly, that the opportunities for economic use of large additional capital inputs in the foodcrop sector are sharply circumscribed. By the same token, appropriate technology does not need to create a large drain on foreign exchange. Furthermore, it is shown that Guyana is unusually fortunate in having a substantial excess entrepreneurial potential already on foodcrop farms -- a potential comprising large numbers of farm-reared young men and women who seem to have attributes for undertaking the management of new farm units for foodcrop production if doors are opened to permit them to do so.

Furthermore, Guyana has a considerable range of soils and environmental conditions, so that the country can produce a sufficient variety of foodcrops to approximate the national objective for self-sufficiency. In a quantitative sense, the country has ample water resources, including navigable rivers which represent a resource for low-cost transport. In localities where it may be possible to draw on ground water for supplemental irrigation, there are winds to provide power for lifting. Finally, the educational attainments of the Guyanese are advanced by comparison with many developing countries, and there is a reasonably strong corps of workers with specialized and advanced training in subjects related to agriculture.

Constraints

When attention is turned to the constraints, it develops that there is another side to each coin. Much of the

country's extensive land resources are little used because of transport constraints and because the soils tend to be low in fertility and difficult to manage. Water from the ample rains falls on flat terrain and causes severe flooding instead of draining readily to the sea. For its part, the sea poses a constant threat to some of the country's more fertile clay soils, which must be protected not only from rain-caused floods, but also from intrusions of seawater. Irregularity of seasonal rainfall restricts flexibility in timing planting and harvesting activities and increases yield uncertainties. Hence, in some regions and for some foodcrops the lack of an effective water control system poses a constraint to increased production.

The broad range of the environment's adaptability for foodcrops is also a mixed blessing, given the tremendous amount of specific technical knowledge needed to produce any one crop in any one region with reasonable success. Guyana's inputs of technical and managerial manpower for agricultural development, although reasonably adequate in both quantity and quality relative to past sector output, are scant indeed relative to the foodcrop sector's diverse problems and dimensions -- as to crops, as to producing regions, and as to the agro-climatic environment. In this sense, present manpower resources in technical and managerial fields represent a constraint to the rapid introduction of broad new programs requiring large amounts of such inputs.

To date, for example, the foodcrop sector has advanced along traditional practice lines, with little tendency for the introduction of modern inputs and yield-increasing technology. Credit for production purposes has therefore

not represented a major constraint, but any programs which make large new demands on the existing agriculture credit structure must recognize and cope with the constraints imposed by limited technical and managerial resources. The same may be said for programs to expand foodcrop processing facilities and operations.

With respect to the abundance of human resources for farm labor and farm entrepreneurship, it must be recognized that underemployed people can create foci of discontent, with adverse effects on future productivity potentials.

Choices

The diagnostic analysis suggests that attainment of goals for foodcrop self-sufficiency and export expansion over the next decade must rely heavily on acreage expansion, given the lack of an adequate base for a comprehensive program of yield improvement on existing farms. Specific exception must be made for near-term expansion of output from tree crops such as coconuts, since any new plantings cannot add to output until after a non-bearing period of several years.

Economic opportunities for expanding foodcrop acreage appear to be strongly commodity-specific by regions. One of the major needs is for expanded output of vegetable oils from any one of three alternative sources -- coconuts, soybeans, or oil palm. The adaptability of the latter is being tested at several locations, but the largest pilot test is in the Northwest, where the experience of the next 3 years or so will provide evidence for examining the feasibility of major expansion. Tests with soybeans -- mainly on

the Intermediate Savannahs -- are mildly encouraging so far as attainable performance at the research plot stage is concerned, but cautionary when it comes to planning their incorporation in economic systems of commercial production. Again, more time is needed to accumulate evidence before new investments are made. Meanwhile, land potentials for expanding coconut acreage are more limited than for the other two oilcrops, but price and program actions should have a potential for bringing substantial increases in yields.

The acreage needed for expansion of vegetable oil crops by 1981 and thereafter represents an important fraction of the total additional acreage which could economically be devoted to additional foodcrops for domestic consumption and export. Needs for additional provisions, fruits, vegetables, and pulses for fresh consumption and limited processing activities could also represent a need for some 6,000 additional acres -- which could represent an appropriate use for riverine lands of the intermediate interior, providing tenure and transport problems can be resolved. This would provide an opportunity for 1,000 or more of the young men and women representing the sector's excess entrepreneurial potential to become established in the kind of foodcrop production with which they are already familiar. Alternatively, hopes for expanded foodcrop output can be pinned on gradual improvement of facilities, knowledge, and institutions for water management in the established coastal and riverine areas. Also, expansion could await the arrival of a situation in which all the necessary elements are available for introducing a package program of improved technology on existing foodcrop farms.

The diagnostic phase of this report examines an extended list of alternative policies, programs, and projects for assisting the foodcrop sector to fulfill its potential contribution to national goals. Some of these deal with regional matters, such as the production of crates in the Northwest for shipping local produce, and the installation of a multipurpose processing plant in that area. Others deal more generally with redirecting the thrust of research and extension programs, with needs for farm credit, and with the major issues of achieving more effective management of water resources. Still others deal with possible improvements of the budgeting process itself, insofar as it affects the effective allocation of public resources for development of the foodcrop sector. Finally, the matter of an improved data base for planning is examined, and the problem of husbanding scarce specialist and managerial resources of the public sector is considered. Such topics are brought together in chapter VII, although they emerge from analyses presented in chapters IV, V, and VI for the three major subsectors.

Results

Public decisions, including those which condition the decisions of farmers and other private entrepreneurs, will have much to do with the attainment of Guyana's broad goals and such more specific targets as may be set for the foodcrop sector for 1981. The outlook projections already summarized in this chapter suggest one possible outcome based on observed trends, policies, and programs, but realization of these projections will depend on the specific content given between now and 1981 to existing programs and on the rate of

progress in implementing the kinds of projects contemplated under the assumptions. Actual sector performance by 1981 will depart from the outlook projections to the extent that additional or different programs and projects can be effectively implemented to bring about an outcome more in keeping with such long-range goals and specific foodcrop targets as may be accepted through the planning process. Thus, the program and policy choices discussed in detail in this report, particularly in chapter VII, indicate the kinds of specific measures from which Guyana may choose in putting together policies and a broad strategy for foodcrop sector development between now and 1981, with an outcome which may correspond to the outlook projections or may go beyond or depart from them.

Because of the Second Plan's expressed emphasis on employment and income objectives, this study has given particular attention to production and processing alternatives which would provide additional agricultural employment and a broad distribution of additional income. A decision to seek additional output mainly from new farm units in the intermediate interior and the Northwest, and to suspend any major shift to a capital-intensive technology, would further these objectives, particularly if supported by progress in developing processing facilities -- mostly in local plants of small to medium size. This, of course, would not preclude <u>selective</u> efforts for improving yields and productivity per worker on established farms, where measures for improved water management, pest and disease control, and improved soil fertility management could produce substantial benefits without major increases in cash inputs. Simple tools and machines, such as small garden tractors, may have a role to

play on some farms where labor is not already redundant, but in the absence of associated practice changes and yield increases, their economic benefits are likely to be rather limited.

If the Government relies mainly on acreage expansion, supported by highly selective efforts for yield improvement, in formulating a strategy for expanding production, processing, and exports according to demands for these respective purposes, then some combination of measures suggested in this report could be expected by 1981 to create new jobs for 3,000 to 5,000 or more workers in the production, marketing, and farm input subsectors.

Corresponding attainment of income distribution goals could be expected, insofar as policies are chosen which favor the creation of new family-size units in the intermediate interior and increases in productivity on existing small farms. Opportunities for all regions to participate in development are evident, although early commitments to rapid development of foodcrop production in such areas as the Intermediate and Rupununi Savannahs could represent decisions entailing very high costs. Capital inputs in relation to the number of jobs created would be low, and a considerable portion of the capital inputs would not need to represent outlays of foreign exchange.

Some of the major outlays of capital (perhaps no more than around $15 to $20 million in the aggregate) would be employed in:

. Completing surveys and associated efforts for eliminating tenure ambiguities on lands where private

claims persist -- possibly through a project along the lines of current pilot tests of the "common bounds" technique of cadastral survey

. Providing subsistence and production credit to new settlers on lands where the regime of soil, water control, tenure, and means of access is acceptable

. Constructing modest, multipurpose plants for processing fruits, vegetables, and (in certain locations) cassava

. Developing cassava and oil palm production and processing if pilot efforts offer appropriate promise

. Installing small-scale supplemental irrigation facilities in selected areas

. Improving on-farm and local supporting facilities for drainage and irrigation, particularly in settings where the major works already installed are not providing full benefits

. Upgrading the technical and managerial qualifications and skills of the relatively small corps of public-sector professionals who must carry heavy and complex responsibilities in planning and implementing the selected strategy.

Other actions to increase foodcrop production may require little or no additional capital. Examples include:

- Modification of the direction and emphasis of the foodcrop research and extension programs

- Selective use of incentive prices, as with coconuts and copra

- Improvements in market information available to farmers

- A yield-improvement program for coconuts

- Development of an export market for pineapple.

Steps Toward Implementation

Implementation of several of the foregoing program alternatives could be initiated in the coming 1 or 2 years without necessarily requiring further formal feasibility studies. Riverine resettlement programs, cassava production in the Northwest, minor irrigation schemes, and selected yield improvement programs offer examples where the apparent probability of sufficient economic returns would not warrant a formal feasibility study. For such programs careful program planning is the next step.

Planning for riverine settlement, for example, would need to begin with identifying actions to follow current efforts for resolving tenure uncertainties, establishing new boat-runs on the river segments in question, and gearing the credit system to assist more prospective new farm operators. A program of minor irrigation might begin with providing credit and technical assistance to a limited number of

established operators who have appropriate settings for the installation of relatively small, low-lift pumps. Both kinds of programs call only for specific actions which fall within already established fields of responsibility of existing land, water, credit, and educational agencies.

These examples also serve to illustrate the need to anticipate program actions which may not be implemented for several years but require planning to begin now. For example, the credit system is not likely to become a serious constraint to foodcrop production for several years, yet now is the time to begin planning actions to avoid this constraint's materializing. Similarly, an expanded program of minor irrigation would require early steps to prepare the research and extension systems on transferring water-use technology to farmers.

Decisions on certain other program alternatives should wait until additional evidence from on-going pilot tests can be accumulated and evaluated. This applies, for example, to possible expansion of both soybean and oil palm production, but in the latter case, particularly, a formal feasibility study would be in order before a decision on installing a sizable extraction plant and developing the associated large plantings of the crop. Similarly, further planning studies on the various on-going and proposed processing facilities would be useful to examine carefully the complex choices of plant scales, locations, product mix, and technology.

Specific early attention is in order for efforts to improve the information base for general planning in the foodcrop sector, and also to expand and upgrade the stock of

technical and managerial manpower. In both cases, particularly high priority would seem to be indicated for upgrading capacities in the Ministry of National Development and Agriculture, where many of the key planning decisions must be made.

III. THE OUTLOOK PROJECTIONS

To make rational choices concerning public policies, programs, and projects, the Government must examine their cost effectiveness -- in other words, the extent of the benefits they are likely to produce relative to the costs. This cannot be done in a vacuum, however; the prospective costs and benefits of any given measure must presuppose the specific nature of the circumstances under which the measure is to be implemented. For example, installation of a processing plant for canning fruits and vegetables would have to be evaluated in terms of the nature of demand for the various possible products, the prospects for costs and supplies of raw materials, and various other specific dimensions of the environment in which the plant activities would be developed.

In an almost static environment, the added benefits and the added costs of a given new activity could be estimated in relation to the constant benchmark provided by performance and price parameters of the present or recent past.

In a dynamic environment, with many kinds of projects, programs, and policies constantly being initiated, modified, or terminated, and with predictable and unpredictable impacts of various exogenous forces such as changes in the

world demand and supply situation for agricultural commodities and inputs, a benchmark against which to measure cost effectiveness becomes harder to define, and more nebulous or arbitrary. Moreover, there is a need to replace the fixed-point benchmark of a virtually static environment with a line or series of points comprising a moving reference mark -- here termed an outlook projection -- to which comparisons can be made at specified periods in time. In the economic decision model of this study, an integrated set of outlook projections of production, consumption, and prices provides such a moving reference.

For present purposes, the outlook projections provide plausible estimates of foodcrop production and consumption anchored in "normalized" 1972 experience and projected to 1976 and 1981 on the assumption that current economic trends will persist and that programs and policies in evidence today will be pursued without major change of course.

The Procedure

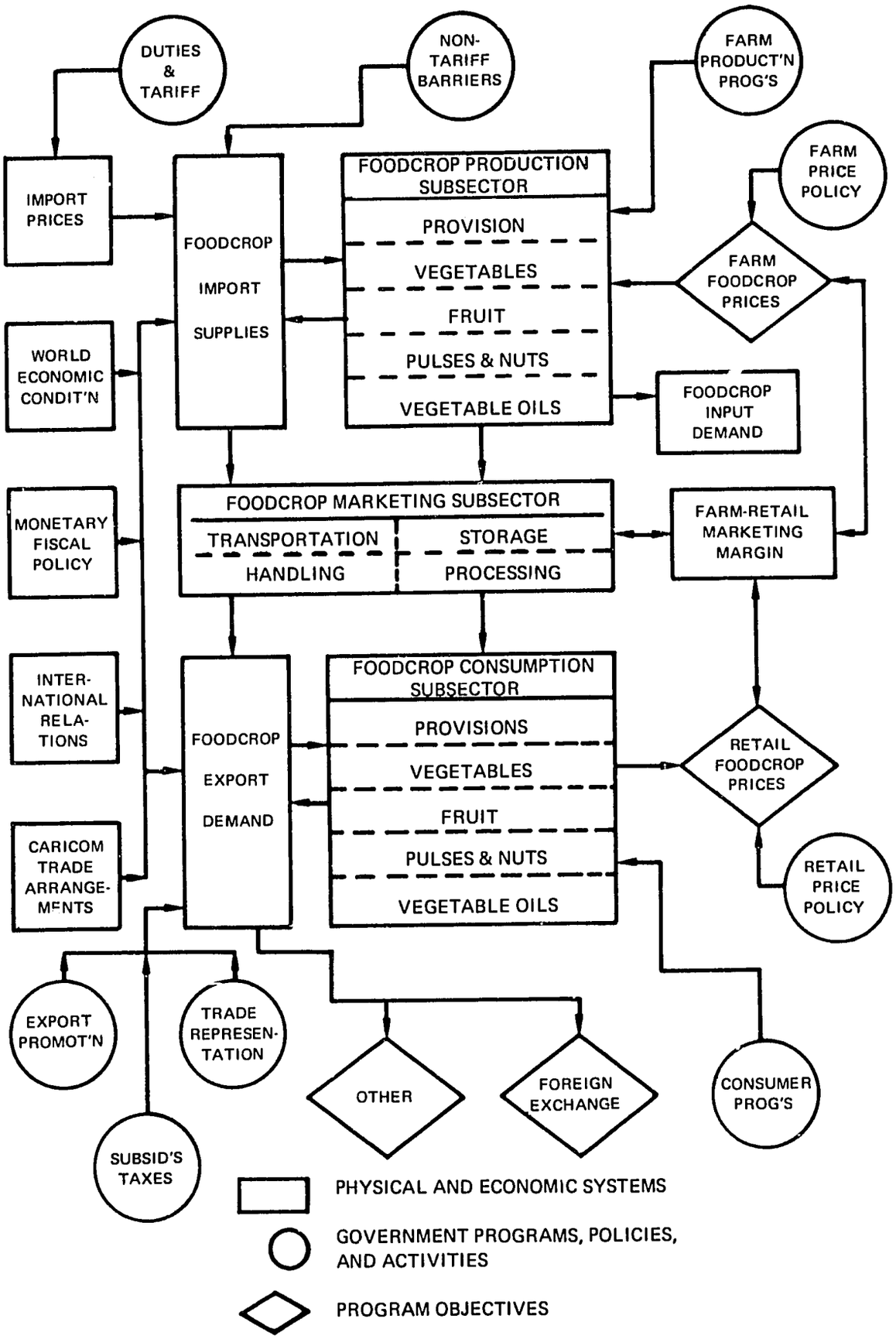
Even the "normalized" 1972 base-year data, it must be noted, lack precision that might be desired. In general, they are based on estimates of domestic consumption from the 1970 Consumer Expenditure Survey, with adjustments for change to 1972. Allowance for trade flows and waste on the farm or in marketing channels has been combined with the estimates of domestic consumption, leading to production estimates which do not wholly correspond with current estimates of the Ministry of National Development and Agriculture (appendix B). The differences, in fact, are rather large in some cases -- a matter which emphasizes the need for efforts to produce an improved data base for program

management and accountability. The base-year data have been "normalized" to reflect the fact that 1972 was not a representative year for foodcrop production because of serious flooding, particularly in the Pomeroon -- a major foodcrop-producing area. The acreage and yield components of the normalized totals reflect judgments based on fragmentary information from many sources: trends identified from official production statistics, occasional data from specific regions for specific crops, and limited reference to a special yield survey (appendix E).

Outlook parameters of consumption, prices, and production were derived by an iterative process within the framework of the integrated foodcrop sector model (figure 2). The initial price projections took account of trend data, insofar as available, and also of Government intervention in the pricing of vegetable oils, rice, and wheat flour. Consumption was initially projected from expected population and expenditure growth, and then adjusted for changes induced by the expected trend of retail prices, taking account of such special circumstances as the recently imposed ban on imports of potatoes from other than CARICOM sources. The export demand for foodcrops is also assessed at this stage.

The first iteration, then, took account of projected shifts of demand curves, based on population and expenditure growth, and projected adjustments along the demand curves induced by new price relationships at the projected levels. Inasmuch as in a dynamic environment supply functions cannot appropriately be treated as mirror images of demand functions, the introduction of supply function shifts and responses was handled in a different manner than in the case of demand.

FIGURE 2. A SCHEMATIC OF THE INTEGRATED FOODCROP SECTOR MODEL



The procedure considered appropriate was to examine factors affecting production trends and potentials with a view to determining where the initially projected prices might be expected to come under substantial upward or downward pressure toward new equilibrium levels. In a few such cases, adjustments to the initial price assumptions appeared plausible, and estimates of consumption were correspondingly adjusted. By this process, estimated production for each commodity remained in balance with domestic consumption (including processing), adjusted for trade flows and waste, at the prices of the second iteration.

The prevalence of perennial crops in the foodcrop sector is but one of the reasons for avoiding any appearance of attempting to quantify supply functions in a manner analogous to that employed for demand functions. Inasmuch as some kinds of responses to price changes are yield oriented and others are acreage oriented, it is obvious that the behavior of a rational producer of long-lived tree crops must reflect the net result of many divergent forces. Whatever he may do in adjusting his plantings, moreover, will not be easily reversible in the short run, as are many price-induced changes in consumption patterns. Hence, while a dynamic environment produces gradual shifts in supply functions and along these functions, it is also likely to produce changes in their shapes. Such changes also take place in demand functions, but seldom in the same degree.

The deliberateness of the biological processes involved in crop production means that the pursuit of an equilibrium position relative to market prices is rarely successful in a dynamic environment; whereas consumers can adjust their

purchases in the short run from day to day or from week to week, and also in the longer run as rapidly as their tastes change, foodcrop producers can adjust their plantings only about once or twice a year for annual crops, and much less often for perennials. Both the invested capital and the time loss involved in changing to another crop are factors which preclude rapid change. Even the matter of charting production behavior is more complex -- consumer purchases come much closer to reflecting intended behavior than do farm marketings in any given period, because the latter are affected by the frequent disparities between anticipated and actual production which follow from the variability of environmental conditions.

It must be noted that the outlook projections can be used as a reference for evaluating cost effectiveness only to the extent that one program, policy, or project, or one set of such changes, is introduced at a time. Several alternatives can be compared against each other, under the parameters of the outlook projections, but once any given policy, project, or program has been adopted, the parameters of the outlook projection must be presumed to change, and a second measure or set of measures would have to be evaluated against the parameters of a new setting.

Notwithstanding the aforementioned conceptual limitations of the outlook projections, they are presented here as a reasonably consistent set of assumptions about the circumstances under which policy choices must be made during the next few years.

Domestic Foodcrop Demand: Current and Prospective

A deficiency of the 1972-76 plan was the omission of an explicit analysis of the demand for farm products as a basis for setting production targets. This led to judgments based heavily on technical possibilities and lacking perspective on possible demand constraints. The present analysis should help officials to give more consideration to demand prospects in setting future targets.

The Relative Importance of Foodcrops in Current Consumption

Guyanese consumers in 1970 directed roughly 44 percent of their monthly expenditures to food of all kinds and from all sources (table 9). With average household spending at roughly $200 per month, this means that nearly $90 per month was spent on food -- an average of nearly $1,060 per year. In urban areas where incomes were substantially above average, consumers tended to spend 30 percent for food. In the rural areas, where incomes were some 15 percent below the national average, nearly 49 percent of incomes were spent on food. If these relationships hold today, Guyana's national food bill probably exceeds $175 million.

Guyana is in general a well-fed nation, with most of its people having food in ample quantities and in great variety. The average Guyanese consumes about 2,400 calories per day (table 10). This is not far below the caloric intake of surrounding countries like Trinidad and Brazil and is similar to intake in African countries like Nigeria.

Table 9. Average Monthly Expenditures on Food in Urban and Rural Areas: 1970

(In dollars per month)

Expenditure categories	Guyana	Urban	Rural
All items.....	201	264	170
Food.....	88	99	83
Clothing.....	15	16	14
Housing.....	42	65	31
Other.....	56	84	42

Source: Consumer Expenditure Survey, 1970.

With regard to quality, the Guyanese diet also compares well to other nations. Around 35 percent of the 1,000 pounds or so of food consumed in 1970 was from pulses, nuts, meats, dairy products, poultry, fish and other high-protein foods. This may be compared to data for Brazil, where more pounds of food were consumed but where only 23 percent of the total was high in protein. In Nigeria, high-protein foods constituted only 10 percent of consumption, while in Trinidad 40 percent of the food intake was from high-protein sources. The average Guyanese diet also contained comparatively large amounts and varieties of fruits and vegetables -- the fortifying foods that are generally considered essential to good health.

Foodcrops as defined in this study comprise roughly 25 percent of the total pounds of food consumed in Guyana. This is lower than the corresponding percentages in Trinidad, Brazil or Nigeria. In Nigeria foodcrops comprised more than two-thirds of total food intake; in Brazil they comprised about 55 percent; and in Trinidad, 33 percent.

Table 10. Guyanese Consumption of Major Food Groups Compared to Selected Countries, 1970

(In percent)

Food groups	Guyana	Brazil	Trinidad	Nigeria
Cereals	32	21	23	24
Starchy roots[a]	8	28	8	61
Sugar	9	8	8	b/
Pulses and nuts[a]	5	6	5	4
Vegetables[a]	5	2	4	2
Fruit[a]	7	17	14	1
Animal products[c]	33	17	35	6
Oil and fats[a]	1	2	2	2
Total all groups .	100	100	100	100
Total foodcrops ..	26	55	33	69
Caloric content	2,400	2,800	2,450	2,400

a/ These categories are broadly consistent with the definition of foodcrops used in this report.
b/ Less than 0.5.
c/ Data exclude butter.

Source: United Nations, Food and Agriculture Organization, FAO Agricultural Commodity Projections, 1975 and 1985, Vol. II, Methodological Notes, Statistical Appendix (Rome: FAO, 1967).

Recent Foodcrop Consumption Levels

In 1970, the average Guyanese consumed roughly 260 pounds of foodcrops (table 11). Nearly 100 pounds were of provision crops, including plantains, eddoes, tannias, dasheen, sweet potatoes, white potatoes and a variety of other roots. Vegetable consumption included nearly 70 pounds of cabbage, tomatoes, onions, pumpkin, callaloo, bora beans, boulanger (eggplant), and many others that are commonly available at one time of the year or another. Fruits too are consumed in important quantities -- about 50 pounds per year. These are dominated by citrus fruits, bananas, and pineapples but also include many other types. Nearly 30 pounds of split peas and other pulses and nuts are consumed.

Rice and wheat flour, while not considered foodcrops for the purpose of this study, are nonetheless important to the study of foodcrop consumption. Both commodities are significant substitutes, especially for provision crops. The average Guyanese consumed over 130 pounds of rice and 113 pounds of wheat flour in 1970. Because these items are so significant in the total diet, any important changes in the consumption of rice and wheat flour are likely to have a significant impact on foodcrop consumption.

At mid-year in 1970 Guyana's population was estimated to be just over 702,000, increasing at a rate of just less than 2 percent annually. At the same time, per capita incomes were expanding by roughly 2.6 percent annually in real terms. This suggests that national foodcrop comsumption probably increased from 180 million pounds in 1970 to about 192 million pounds by 1972. The 1972 total would have

Table 11. Estimated Foodcrop Consumption in Guyana: Per Capita in 1970 and Derived Aggregate for 1972

Crops	Per capita, 1970[a] (lbs.)	Aggregate, 1972[b] (mil. lbs.)
Vegetable oils:		
Coconut oil[c]	22.2	16.5
Other vegetable oils	6.8	5.1
Total	29.0	21.6
Provisions[d]:		
Plantains	26.2	19.4
Ground provisions	47.7	35.3
White potatoes	25.0	18.7
Total	98.9	73.4
Vegetables:		
Cabbage	1.2	.9
Tomatoes[e]	5.8	4.5
Onions	7.4	5.0
Other	52.4	39.2
Total	66.8	49.6
Fruit:		
Citrus[e]	24.5	18.5
Pineapple	3.0	2.2
Banana	11.2	8.5
Other fresh	8.6	6.5
Total	47.3	35.7
Pulses and nuts (dried):		
Black-eyed peas	1.7	1.3
Peanuts	1.2	.9
Split peas	12.3	9.1
Other	.6	.5
Total	15.8	11.8
Total foodcrops	257.8	192.1
Rice	131.4	96.0
Wheat flour[f]	113.4	82.5

a/ Derived from Consumer Expenditure Survey, 1970. These estimates do not coincide fully with table 10, which was derived from the food balance sheets using Ministry of National Development and Agriculture estimates.

b/ Per capita estimates for 1970 (retail weight) multiplied by 1972 population (730,400), with an appropriate allowance for income growth.

c/ Includes oil equivalent of dry nuts (1.4 million pounds) and oil used in soap (0.4 million pounds).

d/ Includes 8.9 pounds per capita as the fresh equivalent of cassava products, largely flour and starch.

e/ Includes the fresh product equivalent of processed products.

f/ Derived from import data.

included 74 million pounds of provisions, 50 million pounds of vegetables, 36 million pounds of fruit, 22 million pounds of vegetable oils, and 12 million pounds of pulses and nuts.[1/]

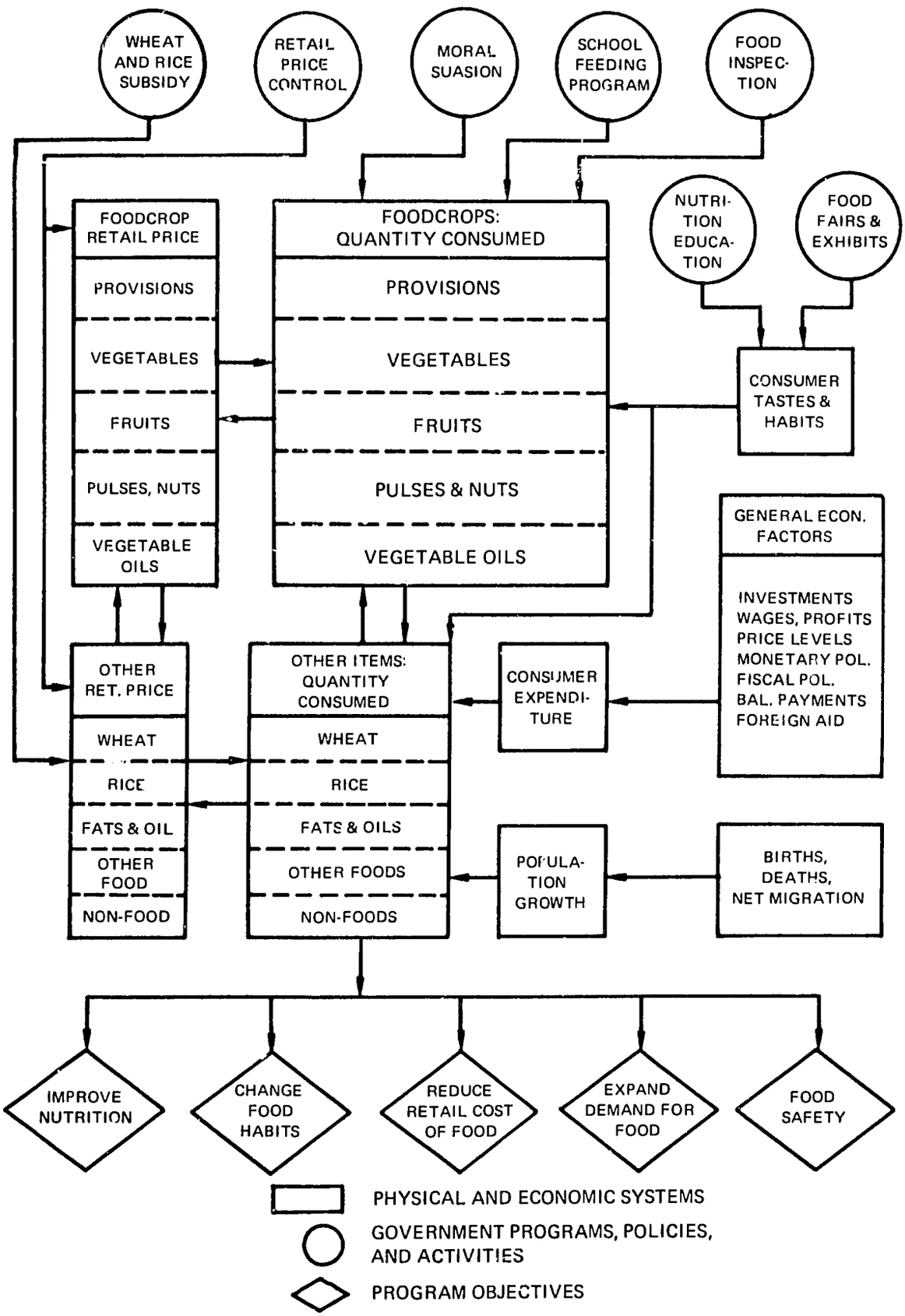
Projecting the Growth of Foodcrop Demand

Many factors interact in a complex way within the foodcrop sector to influence consumption (figure 3). The most significant ones for which moderately reliable measures have been developed are changes in population, changes in per-capita private consumption expenditures, and changes in relative prices of different commodities. These in turn are influenced by a wide range of external economic factors as well as domestic economic policies on wage levels, union activity, monetary and fiscal policies, trade, and balance of payments. The pattern of food consumption is likewise affected by Government objectives, such as improving nutrition and maintaining low prices for consumers, and by the Government's food policies and programs intended to achieve these objectives.

The consumption of foodcrops is also influenced by changes that take place in the basic tastes and food habits

1/ These estimates represent the approximate retail weight of the foodcrops consumed and so exclude any farm-to-retail waste and/or industrial diversion. However, they do include any inedible portions that are generally discarded by the housewife as she prepares food for the table. For vegetable oils or pulses and nuts, this waste would be very little; in the case of provisions and some fruits and vegetables, the waste would be substantial. Thus, farm weight for some commodities would be substantially higher than indicated by those consumption estimates.

FIGURE 3. A SCHEMATIC OF FOODCROP DEMAND SUBSECTOR MODEL



of people. However, such changes usually take place slowly and often result from factors such as the demonstration effect of consumption patterns abroad; gradual changes in the age, ethnic or racial composition of the population; and changes in knowledge about nutrition and dietary needs. All of these in turn may be influenced by Government programs according to specific objectives for which they are designed.

Food Policies and Programs

It is estimated that in 1973 the Government of Guyana spent roughly $14 million on programs to influence in some way the consumption of food (table 12). By far the largest part of this -- about $12.5 million -- was used to bridge the gap between the import cost of wheat and the fixed retail price of flour, which has been held at an average of 13.6 cents per pound for a number of years. This subsidy amounted to nearly 15 cents per pound of flour. It has been estimated by various Government officials that this subsidy could rise to as much as $20 or $25 million in 1974 and could continue at that level through 1976 or as long as world wheat prices remain at their currently high levels.

The remaining expenditure of about $1.4 million was spent on a number of small programs designed to influence food consumption. The Ministry of Health and Education and several other agencies spent about $1.2 million on various nutrition education programs, as well as on food fairs and exhibits. A major purpose of these appears to be an attempt to change Guyanese food habits by emphasizing the use of indigenous food, and to change these food habits without a significant reduction in nutritional content. There was

also a small, $110,000 program to provide snacks to schoolchildren. This program has been operated in conjunction with the USAID-supported school feeding program. The remaining $70,000 in the budget was spent on food inspection to assure the safety of foods and to police price controls which have been placed mainly on imported products. For this, the retail margin is fixed in relation to the import cost by Government.

Table 12. Government Expenditures: Domestic Food Consumption Programs, 1973 Revised[a]

(In millions of dollars)

Program	Total	Allocation to foodcrop
Improve nutrition		
Nutrition education.....	0.55	0.50
School feeding.....	.11	--
Food inspection.....	.04	.03
Total.....	.70	.53
Consumption incentive		
Retail price control.....	.03	.02
Wheat subsidy.....	12.50	--
Food fairs, etc.....	.65	.45
Total.....	13.18	.47
All food programs.....	13.88	1.10

a/ Revised estimates of current and capital expenditures.

It has been the Government's policy for several years to maintain the price of rice to domestic consumers at an average of 11.6 cents per pound for all domestic grades

sold. In relation to current rice export prices, this policy provides the equivalent of a subsidy of about 11 cents per pound at a total cost of nearly $12 million. This subsidy does not affect the national budget since it is handled directly by the Rice Marketing Board, an unsubsidized Government corporation. The Board in effect operates a two-price system where imports are sold at the world price and local sales are made at the price fixed by Government. The rice producer in turn receives a blend price after paying for the operating costs of the Board and for the subsidies he gets on fertilizer and other farm inputs. Thus, as long as the world price of rice is above the domestic price, the Guyanese consumer is being subsidized by local rice producers.

The Impact of Population Growth on Consumption, 1976 and 1981

In April 1960, Guyana's population was about 560,000; by April 1970 it had grown to 699,000, representing an increase of some 25 percent for the decade[1/] (table 13). The available data on births, deaths, and net migration for the years between 1960 and 1970 suggest that the annual growth of population in that decade was basically linear, with an addition of about 13,900 people per year. Thus, population growth occurred at a diminishing percentage rate: in the early part of the decade the growth rate was approximately 2.5 percent per year; it declined to 2.2 percent by the middle of the decade and was down to around 2.0 percent by 1970 (figure 4).

1/ A count of 714,000 has been reported for April 1970, but we are informed the correct count is 699,000.

Table 13. Population Growth in Guyana, 1960-70 and Projections to 1976 and 1981

(In thousands)

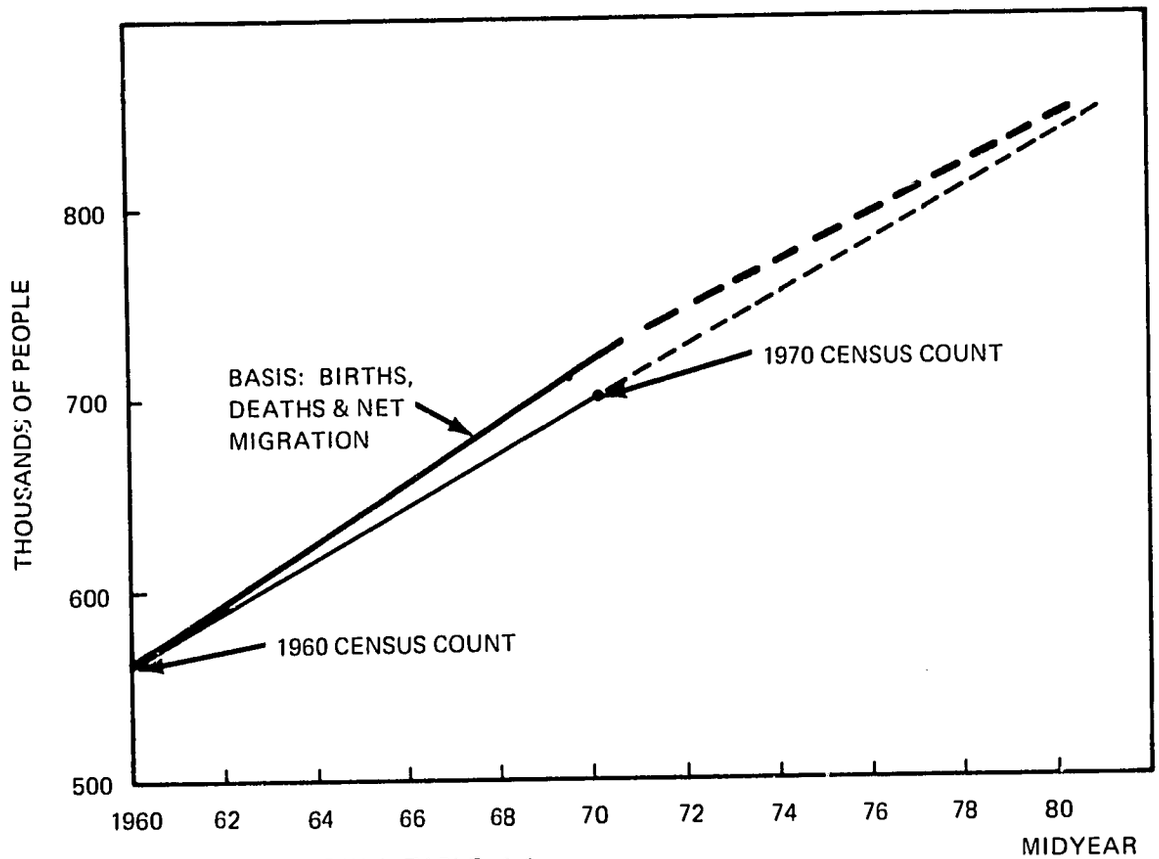
	Actual			Projected[a]		
	1960	1965	1970	1972	1976	1981
Midyear population...	563.6	633.1	702.6[b]	730.4	782.0	855.5
Number of births..	23.3	23.2	23.8	--	--	--
Number of deaths..	5.2	5.0	4.6	--	--	--
Net migration[c]	- 3.2	- 3.0	- 8.3	--	--	--

a/ Based on linear projection of trend.
b/ Based on unpublished census count for April 1970.
c/ Minus indicates net emigration.
Source: Guyana Statistical Abstract, 1971.

If this growth pattern continues, Guyana's population would be about 780,000 in 1976 and would reach 855,000 by 1981. This represents an average growth rate for the whole projection period of slightly less than 1.9 percent per year for a total increase of 17 percent from the 1972 base. A 17-percent growth in population would imply an approximately similar increase in foodcrop consumption, apart from any further changes resulting from income growth, changing tastes, and changing relative prices.

A critical factor influencing the projection of population growth is the implicit assumption that the high rate of net emigration will continue. It is difficult to predict

FIGURE 4. POPULATION GROWTH AND PROJECTIONS, 1960-81



SOURCE: APPENDIX A, TABLE A-1

whether or not this will happen because migration is highly sensitive to the comparative economic and social conditions that prevail in Guyana and abroad. It is also dependent to some degree upon the policies which the Government may pursue to dissuade Guyanese from leaving or to encourage Guyanese who are now abroad to return. Whatever is done in this respect could have a corresponding bearing on the future demand for foodcrops.

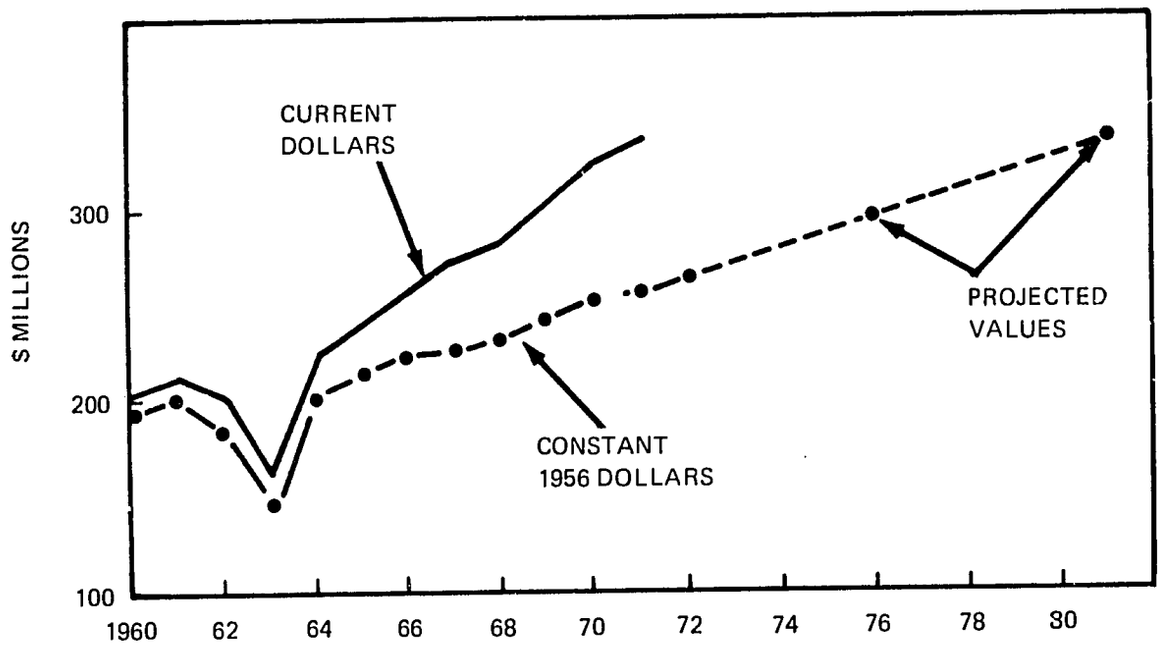
Changes in the birth and death rates in Guyana throughout the current decade are not likely to differ drastically from the recent past. Deaths have been declining in absolute numbers for the past 10 years; there is little reason to believe that with continued improvement in medical care and increased consciousness of nutrition this trend would be reversed. Similarly, the absolute number of births has remained nearly constant in the last decade.

Growth of Private Consumption Expenditures

Total private consumption expenditures[1/] measured in current dollars increased from $202 million in 1960 to $360 million in 1972. This was a gain of about 78 percent over the 12-year period. However, more than half this increase reflected a modest but persistent rate of inflation, leaving real growth at roughly 35 percent for the period[2/] (figure 5).

1/ Private consumption expenditures = private income - private savings.
2/ The Guyana Consumer Price Index rose about 43 percent during this 12-year period.

FIGURE 5. PRIVATE CONSUMPTION EXPENDITURE AND PROJECTIONS, 1960-81



SOURCE: APPENDIX A, TABLE A-2

The year-to-year growth of total consumption expenditure in the past decade was rather moderate and steady. A significant departure from this pattern occurred in 1962 and 1963, largely because of severe civil disorders that took place at that time. In 1964 the economy recovered substantially and continued to pursue its steady upward trend.

The evidence available suggests that future growth of the Guyana economy will not depart substantially from the current trend. The country at this time is continuing its efforts to pursue a development program that is within its financial and managerial means. Unless larger inflows of capital, management and new technology occur, it is not anticipated that the growth rate will substantially exceed its historical 3.3 percent. The recent sharp increases in world fuel prices, the probability of balance-of-payments and savings constraints, and the likelihood of continuing production problems in rice and bauxite are likely to thwart any significant increase in the rate of economic growth for at least the next 3 or 4 years.

Taking into account the factors known at this time, it is expected that real private consumption expenditures will rise to about $335 million by 1981 -- an increase of more than 26 percent over the 1972 level, or a gain of about 2.6 percent per year. By interpolation, real private consumption expenditures should be just short of $300 million in 1976.

The data in table 14 suggest that on a per capita basis, private consumption expenditures made a net gain of less than 4 percent between 1960 and 1972. However, a

severe setback in 1962 and 1963 was followed by growth at the somewhat more impressive rate of about 1.3 percent per year thereafter; nevertheless, per capita income did not regain its pre-1962 peak until about 1969.

Table 14. Real Per Capita Private Consumption Expenditure, 1960-81

	1960	1964	1972	1976	1981
Total private consumer expenditure ($ mil.)....	195	207	263	296	335
Population (mid-year) (thousands).....	564	619	730	782	856
Per capita private consumer expenditure (dollars).....	346	325	360	380	400

Reference: Appendix A, table A-3.

A continuation of the recent growth rate suggests that per capita real consumption expenditure should reach about $380 by 1976 and $400 by 1981. This does not make allowance for the possibility that development investments may be accelerated, nor does it take into account the possibility that some additional efforts to advance technology and expand resource use might be implemented to improve labor and resource productivity. If such additional efforts are effected, per capita consumer purchasing power could increase beyond the $400 projected for 1981.

Expenditure-Consumption Relations

Increases in consumer spending are seldom spread equally among all purchases. For some commodities, expenditures may actually be reduced when consumers can afford to buy a preferred substitute.

In Guyana, purchases of foodcrops and closely related food substitutes are expected to increase as future increases in consumer purchasing power materialize. It is postulated that Guyanese consumers in general have not yet reached a saturation point for any of the major foodcrops, so that income effects should be positive. On the other hand, the responses to income changes are not expected to be as high as they are for some developing countries where per capita income is lower and where food is in short supply. Guyanese will probably tend to allocate a large share of any additional expenditure to high-protein foods and to nonfood items in their family budgets.

Demand Shifts Induced by Growth of Population and Income

As a consequence of a rise from $360 to $400 in real per capita expenditures between 1972 and 1981, per capita purchases of the various foodcrop groups are expected to increase by 3 to 8 percent (table 15). This assumes that consumers will be able to make reasonably free economic choices without abnormal interruptions in the availability of supplies. Consumer tastes and purchase habits, it should be noted, are fixed in no absolute sense, but they tend to change rather slowly.

Table 15. Levels of Consumption of Various Foodcrops and Some Substitute Foods Associated With Different Levels of Real Per Capita Income

Food items	Per capita private consumption expenditure: 1956 dollars						
	$350	$360a/	$370	$380b/	$390	$400c/	$410
	------- Index of per capita consumption -------						
Foodcrop groups							
Provision crops .	99.3	100	100.8	101.5	102.2	102.9	103.5
Vegetables	98.7	100	101.3	102.5	103.7	104.9	106.0
Fruit	98.0	100	102.0	103.9	105.8	107.6	109.4
Pulses & nuts ...	98.9	100	101.1	102.1	103.1	104.0	104.8
Vegetable oils ..	98.9	100	101.1	102.2	103.2	104.2	105.1
Related foods							
Wheat flour	99.7	100	100.3	100.5	100.8	101.0	101.3
Rice	99.2	100	100.8	101.6	102.4	103.1	104.7
Sugar	99.0	100	101.0	101.9	103.8	103.6	104.8
Butter	96.0	100	104.0	108.0	112.0	115.0	118.0
Animal fats	99.2	100	100.8	101.5	102.5	103.5	104.0

a/ Per capita expenditures associated with 1972.
b/ Per capita expenditures associated with 1976
c/ Per capita expenditures associated with 1981.

Source: Interpolated from appendix A, table A-4.

Increased per capita consumption of foodcrops, combined with growth of population, would be expected, in the absence of changes in relative prices, to raise purchases in the various foodcrop categories by 20 to 26 percent between 1972 and 1981 (table 16). The narrow range of increase among commodity groups is partly a reflection of the modest growth rates for population and per capita expenditure. Should Guyana manage to achieve a substantially higher rate of economic growth, the demand for foodcrops would, of course, be higher than that indicated in table 16.

Table 16. Projected Demand Growth for Foodcrop Groups and Related Foods, Considering Only the Impacts of Growth of Population and Private Consumption Expenditures, 1972 to 1976 and 1981

(Index: 1972 = 100)

Commodity or group	1976	1981
Foodcrops		
Vegetable oils.....	109.4	122.0
Provision crops.....	108.7	120.5
Vegetables.....	109.7	122.9
Fruits.....	111.2	126.0
Pulses and nuts.....	109.3	121.8
Related Foods		
Wheat flour.....	107.6	118.3
Rice.....	108.8	120.8

Source: Derived from tables 13 and 15.

Impacts of Price Changes on Consumption

It is commonly accepted that the willingness of consumers to purchase a given commodity depends on its price (other things being equal), and that consumers stand ready to purchase larger and larger quantities, at any given time, as lower and lower prices are postulated. The demand functions or curves which express such relationships between purchases and prices change over time with such factors as incomes and tastes; in the absence of such shifts of demand, observed purchase behavior would be expected to move along a given demand function or curve according to the price at which the commodity could actually be purchased during the relevant time period. Elasticities of demand with respect to price are useful coefficients for estimating the impacts of changes in relative prices upon consumer purchases of a given product, while cross-elasticities of demand are useful for estimating changes in purchases of one commodity likely to be occasioned by changes in the price of a substitute.

Quantitative estimates of price elasticities and cross-elasticities could not be determined from Guyanese data. It is generally accepted that a 1-percent change in price for most of the major foodcrops and related foods here considered is likely to elicit a change of less than 1 percent in the quantity purchased. This is particularly probable in an economy where consumers spend less than 50 percent of their income on food, as in Guyana. Taking account of the available evidence from Guyana and other countries, price elasticities for various foodcrop commodity groups have been postulated at levels ranging from -0.40 for provisions to -0.90 for fruits (table 17).

Table 17. Foodcrops and Related Commodities: Assumed Price Elasticities and Cross-Elasticities of Demand

Commodities subject to 1-percent change in price	Elasticities measuring change in purchases of specified commodities						
	Oilcrops	Provisions	Vegetables	Fruit	Pulses & nuts	Rice	Wheat flour
Oilcrops	-.62	--	--	--	--	--	--
Provisions	--	-.40	.03	--	--	.05	.02
Vegetables	--	.03	-.80	.05	.14	--	--
Fruit	--	--	.05	-.90	--	--	--
Pulses & nuts ...	--	--	.14	--	-.75	--	--
Rice	--	.04	--	--	--	-.50	.02
Wheat flour	--	0	--	--	--	.02	-.15

Substitution possibilities for provisions are substantial; therefore it is assumed that a 1-percent increase in the price of provisions would decrease purchases by about 0.40 percent, and increase purchases of substitute products, if their price did not change, by about 0.03 percent for vegetables, 0.05 percent for rice, and 0.02 percent for wheat flour (table 17). On the other hand, vegetable oils have virtually no substitutes in the foodcrop group. Substitution possibilities tend to be greater within each group than between groups (see appendix A, table A-9).

Recent Price Patterns

Food prices in general rose modestly in the 5 years preceding 1972. Although they moved both up and down on a year-to-year basis, the average increase along the trend was only about 12 percent -- roughly 2.5 percent per year (table 18). This was only slightly more than the increase in the index of prices for all consumer items, indicating that the growth of food output almost kept pace with the growth of demand.

Price movements, however, varied among and within the foodcrop groups. Prices of plantain, cassava, bananas and pulses rose roughly twice as fast as the average for all foods, indicating some sluggishness in the growth of output. Prices of cabbage, onions, oranges and pineapple tended to rise slower than the general price level.

Prices for coconut oil, wheat flour and rice -- the three major price-controlled foods -- have been held virtually constant in the past 5 years. Compared to all food

Table 18. Price Indexes of Foodcrops and Related Items: Actual and Trend Levels, 1972

(Index: 1967 = 100)

Commodity	1972 trend	1972 actual
All consumer items	110	113
All food	112	116
Selected foodcrops:		
Plantain	124	142
Cassava	125	159
White potatoes	123	139
Cabbage	105	96
Tomatoes	109	113
Onions	105	130
Other vegetables	111	118
Oranges	105	110
Pineapples	108	108
Bananas	122	127
Other fruit	110	114
Coconut oil	100	100
Split peas	113	118
Other pulses	124	148
Related foods:		
Wheat flour	100	100
Rice	100	100

prices, the relative prices of these commodities actually declined. These price policies undoubtedly contributed to a substantial increase in consumption of the controlled products and helped put additional pressure on Guyana's foreign exchange position: for vegetable oils and wheat flour because the policy tended to increase imports, and for rice because it tended to decrease exports. At the same time, however, the flour and rice price controls probably moderated the increases in prices of provisions and other commodities that tend to be fairly close substitutes in consumption.

In 1972, foodcrop prices averaged about 4 percent above the trend level. This phenomenon reflected adverse weather conditions and flood damage in certain localities such as the Pomeroon, but it was also the result of an emerging worldwide situation characterized by widespread food shortages, fuel shortages, and a broad realignment of international exchange rates. Because Guyana depends almost wholly on imported fuel and in some measure on imported foods, the economy was not immune to forces felt around the world.

A serious question for the future is whether or not the sharp upward price trends that have recently been felt on world markets will persist throughout the current decade. The prognosis is that food prices may recede somewhat by 1976, at least for the basic commodities such as rice, wheat, and feed grains. Any new norm, however, is likely to be well above 1973 levels, partly because prices of petroleum and many farm inputs are likely to remain high.

The foodcrop price projections for the first iteration of the demand analysis reflect the assumption of a general but moderate upward trend to 1981, with the 1976 index for all foods being only 6 percent higher than in 1972. By 1981, some indexes[1/] would reflect larger increases than the all-items price index and some would reflect smaller increases, in conformity with pre-1972 patterns (table 19).

There were some exceptions to this general pattern of price assumptions. In the first iterative stage, it was assumed that the price-controlled commodities including coconut oil, sugar, rice, and wheat flour would continue to be controlled at the levels of April 1, 1974 (possible increases have since been discussed in Government circles). In the case of potatoes, it was assumed that some imports from the CARICOM area would continue and that the control price of potatoes at retail would hence be about 40 cents per pound.

These price assumptions suggest some significant shifts in the pattern of foodcrop consumption in Guyana by 1981 (table 20). Of special significance is the incentive for higher rice consumption, which would be expressed in consumer readiness to increase purchases by 19 percent as compared to 1972 levels. In combination with the shift of demand resulting from population and income growth, this would lead to a 39-percent increase in rice purchases at the 1981 projected prices.

1/ Price data for commodity groups are weighted by 1972 consumption throughout.

Table 19. Retail Foodcrop Prices: Actual 1972 and Assumed 1976 and 1981

Food categories	Actual 1972	Assumed prices	
		1976	1981
	cents per pound		
Foodcrop groups:			
Vegetable oils	44.5	73.6	72.7
Provisions	16.1	19.2	23.2
Vegetables	34.2	36.7	41.1
Fruit	17.4	19.1	20.9
Pulses and nuts	35.0	37.7	41.6
Wheat flour	13.6	13.6	13.6
Rice	11.6	11.6	11.6
	percent		
Index all foods	100	106.2	119.0
Index, all consumer items	100	106.2	116.5

Table 20. Impacts of Demand Growth and Initial Price Assumptions on Consumption of Selected Food Commodities, 1981

(Index: 1972 = 100)

Commodity group	Demand growth[a/]	Price impacts	Combined impacts
Oilcrops.....	122.0	+ 4.2	126.2
Provisions.....	120.5	- 11.4	109.1
Vegetables.....	122.9	0.0	122.9
Fruit.....	126.0	- 6.2	119.8
Pulses and nuts.....	121.8	- 6.8	115.0
Wheat flour.....	118.3	+ 1.7	120.0
Rice.....	120.3	+ 19.0	139.3

a/ Includes only the effects of population and expenditure growth.

The 9 percent combined impact of demand growth and relative price changes on indicated consumption (table 20) conceals early (1972 to 1976) and subsequent (1976 to 1981) impacts for the component commodities (table 21). Notwithstanding the ban on potato imports from non-CARICOM sources, potatoes would still be available from domestic production and from occasional imports from the CARICOM area; at the projected retail price of 40 cents per pound, consumers would stand ready to purchase nearly 16 million pounds in 1976 and about 19 million pounds in 1981 -- only 3 percent below actual consumption in 1972, when the retail price was 20 cents per pound. The fact that imports and domestic production can scarcely be expected to increase to these levels illustrates the reason for making certain specific adjustments to consumption and price projections in the

Table 21. Initial Consumption Projections: Foodcrops and Related Commodities, 1976 and 1981[a]

Commodity	1972		1976		1981	
	Retail price (¢/lb.)	Consumption (mil. lbs.)	Assumed retail price (¢/lb.)	Consumption (mil. lbs.)	Assumed retail price (¢/lb.)	Consumption (mil. lbs.)
Vegetable oils						
Coconut oil	37.0	16.5	69.0	17.7	69.0	20.9
Other vegetable oils	70.0	5.1	90.0	5.4	90.0	6.4
Total	44.5	21.6	73.6	23.1	72.7	27.3
Provisions						
Plantain	15.5	19.4	17.0	20.3	21.0	21.1
Ground provisions	15.0	35.3	16.0	37.9	20.0	40.8
White potatoes ..	20.0	18.7	40.0	15.7	40.0	18.2
Total	16.1	73.4	19.2	73.9	23.2	80.1
Vegetables						
Cabbage	37.0	.9	42.0	1.0	44.0	1.1
Tomatoes	52.0	4.5	55.0	5.0	60.0	5.6
Onions	30.0	5.0	40.0	5.6	40.0	6.2
Other vegetables	32.5	39.2	34.0	44.9	39.0	48.2
Total	34.2	49.6	36.7	56.5	41.1	61.1
Fruit						
Citrus	19.5	18.5	21.0	19.6	22.0	22.0
Pineapple	18.6	2.2	20.0	2.4	21.0	2.7
Banana	13.5	8.5	15.5	9.0	19.0	10.2
Other	17.1	6.5	18.8	6.9	20.6	7.8
Total	17.4	35.7	19.1	37.9	20.9	42.7
Pulses & nuts						
Black-eyed peas .	62.5	1.3	68.5	1.3	85.0	1.4
Peanuts	50.0	.9	55.0	.9	65.0	1.0

Continued--

Table 21 (continued)

Commodity	1972		1976		1981	
	Retail price (¢/lb.)	Consumption (mil. lbs.)	Assumed retail price (¢/lb.)	Consumption (mil. lbs.)	Assumed retail price (¢/lb.)	Consumption (mil. lbs.)
Split peas	30.0	9.1	32.5	9.7	35.0	10.6
Other	36.4	.5	38.5	.5	44.0	.6
Total	35.0	11.8	37.7	12.4	41.6	13.6
All foodcrops	25.0	192.1	32 .5	203.8	36.0	224.8
Rice	11.6	105.0	11.6	125.9	11.6	143.9
Wheat flour	13.6	82.5	13.6	89.8	13.6	97.6
Total	18.8	379.6	22.2	419.5	23.8	466.3

a/ Taking account of the impacts of demand growth and consumption shifts at the initial price projections.

second iteration. Such adjustments led to the "outlook projections" which imply equilibrium levels of production, consumption, and prices, subject to specific assumptions about the existence of price and import controls.

A caveat is in order: if prices are effectively controlled by Government action and supplies flow at a steady rate, the economic disturbances are usually minimal. Fixed prices with erratic supply flows generate uncertainty, causing consumers to hoard and marketers to carry additional inventories in the pipeline, all of which leads to added costs to the marketing system and to consumers, and distortions of normal responses to price.

Export Demand for Guyana's Foodcrops

Exports have traditionally played an important role in Guyana's agriculture, with exports of sugar and rice accounting for a major share of final demand for both these principal crops. Guyana has made substantial gains in agricultural exports in the last decade (table 22). The annual increase in the value of agricultural exports has averaged $7.3 million since 1964. This growth was obtained solely through sugar and miscellaneous farm products, including livestock. Foodcrops and rice did not contribute to Guyana's export growth; in fact, rice exports declined modestly during the second half of the decade.

Contribution of Foodcrops to Exports

Foodcrop exports have been negligible, averaging only about $300,000, and accounting for less than 1 percent of

Guyana's agricultural exports. Foodcrop exports have been confined to occasional sales of citrus and small quantities of provisions, and have taken place when seasonal gluts occurred in the domestic market. There have also been occasional small shipments of vegetable oils that were probably made in response to periodic external profit opportunities. Guyana's foodcrop exports have been destined almost entirely to CARICOM countries.

Table 22. Value of Guyana's Agricultural Exports, 1964-72

(In millions of dollars)

Year	Total	Sugar	Rice	Foodcrops	Other
1964-66.....	86.61	52.0	23.2	.2	10.7
1967-69.....	106.7	70.3	23.2	.3	12.9
1970-72.....	130.1	92.0	21.6	.3	16.2
Indicated annual average trend.....	+7.3	+6.6	0	0	.9

Source: Guyana trade statistics.

Despite the absence of foodcrop exports, export demand has not been a constraint to foodcrop production in Guyana. The absence of foodcrop exports is explained principally by the fact that Guyana is itself deficit in most foodcrops for which there is an export demand, and thus an exportable surplus has generally not been available. Another, though less important, factor is that Guyana has no explicit programs for developing foodcrop exports. There are neither

special export marketing activities -- as for rice and sugar -- nor export subsidies.

The primary involvement of the Government in foodcrop export is through Guyana's participation in CARICOM trade agreements. One such agreement is the Agricultural Marketing Protocol (AMP), a mechanism created by CARICOM to encourage intra-CARICOM trade for a large number of specified commodities. Through periodic protocol sessions, import and export prices are negotiated for each commodity, with the established trading price usually pegged to the highest cost producer. The AMP has had little impact on Guyana's trade in foodcrops.

Another CARICOM agreement is the Oil and Fats Agreement (OFA). Under the OFA, surpluses and deficits in oils are declared by each member and a trading price is negotiated. Although CARICOM has an oil deficit overall, there are several small surplus producers (Dominica, St. Lucia, St. Kitts). Trade is impeded, however, by the OAF pricing mechanism which generally relates the trading price to the highest cost producer. Since Guyana has a large vegetable oil deficit, it has not had an opportunity to export under this agreement.

Although export demand has not been a constraint to the development of Guyana's foodcrop sector, export markets could offer an opportunity for Guyana to increase foodcrop production. In some cases, the export market could be an important factor in determining the scale of production and processing in Guyana. Moreover, in at least one crop -- pineapple -- the development of export markets will soon become an important factor.

Export Potential: CARICOM

Although the CARICOM market offers Guyana the most promising foodcrop export possibilities, the export potential is modest in both quantitative terms and the range of commodities. This is explained by several factors: (1) the CARICOM market is small (1970 population of 3.68 million and GNP of US$2,450 million) and dispersed among numerous countries; (2) there is a similarity among CARICOM members in agro-climatic environment, thus reducing opportunities for specialization; (3) the larger members -- Barbados, Trinidad, and Jamaica -- are themselves pursuing food self-sufficiency, thus encouraging indigenous production of foodcrops; (4) there is an absence of regular shipping services in the CARICOM area, particularly of vessels equipped to handle perishable and semiperishable commodities; and (5) Guyana is also in deficit of those foodcrops for which there is a significant CARICOM import demand.

The similarity between Guyana's and CARICOM's import demand is readily apparent from table 23. The principal 1972 CARICOM foodcrop imports are the foodcrops which Guyana still imports in large amounts: white potatoes, onions, pulses, vegetable oils, and corn. Aside from some white potatoes from Jamaica and some onions from Barbados, CARICOM imports of these foodcrops are met from sources external to the area. CARICOM imports of other foodcrops in 1972 were modest to negligible: bananas and plantains (0.6 million pounds), tomatoes (0.2 million pounds), pineapple (0.3 million pounds), cabbage (2.5 million pounds), and small quantities of citrus (probably less than 1.0 million pounds).

Table 23. Imports of Selected Foodcrops by CARICOM Members, 1972

(In thousands of pounds)

Crops	Guyana	Trinidad	Jamaica	Barbados	Others
Vegetable oil ...	1,900	9,098	12,507	4,374	21
White potatoes ..	18,684	32,978	6,342	13,130	95
Onions	4,900	8,100	10,700	2,800	n.a.
Corn	10,000	137,000	246,000	9,000	n.a.
Peas and beans ..	8,900	27,000	n.a.	3,400	n.a.
Black-eyed peas	121	2,796	2,171	492	1
Red kidney beans	--	1,471	3,220	--	--
Bananas, plantains	--	42	--	527	--
Peanuts	724	198	102	11	4
Cabbage	--	826	1,288	326	33
Tomatoes (fresh)	--	12	--	209	--
Pineapple:					
Fresh	--	--	--	120	4
Canned	--	184	5	n.a.	1
Wheat	88,000	111,000	162,000	--	--
Flour	6,000	43,000	175,000	28,000	n.a.

n.a. = not available.

Source: Respective country trade statistics; CARIFTA Secretariat.

It is recognized that present CARICOM imports are only partial indicators of future Guyanese export potential. Future export demand for foodcrops will be influenced by the interaction of various factors: (1) growth in foodcrop demand in the CARICOM countries as population and incomes increase; (2) domestic production of foodcrops as CARICOM members encourage production; (3) comparative costs of foodcrop production among CARICOM members; and (4) changes in intra-CARICOM transportation costs. Because of the absence of data on CARICOM production, costs, and prices, it has not been possible to incorporate explictly all of these factors into our assessment of Guyana's export potential.

Potential Foodcrop Exports

Present CARICOM imports and Guyanese production capabilities suggest export possibilities in the following foodcrops: cabbage, black-eyed peas, red kidney beans, vegetable oils, cassava flour, and pineapple. Each will be examined briefly.[1/]

Cabbage is presently imported by Trinidad, Jamaica, and Barbados in small quantities, but the aggregate 1972 imports of 2.5 million pounds were equivalent to 180 percent of Guyana's 1972 production. Guyana probably has adequate production capability for cabbage to satisfy imports of this order of magnitude. The average CARICOM import price of 28 cents per pound (wholesale price) and the Guyanese retail

1/ More detailed data on foodcrop imports for 1972 by Guyana and other CARICOM countries are presented in appendix C.

price of 37 cents suggest that Guyana could compete in the CARICOM market.

Black-eyed peas were imported by CARICOM members to the extent of 5.5 million pounds in 1972, while Guyana produced only enough to meet her own consumption needs. Guyana is capable of producing black-eyed peas in larger quantities, but 1972 comparative prices indicate possible difficulties in establishing a competitive position for Guyana (import prices of 30 to 57 cents and domestic Guyanese price of 62 cents at retail).

Red kidney beans were imported by Trinidad and Jamaica (4.7 million pounds) at average import prices of 30 to 35 cents per pound in 1972. Although Guyana presently produces only small quantities of red kidney beans -- mainly because Guyanese do not generally prefer them -- this crop can be readily grown in Guyana. Belize is a potential competitor for the CARICOM market, having produced approximately 3 million pounds in 1972.

Vegetable oil is a potential foodcrop export for the future. Although Guyana is presently an importer of vegetable oil, it could generate substantial surpluses for export if both palm oil and soybean programs develop successfully. CARICOM imports of vegetable oil are now 26 million pounds; these are almost certain to expand, as indicated by the 12-percent average growth rate in the regional deficit for vegetable oil over the past 7 years. One cannot readily predict whether Guyana's production costs will enable it to compete in CARICOM markets, but the OFA pricing mechanism (i.e., price pegged to the highest cost

producers) will be a contributing factor. While this export potential lies well beyond 1981, it ought nonetheless to be considered when investment and production decisions for palm oil and soybeans are examined.

Cassava flour is another export possibility which can be realized only in the future but which should be considered now. CARICOM imports substantial quantities of wheat and flour, part of which could be replaced by cassava flour. If Guyana is able to effect this substitution in its own economy (the dimensions of such a program are outlined elsewhere in the report), it may also be able to export cassava flour to CARICOM. The development of this particular export market is likely to be highly sensitive to the relative prices of wheat and cassava, and hence Guyana's f.o.b. price for cassava products will be an important variable.

Pineapple is one commodity for which the development of an export market appears urgent. By 1976 exportable surpluses, roughly 50 percent more than Guyana's domestic needs, are likely to be available. If this quantity is not exported, either fresh or in cans, severe price declines will discourage further production. This could reduce much of the progress already achieved in developing the Soesdyke-Linden area, and cause other areas of Guyana to switch from pineapple to other crops.

The only significant importer of fresh pineapple in the CARICOM area is Barbados, which imported about 125,000 pounds in 1972 (mostly from Trinidad). The smaller islands have combined imports of about 75,000 pounds per year. Even

allowing for possible expansion in the CARICOM market for fresh pineapple, it is still small in relation to the expected surplus of some 1.3 million pounds in Guyana by 1976.

The prospects for capturing some part of the fresh pineapple market in the CARICOM area are good. Guyana's surplus situation is likely to generate prices that are well below those of most competitors. Even last year, when surpluses were not apparent, the Guyana Marketing Corporation purchased 81,000 pounds of pineapple at an average price of less than 10 cents per pound. This compares favorably to a price of some 50 to 75 cents per pound paid by Barbados and St. Lucia for imports last year, largely from outside the Caribbean trade area.

Nonetheless, it is not easy to enter new markets on a regular basis. Importers resist new sources of supply until they are assured of regularity. However, even assuming that Guyana could capture the entire CARICOM fresh pineapple import demand, this would represent only some 15 percent of the expected surplus. More distant markets are not likely to prove feasible on a regular basis.

The alternative is to examine the development of a market for processed pineapple -- perhaps both in a solid pack and in juice. Although the CARICOM market for processed pineapple is several-fold larger than for fresh pineapple, the feasibility of a viable processing unit requires careful scrutiny, particularly since Guyana's present pineapple varieties are not well suited for canning. Assuming Guyana could capture this market, it would still have a surplus of pineapples in 1976.

There are minor export possibilities in other foodcrops, including small amounts of fresh citrus, canned citrus juice, and ground provisions.

Identifying the export potential for foodcrops is a relatively easy first step. Developing this potential will be difficult, especially as Guyana has no experience with regular foodcrop exporting. The elements of an export system for foodcrops and of market development programs are examined in chapter VII.

The Interaction of Demand and Supply Prospects

Growth in both population and consumption expenditures is expected to produce shifts of demand for foodcrops, which will be paralleled in some measure by analogous shifts in supply curves. In some situations, equal shifts of the two sets of curves might conceivably occur and leave market equilibrium prices unaffected, but this would be an exceptional outcome. Hence, the emerging path of equilibrium will almost surely involve short-term and longer term reponses of production and consumption to changes in relative prices -- such as the movements along demand curves which have already been discussed.

For various reasons noted earlier in this chapter, supply functions cannot be treated, conceptually or empirically, as pure mirror images of demand functions. Consequently, prospective farm output was assessed on the basis of judgments derived from various considerations concerning the farm operating unit, prospects of improving controls over the agronomic environment, and the impact of continuing

and currently planned programs on foodcrop production. The interaction of these and other components of the production subsystem are shown in figure 6. The initial consumption projections and the corresponding prices were then reviewed to identify cases where appreciable upward or downward pressures on prices might be generated by prospective farm output, after taking account of changes in trade flows. In a few cases, this dictated appreciable changes in the price assumptions, and hence in projected consumption. In selected cases (plantains, ground provisions, other vegetables, pineapples), minor adjustments were made to prospective farm output to reflect the change in the price assumptions.

Relatively limited adjustments of this sort led to the final outlook projections. These projections will be discussed on a commodity-by-commodity basis, with comments where appropriate on the 1972 normalized base data and the factors which led to adjustments in the initial consumption projections. A brief overview of the outlook has already been presented in chapter II.

Coconuts and Coconut Oil

Coconut oil is the major vegetable oil currently produced in Guyana. In terms of refined oil, estimated production in 1972 was equivalent to about 12 million pounds (table 24). This suggests that about 75 million dry nuts were produced, of which some 7 million were consumed directly. Thus about 68 million nuts were processed into oil at home and at commercial plants.

FIGURE 6. A SCHEMATIC OF THE FOODCROP PRODUCTION SUBSECTOR MODEL

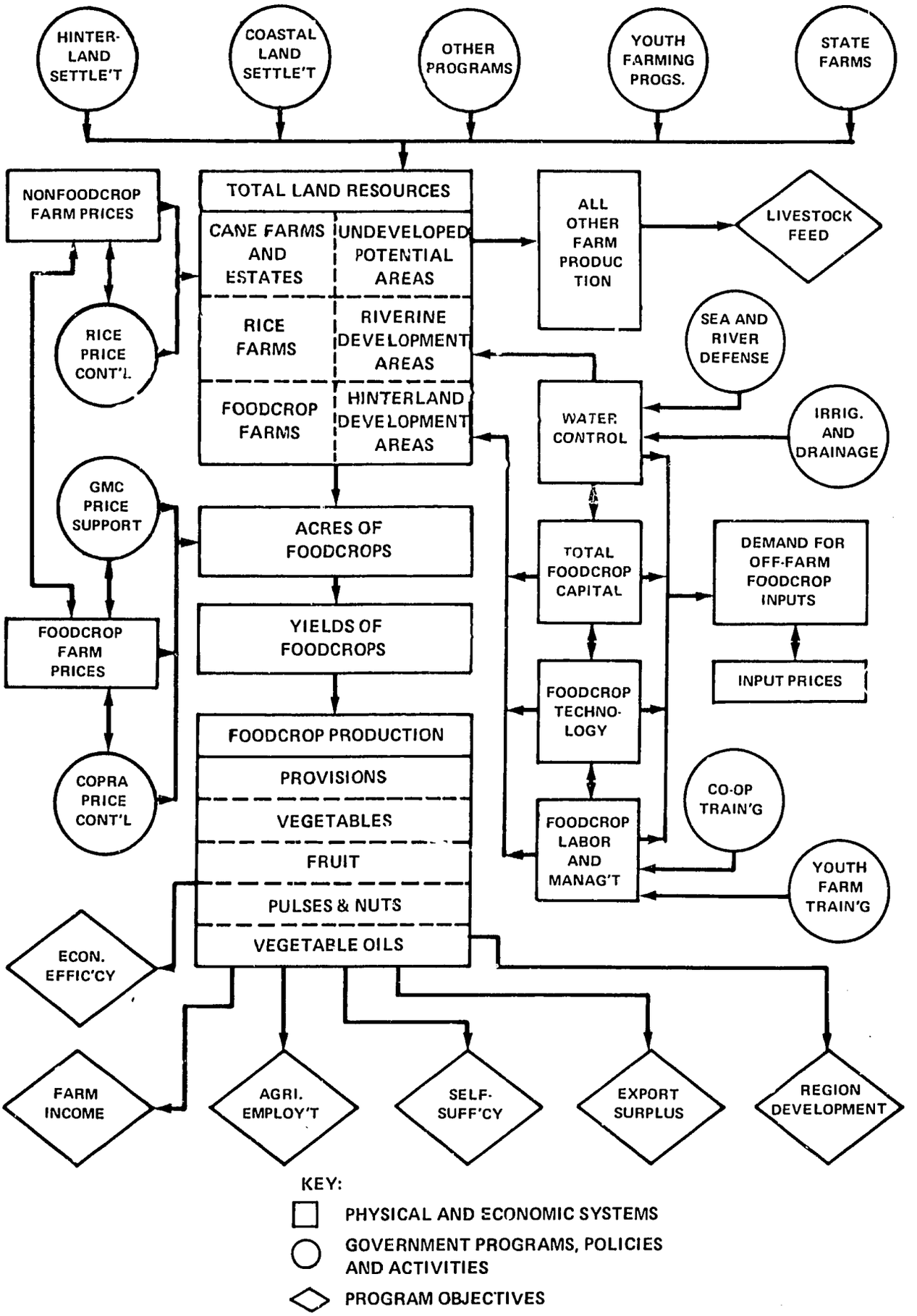


Table 24. Vegetable Oils: Production-Consumption Balances for 1972 and Equilibrium Outlook for 1976 and 1981a/

Year and vegetable oil crop	Acres	Yield	Production	Imports	Domestic disappearance	Retail price
	(no.)	(lbs/ac)	---------	(000 lbs.)	--------	(¢/lb)
1972 Normal						
Coconut oil .	33,300	450	15,000	1,630	16,630	37.0
Soybean oil .	10	200	2	170	172	37.0
Palm oil	200	0	0	0	0	37.0
Other vegetable oils	0	0	0	4,900	4,900	70.0
Total ...	33,510	447	15,002	6,700	21,702	44.5
1976 Outlook						
Coconut oil .	33,300	495	16,480	1,350	17,830	69.0
Soybean oil .	300	250	75	0	75	69.0
Palm oil	500	240	120	0	120	69.0
Other vegetable oils	0	0	0	5,205	5,205	90.0
Total ...	34,100	489	16,675	6,555	23,230	73.6
1981 Outlook						
Coconut oil .	33,500	500	16,750	4,350	21,100	69.0
Soybean oil .	1,000	300	300	0	300	69.0
Palm oil	1,000	375	375	0	375	69.0
Other vegetable oils	0	0		5,725	5,725	90.0
Total ...	35,500	491	17,425	10,075	27,500	72.7

a/ Oil equivalent basis.

Given indications that the industry's output has long been responsive to price in the short run, it is expected that the incentive price increase initiated by the Government in early 1974 will lead to at least a 10-percent increase in yields on existing acreage by 1976.

Even if current high prices for copra and coconut oil continue through 1981, the rate of self-sufficiency cannot easily be improved. Higher prices will continue to moderate the increase in consumption, but the short-term response potential will have been largely exhausted by 1976, leaving the oil deficit to increase to over 10 million pounds by 1981. The level of self-sufficiency will then decline to 63 percent -- some 6 points below the 1972 starting point. This, of course, depends on assumptions which have been made about expansion of soybean and oil palm output by 1981, and emphasizes the importance of any progress which can be realized with these crops.

Soybeans

In 1972 Guyana produced on an experimental basis at Kibilibiri only 10 acres of soybeans, which yielded an average of about 1,250 pounds of beans per acre, or the equivalent of 250 pounds of oil. Production in 1976 and 1981 will obviously depend on Government decisions on how rapidly to push expansion of a venture which is still in the pilot project stage.

In April 1974, the Kibilibiri farm produced about 115 acres, with an estimated yield of only 900 pounds of beans per acre. An October 1974 harvest of about 1,000 acres has

been planned. Current yields are exceedingly low and require high applications of fertilizer.

A few scattered farmers, including Bookers Sugar Estates, are also initiating the production of soybeans on a trial basis. Their potential at this time seemed too uncertain to be included as a major factor in soybean production by 1981.

Soybean production for 1981 is projected to be equivalent to 300,000 pounds of oil from 1,000 acres. This assessment rests largely on the rate at which the management and agronomic problems at the Kibilibiri farm can be resolved. The problems are many. Some of the more apparent ones include: determination of rates of application and placing of fertilizers; inoculation with proper strains of nitrogen-fixing bacteria; reduction of harvest losses resulting from low pods; improvement in the use, maintenance, and operational efficiency of machinery; improvement in the drying, handling, and storing of grains and seed; and resolving some of the labor problems that seem to recur frequently. The resolution of each of these problems will take time and trial-and-error adjustments to the current system. Hence, projected progress has been assumed to be moderate.

Oil Palm

The current Government-sponsored oil palm project was begun in 1966 with small scattered plantings at Ebini and several other locations throughout the country. In 1972 it was estimated that there were about 200 acres, mostly in

trees of nonbearing age. This acreage has been gradually expanded as a result of a seed sprouting program that has a capacity of turning out some 20,000 seedlings per year when in full operation.

At present it is estimated that there are about 320 planted acres, distributed as follows:

- 5 acres at Mon Repos
- 4 acres at Ebini
- 25 acres on the Government plot at Wauna
- 70 acres planted by the Farm Corps at Wauna
- 120 acres on farms at Wauna
- 100 acres at St. Jan, West Bank

The current plan is to increase the plantings on the Government plot at Wauna to 300 acres by the end of 1974.

It is assumed that about 500 acres will be in existence by 1976 and about 1,000 acres by 1981. Like soybeans, the enterprise at present is in the pilot stage; but since oil palm is a tree crop which requires 4 to 5 nonbearing years, the rate of acquiring knowledge about its production problems and their resolution is considerably slower.

In 1976, most of the 200 acres that were planted by 1972 should be approaching full production. However, since about 100 acres will be at Wauna and 100 at St. Jan only the smallest of oil extraction plants can be supported. These plants would be capable of extracting only about 45 to 50 percent of the oil. If such plants were installed, they could contribute a production of only 0.1 million pounds of

crude oil. It is doubtful if this would be worth capturing. By 1981, it is assumed that there will be about 500 acres of oil palm, 400 of which would be in the Northwest. This too would permit only a small and inefficient extraction facility which, if made available, could produce about 0.4 million pounds of oil.

Plantains and Ground Provisions

The key factor in the future outlook for provision crops is the prolonged impact of the import ban on white potatoes from sources outside the Caribbean. Even with some imports from the CARICOM area and some domestic production, the ban represents a reduction of about 15 percent in the total quantity of provisions available in 1976. This will increase the demand for plantains and ground provisions, as well as for wheat flour and rice, and will tend to raise prices to farmers. Increased production of plantains and ground provisions by 1976 will moderate the effect of the potato ban, and further increases of output are anticipated for 1981.

The total production of plantains in Guyana in 1972 is estimated to have been about 23 million pounds (table 25). This is similar to the level of production that was estimated in 1952. On the surface, this lack of growth seems incongruous with the growth in population that has occurred since that time. However, over the same period the food habits of the Guyanese seem to have changed so that more rice, wheat flour, and meat, and less provision crops, are consumed in general. At the same time the price of plantains

Table 25. Provision Crops, Wheat Flour, and Rice: Production-Consumption Balances for 1972 and Equilibrium Outlook for 1976 and 1981a/

Year and provision crop	Acres	Yield	Production	Imports (-) or Exports (+)	Domestic disappearance	Retail price
	(No.)	(lbs. per acre)	----------	(000 lbs.)	----------	(¢/lb.)
1972 Normal						
Plantain	6,460	3,500	22,600	+200	22,400	15.5
Ground provisions	7,050	5,500	38,800	0	38,800	15.5
White potatoes	0	0	0	-18,700	18,700	20.0
Total	13,510	4,548	61,400	-18,500	79,900	16.1
Wheat flour	0	0	0	-82,500	82,500	13.6
Rice	196,300	1,075	210,800	+105,800	105,800	11.6
1976 Outlook						
Plantain	6,640	3,500	23,600	0	23,600	19.5
Ground provisions	8,050	5,500	44,250	0	44,250	18.5
White potatoes	200	6,000	1,200	-2,000	3,200	40.0
Total	14,890	4,580	69,050	-2,000	71,050	19.8
Wheat flour	0	0	0	-92,000	92,000	13.6
Rice	220,000	1,100	242,000	+112,000	130,000	11.6
1981 Outlook						
Plantain	7,000	3,500	24,500	0	24,500	24.0
Ground provisions	8,700	5,500	47,850	0	47,850	23.5
White potatoes	200	6,000	1,200	-3,000	4,200	40.0
Total	15,700	4,686	73,550	-3,000	76,550	24.4
Wheat flour	0	0	0	-100,000	100,000	13.6
Rice	230,000	1,200	276,000	+125,000	151,000	11.6

a/ Fresh basis and farm weight equivalent.

has increased nearly 150 percent, whereas prices for all foods increased just over 50 percent. Thus it is conceivable that production has not kept pace with the increase in demand. The derived production of ground provisions on a farm weight basis is estimated to have been about 39,000 pounds in 1972. This consisted mostly of cassava, but also included substantial quantities of eddoes, sweet potatoes, yams, and other root crops.

The Ministry data show that the 1972 yield of ground provisions was about 5,800 pounds per acre in 1972. This was lower than had been reported in 1970 but was presumed to have risen from a level of about 5,200 pounds in the mid-1960's. There is, however, very little agronomic evidence to suggest that yields should have increased in the past decade; farmers still grow ground provisions on the same types of soil, they still do not fertilize extensively, their practices have not changed noticeably, and the varieties used are still the same.

Virtually no white potatoes were produced in Guyana in 1972 except on a few isolated test plots at Matthew's Ridge and one or two other interior locations.

It was not possible to get complete information about the status of the Government-operated potato project in early 1974. However, some production was observed at Kato and some was reported at Paruima Mission. Government news releases in April 1974 suggested that a total of 200 acres of potatoes would be grown in 1974. This is interpreted as representing 50 acres to be harvested in April and May and about 150 acres to be harvested after the mid-year rainy

season. The general yield expectation is for about 6,000 pounds per acre. The first 2 acres that were harvested early this year were reported to have produced a total of 15,000 pounds. The agronomic conditions observed at the Kato site appeared quite favorable to potato production.[1/] The crop was grown at elevations of 2,000 to 3,000 feet on sandy loams that had been under forest cover. Most of the plots were accessible to water although the land had not been leveled for flood irrigation

White potato production has its limitations, not in terms of soils and climatic suitability but in terms of the management system currently employed and the transportation constraint that is likely to persist for the next 8 or 10 years.

The potato project is essentially a one-man operation directed from Georgetown with onsite visits to Kato and Paruima roughly twice each month. The two locations are about 120 miles apart and are more than 200 miles from Georgetown. In addition, the potato plots at the Kato site were scattered in fields of 2 to 30 acres, dispersed over a distance of some 30 or 40 miles. This makes day-to-day supervision of planting, fertilization, irrigation, weeding, harvesting, and handling extremely difficult. Under this system, it will probably not be possible to cultivate successfully more than about 200 acres of potatoes per year.

However, the transportation constraint may dominate even the managerial barrier. A 200-acre operation would

1/ The Paruima site was not accessible to the team members.

. An increase in the prices of plantains and ground provisions of approximately 5 percent relative to their prospective levels without the ban.

. A direct saving of about $4.4 million in foreign exchange that would have been spent for potatoes.

. A partially offsetting loss of about $1 to $2 million in foreign exchange -- partly because of reduced rice exports and partly to pay for increased wheat imports.

. A major disturbance in the customary food habits of consumers, but only a minor impact on the nutritional quality of Guyanese diets.

. A general upward price impact of all foodcrop prices --particularly vegetables.

The equilibrium outlook for 1981, with essentially similar assumptions, is expected to differ little from the 1976 situation. However, plantain and provision prices will tend to increase more sharply than before, and consumers will turn to substitute wheat flour and rice even more heavily.

In sum, current Government policies will virtually assure a high but somewhat artificial degree of self-sufficiency in provision crops by 1976 and 1981. In 1972, the level of self-sufficiency was 77 percent; the outlook is for this level to rise to close to 97 percent in 1976 and 96 percent in 1981. If potatoes had not been banned, the level of self-sufficiency in 1981 would be only about 79 percent.

Thus the net effect of the potato ban is a substantial gain in the level of self-sufficiency at the expense of higher prices for various commodities.

Vegetables

In the next decade the outlook is for a very moderate upward pressure on vegetable prices -- partly because of a slight lag in production and partly because of a modest backlash from the potato ban which will tend to increase the demand for some of the starchier vegetables. However, the price pressures will not be severe as long as import levels are maintained -- mainly for onions and tomato paste (table 26).

The outlook assumes that small quantities of cabbage will be exported to CARICOM members by 1981. Cabbage has demonstrated a reasonably strong expansion potential in Guyana; it is among the crops for which prices have risen slower than the general price level for all consumer items. This tendency is reflected in the projections through 1981. It is projected that both acreage and yield can be increased under current conditions and price prospects, so that production could be about 50 percent higher than in the 1972 base year.

Production possibilities for tomatoes are not as bright as those for cabbage. While tomato prices have remained high and could encourage a production response, production is still plagued with poor management and a lack of suitable varieties and knowledge of cultural practices. Improvements in yields are likely to be slow or nonexistent.

Table 26. Vegetable Crops: Production-Consumption Balances for 1972 and Equilibrium Outlook for 1976 and 1981[a]

Year and vegetable crop	Acres	Yield	Production	Imports (-) or exports (+)	Domestic disappearance	Retail price
	(No.)	(lbs. per acre)	----------	(000 lbs.)	----------	(¢/lb.)
1972 Normal						
Cabbage ...	180	5,000	900	0	900	37.0
Tomato	690	4,200	2,900	-1,800	4,700	52.0
Onion	5	7,000	35	-4,915	4,950	30.0
Other	5,125	8,000	41,000	-100	41,100	32.5
Total ...	6,000	7,472	44,835	-6,815	51,650	34.2
1976 Outlook						
Cabbage ...	200	5,200	1,040	+40	1,000	43.0
Tomato	750	4,250	3,190	-2,010	5,200	55.0
Onion	5	7,000	35	-5,565	5,000	40.0
Other	5,550	8,100	44,950	-150	45,100	35.0
Total ...	6,505	7,565	49,215	-7,725	56,940	36.7
1981 Outlook						
Cabbage ...	240	5,400	1,300	+100	1,200	42.0
Tomato	850	4,300	3,660	-2,140	5,800	60.0
Onion	5	7,000	35	-6,165	6,200	40.0
Other	5,975	8,200	49,000	-200	49,200	41.8
Total ...	7,070	7,637	53,995	-8,405	62,400	43.5

a/ Fresh basis and farm weight equivalent.

The Ministry effort to produce tomatoes at Blackbush Polder for the processing plant now being developed there will add something to production. There too, however, problems of appropriate varieties and cultural practices have to be settled. The project is still in a pilot stage.

The outlook projections assume that imports of tomato paste will continue to account for a considerable share of consumption, notwithstanding the modest campaign to produce tomatoes for processing. If imports of tomato products were held to the 1972 level and if none were produced domestically, the price of tomato products would increase only about 15 percent.

No appreciable increase in onion production has been projected. While Guyana has areas in which onions can be grown (principally in the interior) and varieties that are not photosensitive to bulbing, the crop is virtually unknown to farmers and the lead time to 1981 is not sufficient to work out the many problems of adaptability and cultural practices for a new crop.

As with tomato products, it is assumed that onion imports will continue to account for a considerable share of domestic consumption. This assumption may be tenuous in view of the import licensing controls established in early 1974. If onion imports in 1981 were held to the 1972 level, their price would probably exceed the outlook level by some 50 percent. This is because only modest production gains could be expected, even if the Ministry were to engage directly in production, as is already being done for potatoes.

Guyana produces a wide variety of other vegetables. Among the more significant ones are boulanger, pumpkin, bora beans, pakchoy, and calaloo. Data on individual crops were not available, but in total it is estimated that some 41 million pounds were produced in 1972 (table 26).

Many of the growers of vegetable crops use some fertilizer --especially people with small home gardens. Thus the yields are judged to be moderately good and have been assumed at about 8,000 pounds per acre. This suggests that the total national area in vegetables could be in excess of 5,100 acres.

There is some evidence that the area and yields of vegetables have been improving over the years. Vegetable prices have risen at about the same rate as the general food price index, suggesting that production has kept pace with the basic demand. The production of these commodities has probably responded more to the national campaign for self-sufficiency than most other categories of foodcrops. The response has not been in any large-scale production effort, but mainly through numerous household gardens, school gardens, and the efforts of many institutions that are organizing their employees for the national effort.

Citrus Fruits

The main existing constraint to virtual self-sufficiency in fruit production is the lack of processing facilities -- mainly for citrus juices. The outlook projections assume that this constraint will be remedied in part before 1981, and that local output will displace imports of canned citrus

juices which in 1972 were equivalent to about 2.8 million oranges. By 1976, it is assumed that Guyana will be producing about half its citrus juice needs, and that this will have a strengthening effect on citrus prices for fresh fruit (table 27).

Oranges represent the bulk of citrus production. They are grown widely throughout the country, with concentrations in the Northwest and the Pomeroon. Much of the planting stock is produced at the Ministry's Central Horticultural Station and at various regional nurseries; plant distributions in the last decade have been in excess of normal replacement needs (see table 55 in chapter VI), but high mortality rates and disaster losses to major flooding in the Pomeroon have diminished the increase in acreage which might otherwise have been realized. The proportion of nonbearing trees in the country as a whole may be above average at present, but the evidence is scarcely conclusive (see appendix E). In any event, a continuing upward trend in acreage is assumed. There seems little reason to expect substantial changes in cultural practices or in the proportion of nonbearing trees which might lead to changes in per-acre yields.

Pineapple

Until recently, pineapple production was relatively concentrated in the coastal portions of East and West Demerara. New settlers in projects along the Soesdyke/Linden Highway, mainly on the white sands, have found pineapple to be one of the more promising crops, especially in view of the possibility of fertilizing with poultry litter

Table 27. Fruit Crops: Production-Consumption Balances for 1972 and Equilibrium Outlook for 1976 and 1981a/

Year and fruit crop	Acres	Yield	Production	Imports (-) or exports (+)	Domestic disappearance	Retail price
	(No.)	(lbs. per acre)	----------	(000 lbs.)	----------	(¢/lb.)
1972 Normal						
Citrus	3,550	5,000	17,750	-2,750	20,500	19.5
Banana	3,270	3,000	9,800	0	9,800	13.5
Pineapple .	510	5,000	2,550	+50	2,500	18.6
Other fresh	1,800	4,000	7,200	0	7,200	17.1
Total ...	9,130	4,085	37,300	-2,700	40,000	17.4
1976 Outlook						
Citrus	3,950	5,000	19,750	-1,500	21,250	21.5
Banana	3,400	3,000	10,250	0	10,250	16.0
Pineapple .	755	4,900	3,700	+500	3,200	16.0
Other fresh	1,900	4,000	7,600	0	7,600	18.8
Total ...	10,005	4,130	41,300	-1,000	42,300	19.5
1981 Outlook						
Citrus	4,450	5,000	22,500	0	22,500	23.5
Banana	3,660	3,000	11,000	0	11,000	19.5
Pineapple .	1,000	4,800	4,800	+1,500	3,300	18.0
Other	2,075	4,000	8,300	0	8,300	21.0
Total ...	11,185	4,166	46,600	+1,500	45,100	21.7

a/ Fresh basis and farm weight equivalent.

from their own flocks or from nearby specialized poultry units. Hence, the locus of pineapple production has been shifting within Demerara County, and there has also been a net upward trend in total acreage and output.

A special survey in April 1974 showed that in the previous year there had been about 450 acres of pineapple in the Soesdyke/Linden area, about two-thirds of which was in new plantings. The total yield from the 151 acres harvested was only about 1[illegible]0,000 fruit, representing a yield of about 2,500 to 3,000 pounds per acre. This yield is much lower than the 5,000 pounds or so that most farmers and the Ministry staff expect. However, it should be noted that while all of the harvested 151 acres bore some fruit by December 1973, many plants were too young to bear fruit in September and October -- the peak harvest months (table 28).

Planted acreage had increased to 524 acres by the time of the special survey in April 1974, and growers expected that 233 of these acres would bear fruit before the end of the year. From this acreage they expected an average yield of about 5,500 pounds -- perhaps an optimistic figure. Ministry estimates suggest a 7,200-pound average for the 1972 national crop; in earlier years, estimated yields for some of the established districts were as high as 10,000 pounds per acre. Such yields, however, will not be easy to attain on the white sands.

Considering these circumstances, pineapple acreage and yield trends will depend to a major degree on the rate of new settlement and acreage expansion on lands along the Soesdyke/Linden Highway, a matter subject to public policy decisions. If expansion continues, strong reactions will

soon be felt in prices on domestic markets. The outlook projections assume, perhaps optimistically, that export markets can be found for about 500,000 pounds of pineapple by 1976 and for the equivalent of about 1.5 million pounds (fresh basis) by 1981. This would leave considerable downward pressure on domestic prices in both 1976 and 1981. In the latter year, they have been adjusted downward about 10 percent below the trend level.

Table 28. Pineapple: Summary of Soesdyke/Linden Special Acreage and Yield Survey, Soesdyke/Linden Area

Item	1973	1974
	Acres	
Total area planted to pineapple.....	454	524[a]
Area nonbearing.....	303	291[a]
Area harvested.....	151	233[a]
	Number of fruit	
Total production of pineapple..	120,000	419,000[b]
Yield per acre harvested...	795	1,810
Yield per acre planted.....	264	900

a/ Acreage as of April 15, 1974.
b/ Expected harvest.

Adjustments in pineapple production can occur in a shorter period of time than in citrus, since it takes only 12 to 18 months for new pineapple plantings to come to full bearing age, rather than the 4 to 5 years required for

citrus. Even so, misjudgments of market potentials can lead to severe on-farm losses and reductions in farm income expectations. The expected near-term price declines will have an unsettling effect for the relatively specialized growers already hampered by soil fertility problems on the white sands, and with few promising production alternatives.

Thus, the pineapple outlook has important implications for future development policy concerning the Soesdyke/Linden area. Appropriately, officials are already assisting growers to diversify with other crops and also with poultry -- the latter partly because of the utility of poultry litter in maintaining soil fertility. However, a low-cost source of feed grains is needed if the poultry enterprise is to be successful (see chapter VII). Clearly, emphasis on expanding production of other fruits must be cautious, in the absence of demonstrated market potentials at home or abroad.

Bananas

The 1972 normalized output of bananas is placed at 9.8 million pounds. Actual production and yields in that year were probably below normal, partly because of losses in the Pomeroon, an important production source. Bananas suffer from some of the same problems as plantains, including Moko disease, and there seems little reason to expect rapid changes in normal yields. Modest acreage increases are projected, but the extent will depend, in part, on the interrelationships of bananas with other crops in mixed plantings, such as those found in the Pomeroon (see appendixes D and E).

Other Fruits

Many different species of other fruits are produced throughout the country, most of which are perennials grown in mixed plantings, largely for nearby consumption. The normalized 1972 output is placed at 7.2 million pounds, but estimates of actual acreages, yields, and prospects are largely conjectural.

Pulses and Nuts

Prices of Guyanese-produced pulses and nuts have increased more than most other food prices in recent years. The increases were especially sharp in 1972 and 1973, which suggests a supply lag. It is believed that most of this lag resulted from partial restrictions on imports rather than from a lack of response by producers.

The Government is making a substantial effort to promote the production of peanuts and red kidney beans particularly in the interior areas. At the same time, the Guyanese Marketing Corporation (GMC) has raised its minimum price; in total, some acreage response should be generated.

Black-eyed peas are grown throughout most of the coastal area, with a few scattered acreages throughout the interior. They are a widely adaptable crop and will perform moderately well under most conditions; they are also especially tolerant to aluminum toxicity, a major problem in many parts of Guyana. The single largest concentration of the crop was grown on the Government farm at Kibilibiri, where the 1973 yield was only 500 pounds per acre.

Peanut production tended to be scattered throughout several of the interior development areas such as Kato, Paruima and the Northwest. This is part of the Interior Department's effort to introduce peanuts as a cash crop with good market potential at home and abroad. The largest single acreage, however, was at Kibilibiri, where 92 acres were harvested in 1973 with an average yield of 460 pounds per acre.

The Ministry plans for a production of about 150,000 pounds of peanuts on 250 acres at three major locations: 100 acres at Kibilibiri, 25 acres at Kato, and 125 acres at Wauna through an incentive scheme which provides farmers with credit for the purchase of seed and fertilizer. This would be in addition to minor production in other areas.

The production of pulses other than peanuts and black-eyed peas is estimated to be about 500,000 pounds. The largest component of this is pigeon peas, which are grown widely throughout Guyana in home gardens. There are very few significant concentrations of this crop. Red kidney beans are another component which the Government has promoted as having a good potential. It is estimated that in 1972 there were about 35 acres of red kidney beans grown at interior points, with a total production of about 20,000 pounds.

There are no data on yields of pigeon peas. The judgment of some specialists suggests that the crop could yield about 600 pounds to the acre under average home garden conditions. If this yield is assumed for the "other" group, it suggests an aggregate area equivalent to about 830 acres.

The situation for all pulses and nuts as a group is characterized by the recent and prospective entry of new growers. Under such conditions, one would not expect increased national average yields in the short term; constant yields at 1972 levels are therefore assumed throughout the projection (table 29).

The 1976 and 1981 outlook for the group is that the deficit will continue to grow. In 1981, total import needs will increase about 13 percent over 1972 as prices continue to climb along the current trend.

Basically these projections assume that imports of split peas and peanuts will continue as needed. Otherwise, higher prices would result, the degree of increase depending on the extent to which imports are restricted. For example, if split pea imports in 1976 were held at the 1972 level, the price would be about 7 percent higher than the current trend suggests. This would tend to force a limited substitution of meats and other pulses.

The outlook indicates that with current consumption patterns there could be modest exports of black-eyed peas. If such exports take place, prices would be maintained at current trends; if not, prices would be inclined to weaken modestly, with some increase in consumption and some minor impact on production.

Peanuts are likely to continue in a very slowly growing deficit position through 1981, despite scattered efforts to increase production in the hinterland. Undoubtedly this situation could change rapidly if the Kibilibiri farm can gear itself to produce some 1,000 to 1,500 acres of peanuts

Table 29. Pulses and Nuts: Production-Consumption Balances for 1972 and Equilibrium Outlook for 1976 and 1981a/

Year and pulses or nuts	Acres	Yield	Production	Imports (-) or exports (+)	Domestic disap-pearance	Retail price
	(No.)	(lbs. per acre)	----------	(000 lbs.)	----------	(¢/lb.)
1972 Normal						
Black-eyed peas	2,100	650	1,350	0	1,350	62.5
Peanuts	270	600	160	-725	885	50.0
Split peas .	0	0	0	-9,100	9,100	30.0
Other	830	600	501	0	501	36.4
Total	3,200	628	2,011	-9,825	11,836	35.0
1976 Outlook						
Black-eyed peas	2,300	650	1,500	+100	1,400	68.5
Peanuts	300	600	180	-730	910	55.0
Split peas .	0	0	0	-9,700	9,700	32.5
Other	900	600	540	0	540	38.5
Total	3,500	634	2,220	-10,330	12,550	37.7
1981 Outlook						
Black-eyed peas	2,600	650	1,700	+250	1,450	85.0
Peanuts	400	600	240	-760	1,000	65.0
Split peas .	0	0	0	-10,600	10,600	35.0
Other	1,000	600	600	0	600	44.0
Total	4,000	635	2,540	-11,110	13,650	41.6

a/ Farm weight equivalent.

annually. This has not been built into the projections; if it were achieved, Guyana would reach full self-sufficiency in terms of currently expected domestic disappearance levels. Also, the projections do not include the possibility that consumption could be increased moderately if more peanuts were to be used for processing into peanut butter and oil.

Competing Crops

The primary crops competing to some degree for land and labor with foodcrops are corn, rice, and sugar. The acreage of corn is comparatively small and localized in East Berbice, the Pomeroon, the Northwest and elsewhere. In the aggregate, any expansion of corn acreage is unlikely to have much of an aggregate impact on foodcrops. However, the potential impacts of sugar and rice are much greater -- not so much because they are close alternatives on most foodcrop farms, but because aggregate plantings of these crops are several times as large as the total foodcrop acreage.

A significant competing aspect is the encroachment of rice and cane in certain foodcrop areas. Some crude estimates suggest that they may have displaced as much as 20 percent of the foodcrop area (excluding oil crops) in the last 5 to 10 years. Two major factors appear to be responsible for this: (1) increasingly high risks, including larceny, appear to be reducing the comparative advantage of foodcrop production, and (2) the comparative advantage for rice and cane rises where water control is improved.

Corn

Although corn occasionally competes with foodcrops for land and labor, it is also sometimes integrated in the crop sequence on foodcrop farms. In most localities, planting, yields, and production have shown little change for some time.

A major source of increased corn production is the State farm at Kibilibiri, where some 570 acres planted in 1972 produced nearly 800,000 pounds (table 30). This competes with other foodcrops only in the sense that soybeans and pulses are also being grown at that location.

Table 30. Corn: 1972 Production Base

	Acres (number)	Yield (lbs./acre)	Production (000 lbs.)
Kibilibiri.....	570	1,430	793
Northwest[b/].....	980	1,800	1,770
Other areas[b/].....	1,200	1,700	2,040
Total.....	2,750	1,675	4,603

a/ Includes Matthew's Ridge area: estimate assumes that production is equal to twice the 1972 marketings of 885,000 pounds.
b/ Based on subjective estimates provided by field assistants.

Recently, two major efforts have been initiated by the Ministry to boost corn production in other localities. The first of these is an increase in the support price of corn

from the previous level of about 8.5 cents to 14 cents. This increase is likely to generate some reallocation of resources on foodcrop farms. However, it is more likely to cause an expansion into new lands, as corn has traditionally been the first crop grown on newly cleared bush land. The major constraint to such an expansion into new lands will be the local availability of labor and the extent to which the added returns from corn can compete against the desire for leisure time.

The second major corn expansion effort is currently taking place in a sizable area along the Berbice River, from a point about 25 miles upriver from Ebini. The Ministry has assigned a special full-time field officer to the area to organize farmers in helping each other to clear land. Each farmer is given a loan of $50 per acre cleared and planted to corn. This loan is to be repaid at harvest time.

At the end of April 1974, a substantial new area had been cleared, and a maximum of 400 acres were expected to come under the program. However, it is not clear whether all of this will be additional area as the acreage history of corn on these farms is unknown. Considering the possibility of a labor constraint, it is quite possible that the net gain would be only about 250 to 300 acres.

In sum, the foreseeable increases in corn production from all areas are small relative to the present level of imports, and the prospective competition with foodcrops is restricted.

Rice

There is some indication that rice acreage will tend to stabilize throughout the current decade at about 220,000 to 230,000 acres. This does not deny the possibility of substantial year-to-year variation as growing conditions fluctuate.

At present, about 100,000 to 150,000 acres of rice land are under fair to good water control. This land is likely to stay in rice since it appears to have a comparative economic advantage when all factors including costs, risks, productivity, and price policies are considered. Much of the coastal land that is likely to gain improved water control in the next few years is also likely to go into rice (or farmers' cane) as these improvements take place.

There is no estimate available concerning the amount of foodcrop land that has gone to rice in recent years. Observations in areas like the Canals Polder suggest that this may be substantial. On a national basis it could be at least as much as has shifted into farmers' cane -- possibly 10 percent of the national foodcrop area (excluding oil crops). The percentage would be much higher if foodcrop areas like the Pomeroon and Northwest are excluded from the foodcrop base.

On the other hand, estimates of land planted to fall rice (known as the "big" crop, inasmuch as a portion of the same acreage is harvested again for the spring crop) show a decline from 294,000 acres in the peak year of 1964 to 173,000 acres in 1971. Over this period, the data indicate

that 120,000 acres of land were withdrawn from rice cultivation, and plantings in 1972 appear to have been even smaller because of unfavorable weather conditions. The harvested acreage for the fall crop of 1973 was larger than in 1972 but smaller than in 1973. Such evidence as is available points to the conclusion that rice plantings had expanded by 1964 on land with serious limitations as to water control and perhaps salinity; thereafter, such lands were gradually allowed to revert to idleness or grazing uses.

If prices of rice rise to relatively high levels, some growers may again be tempted to expand on marginal lands such as those which were planted at the 1964-66 peak. This is unlikely to present any substantial competition for the bulk of the lands now occupied by foodcrops.

Sugarcane

Sugar estates in Guyana control nearly 200,000 acres, including about 78,000 acres of freehold land. Of this area, approximately 122,000 acres are cane land, including drains and canals; about 14,000 acres are leased out to cooperatives and other parties. In addition, there are about 10,000 acres in farmers' cane.

Expansion of sugar production to fully utilize factory capacity and to take advantage of current sugar prices is an objective of Bookers, Demerara Company and the Government. Furthermore, it is Government policy that unutilized estate lands be converted to residential or other productive use. Consequently, every estate is reducing its amount of land in housing, rice, grazing, and uncultivated lands, either by

planting cane or by exchanging with the Government for rights elsewhere in the coastal region. Bookers recently exchanged 7,600 acres of land for 8,800 acres of land to be planted to cane near Skeldon.

It is likely that by 1976 sugar estates will contain few acres that cannot be used for cane cultivation. With minor exceptions, no other crops will be grown and, in fact, crops such as limes and cocoa once grown on Bookers' lands have been ploughed up for cane. Examination of sugar estate expansion plans shows that industry output should reach approximately 400,000 tons by 1976, followed by a second stage of expansion which would bring capacity to 500,000 tons (see appendix G). The additional 100,000 tons of sugar production would correspond to approximately 30,000 acres of cane, so the present output target would require lands beyond those now under estate control. It would also presumably require irrigation water beyond that now available in most areas, although water deficits might not preclude expansion in farmers' cane -- at moderate yield levels which already prevail on the 90 percent of farmers' cane which is unirrigated. There is, of course, a trade-off between land and water inputs for achieving a 500,000-ton sugar output.

IV. THE FOODCROP PRODUCTION SUBSECTOR

The position of foodcrops in Guyana's total land use pattern is anomalous. On the one hand, they represent a relatively intensive use for lands which can scarcely be rated high in terms of inherent fertility or general productivity. On the other hand, they occupy a mere 0.1 percent of the surface of a country with extensive reserves of uncultivated lands classified in Land Use Capability Classes I or II.

In the aggregate, no more than 50,000 to 60,000 acres of land are occupied by foodcrops, whereas twice as much land is in sugarcane and 4 or 5 times as much land is commonly planted to the main rice crop. Yet the estimated gross farm value of foodcrop production in both 1972 and 1973 was larger than for rice, whereas outlays for purchased inputs were probably lower.

These facts reflect at least three important underlying phenomena:

- The demand for rice (and for sugar), taking account of external markets, is much more elastic than the domestic demand for most foodcrops.

. Foodcrops can be grown with reasonable success on land which is not well suited for rice or sugar.

. Much of the land classified in Capability Classes I and II is not immediately accessible or attractive, for one reason or another, for production of foodcrops.

As is the case for sugarcane and rice, an overwhelming proportion of Guyana's foodcrop production takes place on the coastal plain, within no more than 5 to 15 miles of the sea, and in even narrower bands along the lower margins of the major rivers. Effective use of these lands is almost wholly dependent on the existence and functioning of structures for drainage and protection from inundation by the sea. Lands with the most effective application of measures for water control are mostly used for sugarcane production or for double-cropping with rice. Other lands where clay soils predominate tend to be used mainly for single-crop rice, while coconuts predominate on the sand ridges close to the sea. Foodcrop production is found on various soil types at locations scattered throughout the coastal and riverine areas, but often under conditions of less than effective water control.

Although the earliest settlers in Guyana chose locations toward the upper reaches of tidal flows on the major rivers, their successors were soon induced by the greater fertility of the coastal clay soils to expend much effort in constructing seawalls, dikes, and drainage systems. The low cost of slave labor made possible these investments in structures; maintaining and extending them today involves much higher costs.

The Production Subsystem

The production process is sometimes viewed as merely a matter of combining land, labor, and capital to achieve some output of a specified product, within a given institutional context. A somewhat more comprehensive model of the interacting elements (resources, activities, Government programs, goals) involved in the Guyana foodcrop production subsector was suggested earlier in the discussion of prospective farm output (see figure 6). For planning purposes in Guyana, it would obviously be difficult to define all the equations and quantify all the parameters necessary to make this a working formal model; nonetheless, policy decisions can benefit even from a conceptual model. Such a model can call to mind some of the major interactions which must be considered and evaluated as goals, programs, and activities change over time. In addition, various elements of the model can be at least partially quantified from the available data.

Planning with respect to the production subsector must be concerned with decisions made at two distinct levels. Decisions about public development efforts, regulatory matters, and incentive programs and similar activities are, of course, made in the offices of the various responsible agencies. Such decisions can have major impacts on performance of the production subsector, but only to the extent that they influence decisions to be made at the second level -- that of the individual farm operating unit. Thus after a general review of Guyana's agricultural land, water and labor resources, attention will turn to the strategic role of the farm decision-making units of Guyana's foodcrop sector.

Land and Water Resources

Guyana has a total land area of some 50 million acres, of which fewer than 1 percent are under cultivation. Nearly all of the 400,000 or more acres of cultivated land, together with a roughly equal acreage of pasture, are in the coastal plain (and the associated riverine margins). This is basically a swampy strip of marine alluvium, much of which is 5 feet or more below sea level at high tide. It is usable for habitation and agriculture only because it is protected by sea walls and other barriers, and drained through ditches and sluice gates which are opened as each tide recedes.

Behind the 5 million or so acres of coastal plain, the terrain extends far toward the interior with only a gradual rise above sea level. West of the Essequibo River, much of this intermediate zone is in low-lying tropical forest, which gives way to scrub growth on the white sands along both sides of the Demerara River. Not far inland, between the Demerara and the Corentyne Rivers, is an extensive area characterized as "Intermediate Savannah," where brown sands predominate.

The Rupununi Savannahs represent a much more extensive area occupying the south-central portion of Guyana. To the west and northwest of these savannahs are the highlands of Guyana, including various groups of mountains in the Mazaruni-Potaro District, near the Venezuelan border, as well as the Pakaraima and Kanaku Mountains which adjoin the border with Brazil.

For the most part, those soils of Guyana which do not consist of river-laid and marine alluvium are in advanced stages of weathering, are of relatively high acidity, and are of extremely low fertility. They have been likened to a huge filter pad which permits gradual percolation of the heavy rainfall, with the result that most soluble constituents have been carried away via the underground water system. The remaining soil is thus an accumulation of the minerals most resistant to decomposition and solution. Although lacking in fertility, they often have good physical condition and can be made productive with heavy applications of fertilizers, supported by adequate liming.

At first glance, it would seem that water supply would scarcely be a major problem in a country known for its important rivers and its humid climate, with rainfall approaching or exceeding 80 to 100 inches annually in much of the present and potential agricultural area. The rainfall pattern, to be sure, is rather variable from season to season and from year to year (table 31), with the result that irrigation is a major input for the production of sugarcane, as well as for rice and occasionally for other crops. Several rather large water conservancies near the coast are used to provide this irrigation water; in general, however, there are relatively few sites for economical surface storage of water. Moreover, the construction of river diversion structures is rendered difficult by massive flooding and by the physical characteristics of the major river channels and ocean tides, the latter sometimes running as high as 20 feet. Hence, the principal potential sources of additional irrigation water are the numerous waterways and some high-yielding aquifers for groundwater development. At many locations in the Rupununi and other portions of the interior, groundwater is found relatively close to the surface.

Table 31. Variations in Monthly Rainfall and Rainy Days At Georgetown, 1880-1959

Month	Rainfall (inches)			Rainy days		
	Mean	High	Low	Mean	High	Low
January	8.88	32.72	0.9	21	29	11
February	5.50	20.72	0.45	16	26	3
March	5.60	17.67	0.17	16	29	1
April	6.51	21.29	0.48	16	27	3
May	11.57	23.38	1.20	23	31	8
June	12.66	24.38	5.14	25	30	16
July	10.57	21.22	2.81	23	31	1
August	6.81	25.74	0.68	17	27	8
September	3.19	13.60	0.10	9	21	1
October	3.05	9.20	0.02	9	25	1
November	5.76	20.74	0.12	13	26	1
December	11.98	40.24	1.35	22	29	7

Source: Department of Agriculture, Agricultural Statistics of British Guiana, 1850-1956 (Georgetown: Government Printery, December 1961), p. 215.

Soil Surveys

Extensive soil survey work in Guyana has been completed under a U.N. Special Fund Project which was approved in 1960. Most of the country had been covered at the reconnaissance level by 1964, when general soil maps and land-use capability maps were published. By 1965, about 1.5 million acres of the Northeastern Coastal Plain (east of the Essequibo River) had been surveyed at the semidetailed level, and other semidetailed survey results are available for some additional portions of the country.

The results of the reconnaissance surveys and the land-use capability classification show vast areas of Class I and II lands, apart from those already in agricultural use, distributed over much of the northeastern and some of the northwestern portions of the country. On the other hand, the largest pocket of such land in all the southern and southwestern half of the country consists of fewer than 50,000 acres in the vicinity of the Moco Moco Valley, near Lethem. These findings, of course, inevitably represent a vast oversimplification of soil potentials for agricultural use. Local variability, which obviously cannot be delineated in surveying at the reconnaissance level, is surely considerable. Inasmuch as a tenfold increase in the total acreage devoted to foodcrops would call for the utilization of only 1 percent of Guyana's total land area, it is clear that any near-term constraints to foodcrop acreage expansion are unlikely to be evidenced by the existing soils and land-use capability maps. On the other hand, these do provide a basis for general characterization of major geographic areas.

The Rupununi

The Rupununi Savannahs are distinctive in that they have only one rainy season and one dry season; that large areas of level land with some year-round streams and supplies of ground water for irrigation development are available (especially in the central and south portions); and that there are steady winds which might power windmills for pumping and limited electrical output.

The region as a whole is sparsely settled, but there are a number of ranches and some 25 scattered Amerindian villages. Trails and roads (often unpassable during the rainy season) connect these villages to Lethem, the focal point for trade and administration.

The land is now mainly used for grazing, but the Amerindians grow cassava, other starchy roots, and such fruits as bananas, citrus, mangoes and guavas. These complement a diet which depends upon game and fish as important sources of protein. The Amerindians grow their rootcrops in the foothills, where soils and moisture conditions are reasonably favorable, where losses to flooding are low, and where game is near at hand. Most of the ranchers produce their own supplies of starchy foods and fruits, but rely on purchases of wheat flour, rice, and edible oils.

Extensive areas of well-drained, porous, deep, red-yellow latosols comprise some of the more promising soils with potential for cropping, although they are now used mainly for grazing. Other soils covering large areas include ground-water laterites; rocky, shallow lithosols; and very poorly drained low humic gleys. Although the lands suited for foodcrop production comprise only a small fraction of

the total land area, a sizable acreage might be considered for some form of development under irrigation for crops whose moisture requirements are modest. Large expenses for clearing and other improvements on farms or for local roads would be unnecessary; the main capital costs would be for installing pumps, wells, and complementary irrigation facilities. On this basis, small-scale tests of pumped water for foodcrop production could be made without waiting for the development of major projects; the pumps and wells would probably prove useful for the livestock enterprise even if foodcrop production were later abandoned. However, the environment seems to offer favorable conditions for seed crops, dried fruit production, and also for growing grapes for winemaking.

Intermediate Savannahs and White Sands

Brown sands, consisting mainly of deep, well-drained, red-yellow latosols with clay in the subsoil, and drouthy regosols which lack the clay component predominate in the Intermediate Savannahs. An area in the Ituni/Kwakwani/Tiger Hill triangle, where soils are of the Kasarama and Ebini series, was described by a visiting consultant from the University of Florida as follows:[1/]

> The Kasarama series has a brownish, loamy-sand surface grading into a sandy clay loam within 24 inches. The Ebini series is similar except that a sandy clay layer appears within 24 inches.

1/ John H. Herbert, Jr., "Report of Investigations Concerning Agricultural Schemes in Guyana," Task Order No. 2 Report, Submitted to the Ministry of National Development and Agriculture by the University of Florida, April 1969, p.3.

> Native vegetation in the savannas is primarily grass and an occasional wild cashew. These well-drained sands probably have a higher potential than the white sands for citrus, forest species, tropical fruits, pastures, and clean tilled crops.
>
> Land management practices that should be considered are protection from wildfire, contour farming, liming, fertilizing, wind strip cropping, crop rotations, cover crops, pasture management and pest control.
>
> Crops growing on an experimental basis included: corn, peanuts, sorghum (which had ratooned itself), egg plant, kenaf, papaya, citrus, sweet potatoes, seta velva (a pasture grass), black-eyed peas, okra, eddo, karilla, cassava and tomatoes. All seemed in surprisingly good condition, considering a totally inadequate fertilizer program, no irrigation, no pest control and cultivation generally disregarding slopes. One area planted on the contour showed the practice can conserve soil and water resources.

The brown sands border vast areas of the white sands (regosols, white quartz phase), which cluster around the Linden area and occupy some 4 million acres extending from the Corentyne River, Guyana's eastern boundary, to west of the Essequibo River. The white sands are thus intermingled with the Intermediate Savannahs, although they extend far beyond the margin of the savannahs as ordinarily defined. Some observers have found them too low in fertility and water- and nutrient-holding capacity for economic use as agricultural land.[1/] Nevertheless, recent settlement efforts in the Soesdyke/ Linden corridor demonstrate that such lands can produce pineapple and other crops, in conjunction with

1/ Milo L. Cox and Richard Newberg, "Evaluation Report: Guyana Agricultural Sector," 1969. Draft available in the Memory Bank of USAID, Guyana.

poultry enterprises which contribute low-cost plant nutrients, on a basis which perhaps can become economical.

A description of the Soesdyke/Linden area white sands, mainly of the Tiwiwid series, was presented by the consultant from the University of Florida as follows:[1/]

> Native vegetation consists of mixed soft and hardwood forest species; shrubs, locally referred to as dakama, murri bush and wild cashew; and some native grasses. There is extensive evidence of fire damage.
>
> These deep, excessively-drained sands potentially may support such perennials as citrus, forest species, tropical fruits and pastures. They could also be used in schemes devoted to clean-tilled crops such as peanuts, melons, tobacco, cucumbers, tomatoes, bell peppers and likely a host of others. However, because the potential for returns to production inputs may be lower on the white sands than on brown sands or silt loams, all schemes must be thoroughly evaluated economically before large-scale development can be recommended. The work underway at Long Creek should prove helpful in an economic analysis regarding the white sands. Other possibilities in this area could include residential development and poultry operations....
>
> Land management practices to be considered will include a combination of selective clearing, protection from wildfire, cropping systems related to rainfall pattern, aerial seeding of forest species (for example, *Pinus elliottii caribaea*), liming, fertilizing, supplemental irrigation, strip cropping, wind strip cropping, crop rotations, cover crops, pasture management and pest control.

1/ John H. Herbert, Jr., *op. cit.*, pp. 2-3.

Northern Guyana Uplands

Apart from the brown and white sands already mentioned, extensive areas of upland soils have some agricultural potential. These include heavy-textured loamy phases of red-yellow podzolic soils and red latosols such as extend away from the vicinity of the railroad between Matthew's Ridge and Port Kaituma, as well as other soils of generally similar origin. Terrain varies from rolling to steep, and is an important consideration affecting cropping potentials.

The Coastal Plain

Some 2.4 million acres of Class I and II soils -- mostly of marine or fluvio-marine sedimentary origin -- are to be found along the coastal plain. Two million of these acres are located east of the Essequibo River, where some 80 percent of the plain is classified in Capabilities I and II. The remainder of the northeastern portion of the plain includes large areas of deep pegasse and of soft clays containing acid sulphates. Water conservancies, which provide irrigation water to cane and rice lands, occupy important portions of these low swampy lands.

Northwest of the Essequibo River, much of the plain is swamp land with peat or muck soils, locally called "deep pegasse." Cultivation is largely concentrated on limited areas of clay soils along the coast and in the Essequibo Islands.[1/]

1/ J.G. Steele, "Soil Areas Suitable for Development in Northern Guyana," Appendix II to chapter XII of the 1966-72 Guyana Development Program.

Water Control

In the coastal plain, some 600,000 acres (gross) are provided with some drainage, irrigation and/or flood control. Of this acreage, approximately 180,000 acres are under the management of sugar estates (Bookers and Demerara Company), and some 240,000 acres (net) are in the 35 declared drainage and irrigation (D&I) areas developed through the Drainage and Irrigation Board. These figures compare with the total of around 400,000 acres currently under cultivation in the area, plus a roughly similar area in pasture.

Areas outside sugar estates or declared D&I areas are provided with sea or river defense works developed by the Sea Defense Board and/or with small-scale drainage and irrigation works developed by private proprietors or local authorities. For the most part, these locally maintained works are in poor condition; recent infusions of "flood relief" monies into areas outside declared D&I areas may have helped to upgrade their performance. Since little cultivation along the coast would be possible without some water control, all cultivated lands must be assumed to be provided with at least a minimum of such works. In such minimally protected lands, however, adoption of improved technology is unlikely because such technology ordinarily has a low tolerance for unreliable water control.

Attention here must focus on the lands with somewhat effective water controls (excluding sugar estate lands). These are primarily declared D&I areas where responsibility for primary water control works has been shifted from private proprietors and local authorities to the Drainage and Irrigation Board.

Appendix F, table F-1 lists the 35 declared D&I areas (together with the Tapakuma Extension), their gross and net drained and irrigated areas, pump capacities, and cropping patterns. In addition, a brief, qualitative assessment of the adequacy and deficiencies of the D&I system is given. The declared D&I areas listed in this table appear in figures 7-10, which also show sugar estate lands and areas slated for water control improvement by 1976. Sea and river defense works are not shown (nor discussed further except where seriously deficient). Improvements currently underway with international assistance should ensure adequate sea defense. River defenses are not always adequate, however; we are unable to assume, for example, that the Pomeroon will have adequate river defenses by 1976.

The acreages reported in appendix F, table F-1 under headings "main drainage area" and "main irrigation area" can be misleading (overstated) for several reasons:

- A smaller area may have the subsidiary works necessary for effective water control

- Sluices may be blocked

- Irrigation water may be unavailable when most needed

- The system may be so in need of reconditioning that drainage and/or irrigation is ineffective over large areas.

Figure 7. Coastal Plains Portion of Guyana With Indications of Proposed Drainage and Irrigation Areas and Sugar Estate Lands, Charity-Parika

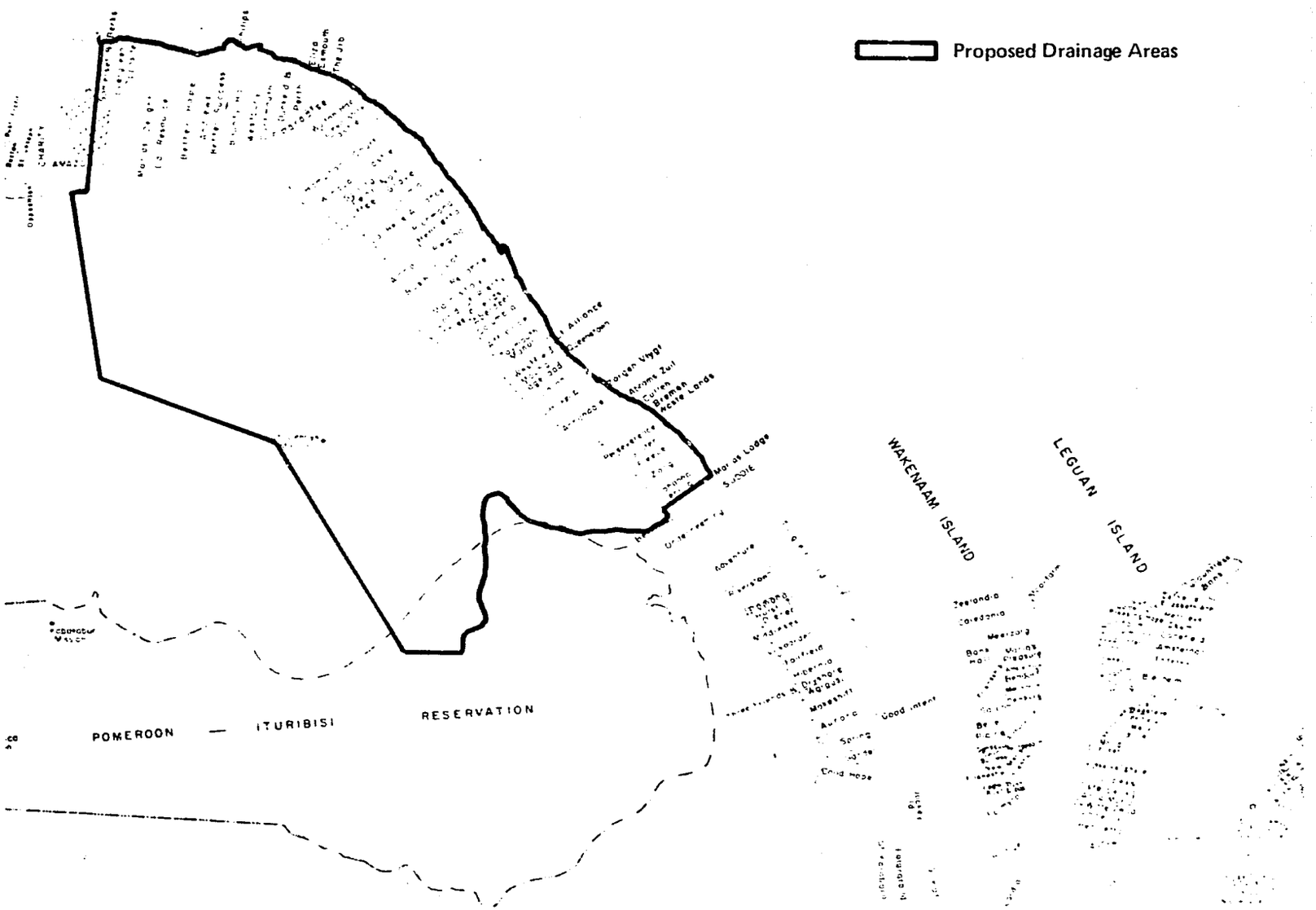


Figure 8. Coastal Plains Portion of Guyana With Indications of Proposed Drainage and Irrigation Areas and Sugar Estate Lands, Parika Georgetown-Dora

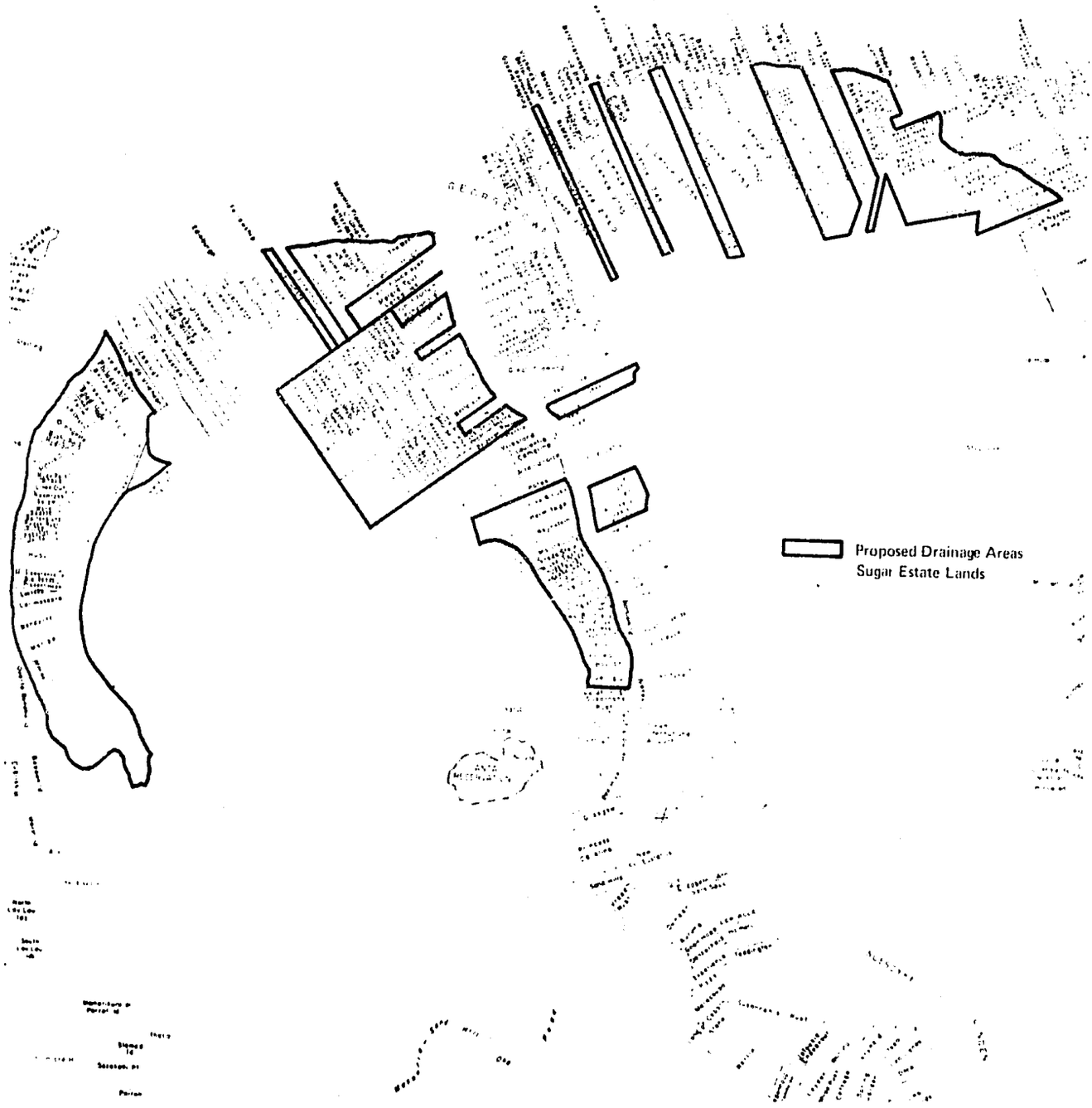


Figure 9. Coastal Plains Portion of Guyana With Indications of Proposed Drainage and Irrigation Areas and Sugar Estate Lands, Mahaica-Abary

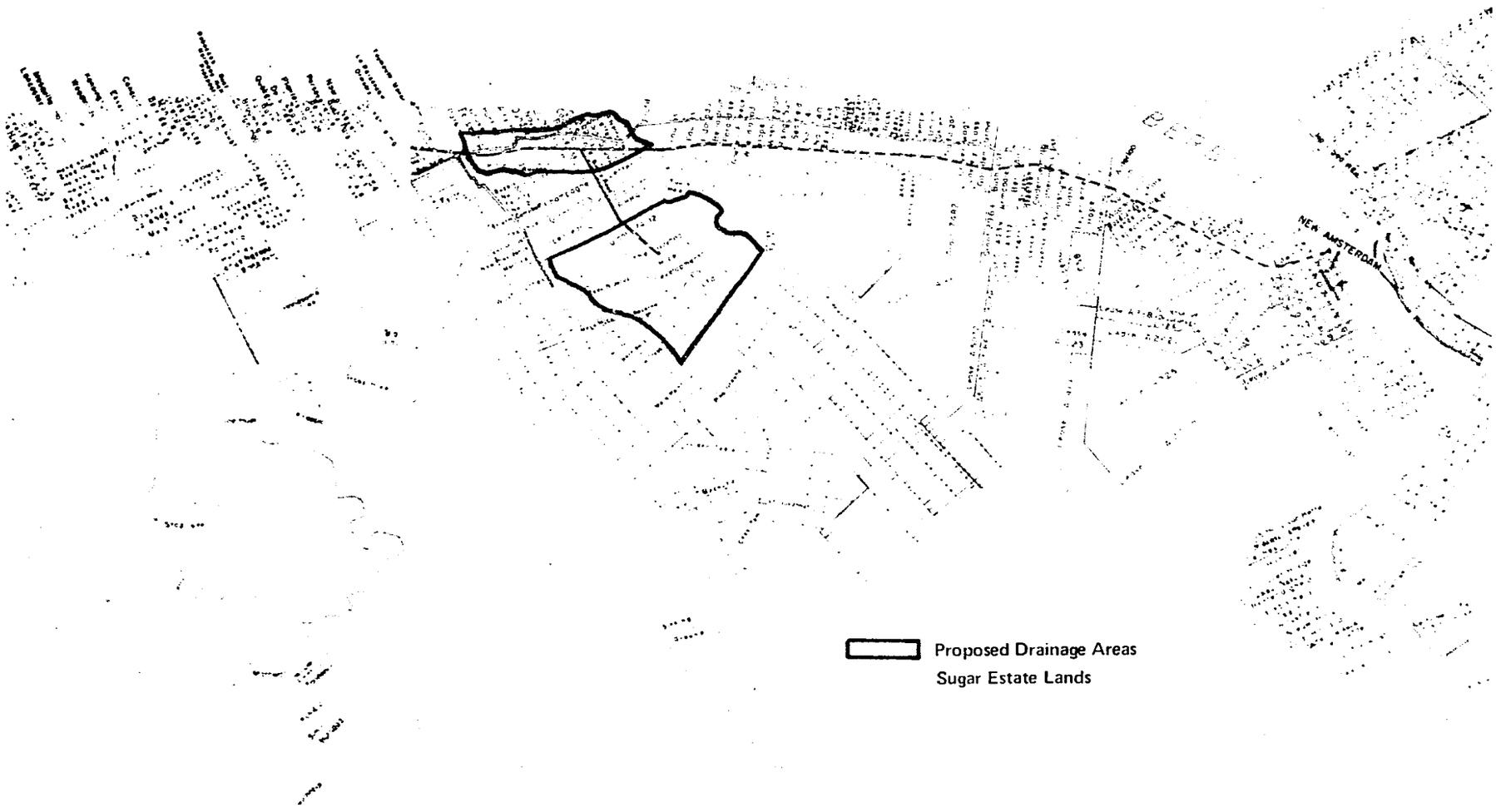
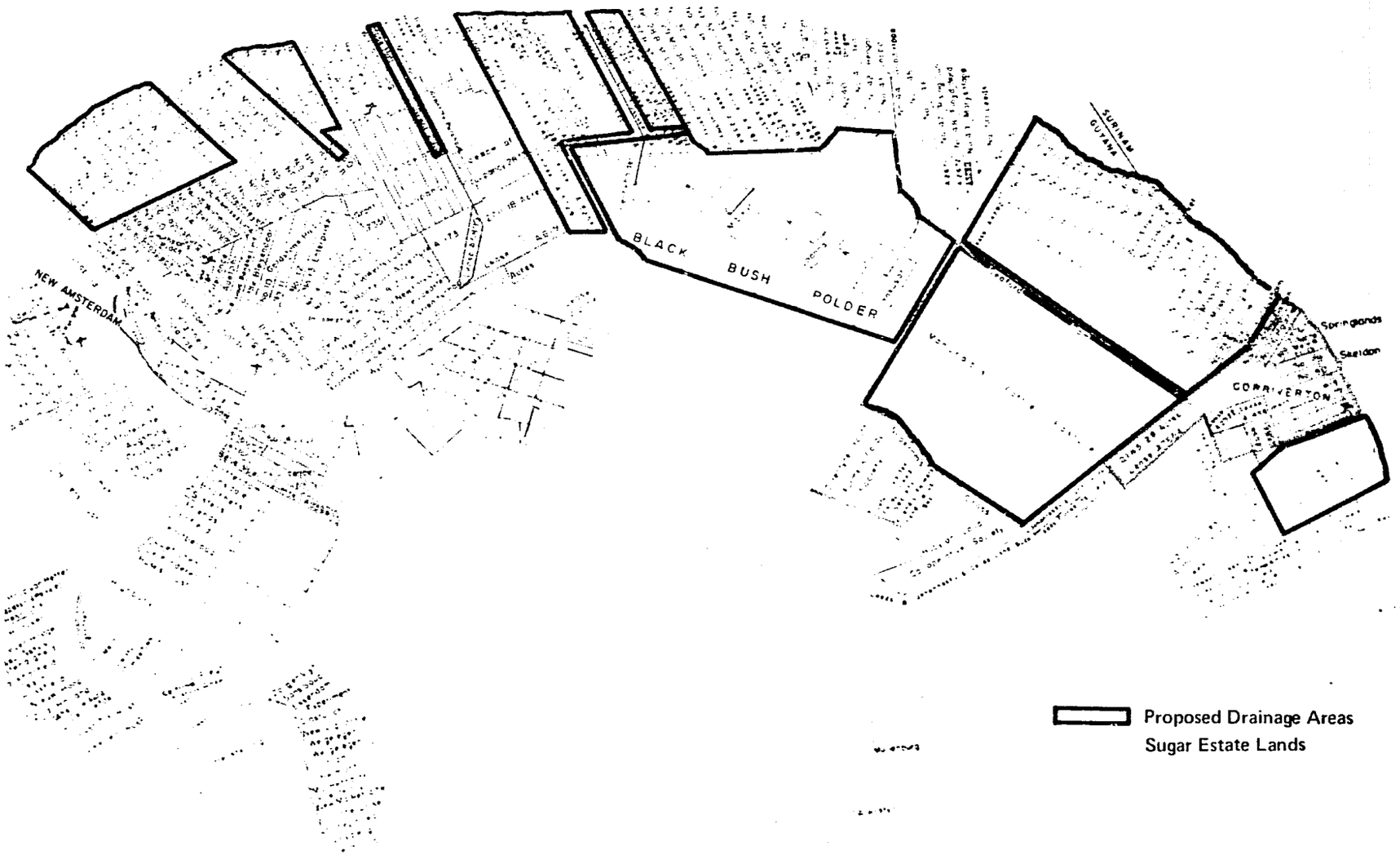


Figure 10. Coastal Plains Portion of Guyana With Indications of Proposed Drainage and Irrigation Areas and Sugar Estate Lands, New Amsterdam-Skeldon



As a consequence, acreages given in parentheses below net D&I acreages are a rough estimate of effectively drained and irrigated lands. Although these estimates are not based on detailed field and map analyses, it is felt they are indicative of the current situation. Thus, an effectively drained area must have:

- Regularly maintained subsidiary drainage works

- Regularly maintained main drains

- Unblocked sluices or drainage pumps capable of removing 1.0 inch or more of water in 24 hours over the drained area.[1/]

An effectively irrigated area must have:

- Regularly maintained subsidiary irrigation works

- Regularly maintained main high-level canals

- Non-saline water supply (and pumps if necessary) of sufficient capacity to supply irrigation water requirements of 2 acre-feet per year for non-rice crops and 4 acre-feet per year for rice, assuming the 80 percent dry-year hydrologic situation.

1/ This drainage coefficient of 1.0 inches in 24 hours is almost certain to be rather low, even for rice, and certainly too low for most foodcrops. Sugar estates use 2.0 inches and Naraine, in a 1971 report of the Ministry of Economic

Unfortunately, previous analyses and readily available data are insufficient to permit as precise an assessment as the above quantitative criteria may imply, but we are confident errors in effective acreage estimates will not be large and that such an assessment will identify areas currently most favorable as far as water control is concerned.

Several general difficulties facing improved water control in Guyana are the following:

. Water supplies in the East Demerara and Boerasirie Water Conservancies are insufficient to supply requirements during dry periods when swamp-water levels are low, either because of lack of head for gravity irrigation or because of too little water. Similarly, water withdrawals in the Canje and Abary Rivers result in salinity intrusion during low flow periods. In all of these cases there are conflicts (existing or potential) between sugar estate withdrawals and needs of other crops.

. Water use efficiencies are low for several reasons, including poor land leveling and watercourse maintenance, flood irrigation from field to field, water stealing and vandalism of control structures, and preference for dark swamp water over clear rain water. There is no economic incentive for the farmer to conserve water.

Development ("Pumping Requirements and Drainage Improvements for the Coastlands of Guyana"), recommends use of 1.6 to 4.0 inches for crops depending on region and crop. Most stringent criteria, however, would eliminate nearly all areas.

. Gravity drainage suffers from inability to function during high river or tidal stages and from excessive siltation of outfall channels. In addition, the lowest-lying lands cannot be gravity drained.

. In many areas, subsidiary D&I works are the responsibility of local authorities or private proprietors. For various reasons, including lack of funds, uncertainty over land rights, and inconvenient plot shapes, these subsidiary works are often not constructed or, if already in existence, are not maintained properly.

There are 276,000 gross acres in declared D&I areas (appendix F, table F-1). To this acreage may be added the 8,000 acres (gross) in Tapakuma Extension; the approximately 10,000 acres (gross) provided with main drainage works and sea defenses on Leguan and Wakenaam; and other small areas in the lower Pomeroon, Essequibo West Bank above Johanna Cecelia, East Bank Demerara, West Coast Berbice from the Abary to Rosignol, and the Corentyne Coast that have sea or river defenses and some gravity drainage facilities, for a total of over 300,000 gross acres of land with sea and river defenses and some drainage. Perhaps another 100,000 acres are provided with sea defenses but with only the most rudimentary drainage works. In addition, water control on sugar estate lands is provided for nearly 180,000 acres.

It is also estimated that 240,000 net acres in declared D&I areas have main drainage works and that 169,000 net acres have main irrigation works. Using the criteria for "effective" irrigation and drainage described earlier, we estimate that there are approximately 137,000 acres of land (other than on sugar estates) with effective drainage and

93,000 acres with effective irrigation in Guyana. It must be recognized, however, that the criteria used are not strict and that even more effective drainage and irrigation will be needed in the future before adoption of a package of modern inputs can be expected.

Appendix F lists ongoing and planned water control projects in Guyana, with an attempt to look ahead to 1976 and 1981. Clearly the 1981 prognosis is hazardous at best and is less optimistic than the Government targets.

In table 32, we estimate that by 1976 an additional 22,000 acres will be "effectively" drained and that by 1981 an additional 92,000 acres will be "effectively" drained. Most of the increases in effectively drained areas will result from the installation of 41 drainage pumps as provided for in the Second Development Plan. We also estimate that by 1981 an additional 26,000 acres will be provided with "effective" irrigation.

These estimates may be low because works being undertaken on the Pomeroon, from Johanna Cecelia to the Supernaam, in the Essequibo Islands, in the Potosi-Kamuni area, in new cane farming areas, and in the Black Bush backlands are excluded. Furthermore, much of the area given in table 32 will be provided with a more reliable drainage system than has been assumed to be the minimum for inclusion in the "effective" list given in appendix F, table F-1.

Labor for Agriculture

Guyana's comprehensive survey on manpower, undertaken in 1965, found a total labor force of 175,000 persons for the survey week, of which 138,000 were employed. By counting

Table 32. Additional "Effective" Irrigated and Drained Acreages Expected by 1976 and 1981

(In acres)

Area	1976		1981	
	Drainage	Irrigation	Drainage	Irrigation
Tapakuma	4,000	--	3,440	--
Tapakuma Extension ...	--	--	7,200	7,200
Vergenoegen/ Bonasika	500	500	--	--
Golden Grove .	3,950	--	--	--
Cane Grove ...	3,620	--	--	--
M.M.A.	10,000	--	27,000	10,000
Lots 1-25	--	--	6,940	--
Gibralter/ Courtland ...	--	--	2,020	--
Fyrish	--	--	400	--
Hammersmith/ Borlam and SheetAnchor/ Palmyra	--	--	5,900	--
Bloomfield/ Whim	--	--	1,930	1,900
Lancaster/ Manchester ..	--	--	2,160	1,600
Ulverston/ Salton	--	--	3,380	2,600
Hogstye	--	--	650	650
Black Bush Polder	--	--	7,000	--
Limlair/ Kildonan	--	--	2,560	2,000
Total ...	22,000	500	70,000	26,000

the additional individuals who fell in these categories during the entire 12-month period prior to the enumeration, the labor force estimate was increased to 193,000 and the working population estimate to 166,000.[1/] The rate of unemployment had risen as follows:[2/]

Basis	1956	1960	1965
		(In percent)	
Survey week....	18	--	21
Preceding year.	--	11	14

There is little evidence that the upward trend in unemployment has been reversed since 1965.

Although comparisons over time are hazardous because of various technical differences in such data as are available, the failure of employment opportunities in agriculture to keep pace with the growth of the population and total labor force emerges clearly. While population grew by some 68 percent between 1946 and 1965, the number of workers employed in the agricultural sector actually declined from 67,000 to 58,000. Of the absolute loss, 2,000 or so would correspond to workers in the 10-to-14 age bracket, who were counted in 1946 but not in 1965. The remainder (about 7,000) is smaller than the decline in the sugar industry's average field employment during the second of the two decades.[3/]

1/ Ministry of Labor and Social Security, Manpower Survey Office, Report on a Survey of Manpower Requirements and the Labor Force, 1965, vol. II, Human Resources in Guiana, p. 106.
2/ Ibid., p. 107.
3/ Ibid., pp. 2, 13, 20, 110, 111. These totals for employment in agriculture include individuals whose main employment during a 12-month period was in agriculture, fishing, hunting, forestry, or logging.

Hence, the data are consistent with the possibility that there was some increase in employment for foodcrop production during the period.

The 1965 data also show that many agricultural workers do not have continuous employment throughout the year. Although 58,000 workers reported that their "main usual industry" of employment during the 12-month period preceding the survey was some phase of agriculture, only 44,000 individuals were mainly employed in the sector during the survey week.[1/]

Note that a distinction is made between the main industry where a worker found employment during the survey week, and the main usual industry, where he obtained his principal income for the preceding year. Those employed in agriculture during a given week might not consider it their "main usual industry" for the preceding year, and vice versa. Hence, a classification differing from that cited in the preceding paragraph showed that 45,000 of the 58,000 workers whose "main usual industry" was agriculture were somehow employed during the survey week. It does not follow that all 45,000 were actually employed in agriculture during the survey week, although most of them probably were. As reported in the study, the agricultural activities comprising the "main usual industry" of the 45,000 employed during the survey week and the 13,000 not so employed were as follows:[2/]

1/ Ibid., pp. 85, 119.
2/ Ibid., pp. 110, 111, 119, 187.

Agricultural activity	Employed during survey week	Not employed during survey week
	(Number of workers)	
Sugar estate (field).....	18,260	2,410
Rice farming.....	12,300	7,070
Vegetable farming..	1,749	--
Ground provision farming & dairy..	4,220	--
Livestock/farming..	1,500[a/]	--
Fishing.....	1,690	--
Logging.....	1,073[a/]	--
Not mentioned in report.....	4,217	3,486
Total.....	45,009	12,966

a/ Underenumerated, relative to other groups, for reasons explained in the report.

Workers whose "main usual industry" was some phase of agriculture reported an average of no more than about 7 months' employment in that industry for the year preceding the survey week. For those associated with sugar estates, the average was 7.2 months for both males and females; for those in rice farming, the average was 5.7 months for males and 3.5 months for females. In addition, some 18,000 individuals reported employment in some phase of agriculture as a "subsidiary usual industry," usually for only about 2 or 3 months of the year. By combining groups of workers who had either primary or secondary agricultural employment at some time during the year, it was found that as many as 76,000 were "involved" in agriculture; however, it is not

clear that this summation avoided double counting of workers with primary employment in one subsector (e.g., rice farming) and secondary employment in another (e.g., vegetable production). Those reporting subsidiary employment in agriculture included 1,800 engaged in field work on sugar estates and 6,400 in rice farming; hence, there were no fewer than 9,800 with secondary employment elsewhere in agriculture, including foodcrop production.[1/]

Even among individuals occupationally employed during the survey week as "manual workers" -- of whom at least two-thirds were farm workers -- there were days without work. This conclusion can be drawn from the fact that 58 percent of the 28,700 wage-earning manual workers had no more than 4 days of work during the week, and 24 percent worked only 1 to 2 days.[2/]

In 1965, there was evidence that many of those classed as unemployed were not "inexperienced" (lacking previous employment) but were still unable to report a definite occupation or vocational training. Such individuals, as well as many among the "manual workers" category of the "experienced unemployed," may have worked occasionally in agriculture. When the "experienced unemployed" were classified by usual industry, the agricultural sector accounted for 7,000 males, of whom 3,200 were identified with rice farming, 1,850 with sugar estates, and about 2,000 with other activities, including the foodcrop subsector.[3/]

1/ Ibid., pp. 116, 117, 122, 123, 125.
2/ Ibid., pp. 176, 177, 203, 204.
3/ Ibid., pp. 59, 164.

There seems no reason to believe that the substantial levels of unemployment and underemployment which had built up in the Guyanese economy in general by 1965 have been alleviated in subsequent years. In this setting, it is easy to accept the indications of a redundant labor supply on foodcrop farms, as suggested by evidence from the farm survey, to be discussed later in this chapter.

Some conclusions about labor for foodcrop production in Guyana may be summarized as follows:

. Whereas the value of output per acre of land in foodcrops is relatively high, inputs of machinery, fertilizer, and other production materials are relatively low, leaving labor to account for a major share of all inputs.

. In 1965, the "main usual industry" of 12 percent of all employed agricultural workers was either vegetable farming or ground provision farming, while others must have been associated with other forms of foodcrop production.

. In the absence of mechanization, labor inputs have tended to keep pace with the country's moderate rate of population growth. Hence, it may be inferred that the foodcrop subsector has tended to provide expanding employment at a rate corresponding roughly to the growth of total population and the labor force, whereas this has not been the case for the agricultural sector as a whole and for the rest of the economy.

. There continues to be a relatively high level of unemployment in the Guyanese economy as a whole, and both unemployment and underemployment are prevalent among individuals associated with the agricultural sector. On foodcrop farms, there is also redundant labor and a redundant supply of potential managerial talent.

. If foodcrop production expands in proportion to growing domestic demand, without becoming substantially more mechanized, the subsector will continue to provide new employment opportunities at a rate commensurate with the general growth of population and the labor force. A limited number of additional workers can be absorbed to provide output for import substitution and export expansion, but some of these activities (e.g., soybean production on the Intermediate Savannahs) will almost surely involve a highly mechanized technology with minimum additional job opportunities. Nevertheless, expanded foodcrop production is one of Guyana's more promising possibilities for providing new employment.

. Although the total labor supply cannot be regarded as a significant constraint for expanded foodcrop production between now and 1981, difficulties may arise in assuring that motivated workers, with appropriate skills, are available at the appropriate times and places. The locus of production cannot be expected to shift easily without a corresponding movement of workers and their families. Unless

workers with appropriate experience can be induced to move to new locations, considerable vocational training for others may also be necessary.

. Finally, it must be recognized that certain jobs in agriculture (e.g., ditch digging) are both arduous and unattractive. Workers may not flock to accept this kind of employment, and farm operators and members of their families may shun such work so long as leisure remains an attractive alternative and more limited exertion can provide an acceptable living.

The Strategic Role of the Farm Operating Unit

What happens to foodcrop production between 1974 and 1981 will depend in considerable measure upon decisions to be made by the individuals responsible for managing Guyana's farm operating units, whether these be private, cooperative, or state. To understand the problems and prospects of the foodcrop production subsector, one must examine farm resources, production activities, and related circumstances which form the setting for decision-making on such units.

At this point, attention will focus on the farm units already engaged in foodcrop production. Operators of these farms can presumably take one or both of two approaches to expanded output: adopting improved technology to raise per-acre yields, and/or increasing the acreage under cultivation. In addition, it is possible that units still to be established, in the interior or elsewhere, can make some contribution to foodcrop production by 1981, or that presently specialized producers of rice or sugarcane can diversify with foodcrops.

The Farm Operating Units of Guyana's Agriculture

Preliminary data from the latest agricultural census show that Guyana had more than 35,000 farm units in 1968 (appendix H). Some 7,000 of these had no farmland; they were counted as farm holdings only because the associated households kept small numbers of chickens or livestock, or met other specified criteria related to agricultural activity. Of the remainder, all but a few hundred were holdings with fewer than 50 acres of farmland. Many of these 28,000 units probably had a kitchen garden or produced some foodcrops for home use, but rice is known to be the main or only crop grown commercially on thousands of farms in the coastal area. The total number of farms has changed but little in 20 years; the 1952 census found 27,000 units with 1 to 50 acres of farmland.

Unfortunately, census data do not provide a classification of farms by type, but it is common knowledge that the number of farms specializing in foodcrop production is relatively small. In fact, only about 15 percent of total agricultural output value is represented by foodcrops as here defined.

In Parika, the Pomeroon, and portions of the Northwest District, most farm units are almost exclusively devoted to foodcrop production. Foodcrops also receive major emphasis along the banks of the Demerara River from Coverden to Dora, and in the new settlements along the nearby Soesdyke/Linden Highway. Along the east coast between the Mahaica and Berbice Rivers, some relatively large coconut estates occupy sand ridges which are interspersed with the clay soils used mainly for rice production. Throughout the rice areas, limited plantings of provisions and vegetables are also to

be found, especially between the Berbice River and the Corentyne. In this zone, the design of the Black Bush Polder Project made specific provision for diversified farm units, most of which have a 15-acre rice plot and a 2.5-acre homestead devoted to mixed foodcrops.

In the interior, limited foodcrop production can be found in widely scattered localities. Sizable numbers of Amerindians subsist from hunting, fishing, and a limited amount of shifting cultivation which emphasizes production of corn and cassava. Although these families are engaged in agricultural production, they can scarcely be said to operate farms, in view of the shifting nature of their cultural activities and their somewhat nomadic existence.

In the Rupununi, market outlets and technical assistance have been provided for small-scale production of peanuts, black-eyed peas, tomatoes, and a few other foodcrops for local consumption or outshipment by air. Near airstrips serving several localities elsewhere in the interior, encouragement has been given to commercial production of such products as potatoes and cabbage.

Mention must also be made of several state farms which engage in foodcrop production. One of these, on the Intermediate Savannahs at Kibilibiri, has recently devoted several hundred acres annually to the mechanized production of corn, soybeans, grain sorghum, peanuts, and black-eyed peas. Another unit is comprised of the activities at Matthew's Ridge and Port Kaituma, where land under cultivation now includes some 340 acres of nonbearing citrus and about 60 acres of ground provisions and pulses. Several research stations of the Ministry of National Development and Agriculture also account for limited amounts

of commercial foodcrop production. The Guyana Defense Forces and the Youth Corps engage in foodcrop production, largely with a view to at least partial self-sufficiency.

To sum up the numbers and locations of farms currently engaged in commercial foodcrop production, one may count:

- A few score of sizable coconut plantations along the coast, mainly situated between the Berbice and Mahaica Rivers and from Charity to the mouth of the Pomeroon

- Around 3,000 relatively specialized foodcrop farms in the Pomeroon, Parika, Canals Polder, Timehri, and Soesdyke/Linden areas

- More than 1,000 settlers with limited foodcrop production on units in the Black Bush Polder Project

- A few hundred other farms with varying degrees of specialization in foodcrop production, mainly situated along the coast and riverine areas but also found at scattered locations in the interior

- The two large state farms at Kibilibiri and Matthew's Ridge, plus several others making smaller contributions to commercial production.

From the foregoing, it is clear that only a minor degree of oversimplification will be involved if potentials on existing farm units are equated with those of the established coastal and riverine areas, while potentials of the interior are equated with activities to be developed on new farm units.

The interior, to be sure, does have its existing farms, including the state farms at Kibilibiri and Matthew's Ridge, the settlement units just taking shape along the Soesdyke/Linden Highway, and various scattered units like those of the Moco Moco Valley, where sedentary agriculture is already practiced. However, the Soesdyke/Linden units and the two large state farms are still "new" units, inasmuch as they were scarcely in production by the 1972 base year. In most of the interior, it will be necessary to look to new farm units if sizable production gains are to be realized.

Some indicators of the principal crops and crop yields on the established foodcrop farms are summarized in table 33. A regional distribution of acreages of the major foodcrop groups appears in table 34.

Characteristics of Foodcrop Farms in Established Areas

In view of the paucity of information about the characteristics and potentials of the farms operated by foodcrop producers, a survey of nearly 350 farm units in four sample localities was completed as an integral part of the foodcrop study. The primary purpose of the survey was to classify and describe foodcrop farms according to resource combinations, current production activities, and related circumstances, with a view to evaluating production potentials, identifying constraints to their realization, and proposing actions to overcome such constraints.

Sampling procedures were limited by lack of basic data for a sampling frame and by the short time span available for completion of the survey. Nevertheless, the farms included in the survey were intended to represent, insofar

Table 33. Indicators of Foodcrop Acreage and Yield in Guyana, 1952-72

Item	Census, 1952	Ministry estimates		Census, 1968	Ministry estimate, 1972	Normalized base, 1972
		1964	1968			
	Acres (000)					
Coconuts	31.5	40.0	45.4	n.a.	47.4	33.3
Ground provisions .	21.4	14.6	8.0	n.a.	10.3	7.0
Plantains ...		17.3	13.5	n.a.	18.2	6.5
Bananas	3.6	1.4	2.0	n.a.	3.0	3.3
Citrus	2.2	4.2	5.4	n.a.	6.9	3.6
Pineapple ...	0.2	0.5	0.2	n.a.	0.6	0.5
Sub-total .	58.9	78.0	74.5	n.a.	86.4	54.1
Tomatoes	n.a.	0.3	0.6	n.a.	1.2	0.7
Black-eyed peas	n.a.	0.4	0.3	n.a.	0.6	2.1
	Yields per acre (000 lbs.)					
Coconuts	1.3 a/	1.3 a/	1.2 a/	n.a.	1.4 a/	2.2 a/
Ground provisions .	n.a.	5.7	5.5	n.a.	5.9	5.5
Plantains ...	n.a.	2.6	3.5	n.a.	2.9	3.5
Bananas	2.8	7.7	5.5	n.a.	5.0	3.0
Citrus	1.8	6.0	3.9	n.a.	3.3	5.0
Pineapple ...	8.2	8.2	12.8	n.a.	7.6	5.0
Tomatoes	n.a.	3.5	5.3	n.a.	4.7	4.2
Black-eyed peas	n.a.	0.6	0.6	n.a.	0.7	0.65

n.a. = not available

a/ Assuming, for simplicity, an average weight of 1 pound per nut.

Table 34. Estimated Regional Distribution of Major Foodcrop Categories, 1972

(In acres)

Area	Vegetable oils	Provision crops	Vege-tables	Fruit	Pulses & nuts
Berbice.....	10,000	900	1,500	1,600	1,000
Demerara....	15,410	5,300	3,750	3,500	1,200
Essequibo...	7,000	5,000	600	2,330	550
Northwest...	1,000	2,210	100	1,600	150
Interior....	100	100	50	100	300
Total.....	33,510	13,510	6,000	9,130	3,200

Source: Derived from acreage totals of chapter III by prorating totals according to 1973 regional estimates of the Ministry.

as feasible, random samples of active units of 1 acre or more in each of the following areas:

. The upper and lower Pomeroon River area, including tributary creeks.

. The district served by the agricultural field assistant stationed in Parika, including farms along the road from Ruby to Present Hope, plus some located along Bonasika Creek and others in the Backdam settlement project area.

. The district served by the agricultural field assistant for Coverden/Timehri, including farms along the Demerara River upstream from Timehri. (A few farm units on the white sands near Timehri were also included in this group.)

- The Lesbeholden North and Mibikuri North units within Black Bush Polder.

More generally, the combined sample may be treated as broadly representative, in various respects, of the bulk of the farms and farmland which contribute to the country's output of foodcrops for market. It may be noted, for example, that the Pomeroon has much in common with the Northwest; both are mainly devoted to relatively specialized foodcrop production at some distance from market, which is accessible mainly by boat. Similarly, the Parika and Timehri Districts have much in common with the Canals Polder and other localities where relatively specialized foodcrop farms are to be found near the marketing and consuming center of Georgetown. Black Bush Polder, although differing from other localities where rice production is a major enterprise, does reflect some of the problems and possibilities common to farms and areas where limited foodcrop production is combined with rice cultivation.

All 100 of the sample units in the Pomeroon were primarily devoted to foodcrop production, and the same was true for 144 of the 169 sample farms in the Parika and Timehri areas. All sample units in Black Bush Polder also produced foodcrops, although most of them devoted the bulk of their crop acreage to rice. Thus the combined sample included 321 units classed as foodcrop farms. Some of the key findings as to characteristics of foodcrop farms will be reviewed in the following sections.[1/]

1/ Survey procedures and additional details of findings appear in appendix D.

Farm Size and Land in Crops

The average size of the foodcrop farms was 22 acres, of which 12 were in crops, the remainder being mostly bushland. Rice grown on the Black Bush Polder units represented about 3 of the 12 acres in crops for the sample as a whole. Two-thirds of all 321 producers cultivated fewer than 5 acres of foodcrops; only 3 percent cultivated 50 acres or more, the larger units being devoted mainly to coconut production.

In Guyana's foodcrop production, a large share of all cropland is characteristically occupied by rather complex mixtures of various annuals and perennials. Sometimes a crop like coconuts is planted on a regularly spaced basis and others like citrus and bananas or plantains are inter-planted in part or all of the main stand; in other cases, annuals may be planted between rows of plantains or young fruit trees, or in small patches which would otherwise be vacant for one reason or another. In some cases, the second or third species may be distributed uniformly over the entire plot; in other cases, crops like eddoes or tannias may be represented by only a few scattered plants. Double or triple-cropping of rapidly maturing species is also sometimes practiced over a single crop year.

If each planting under a multiple cropping system is counted in reporting land use, and if each species represented in mixed stands is considered to occupy the entire plot, then the total acreage of crops grown in a given year can be at least 5 or 10 times as large as the total acreage devoted to crops. On the other hand, the "sole-crop equivalent" basis of reporting, as conventionally practiced elsewhere, is neither realistic nor feasible for the complex mixtures commonly encountered in Guyana. Although any one of various

arbitrary alternatives may be acceptable for crop reporting purposes, the method chosen must be clearly specified in analyzing yield performance and potentials and in estimating additional acreages of cropland needed to meet various production targets.

In appendix D, table D-8, land-use data for the survey farms have been summarized by the four areas and for the combined sample according to the principal single crops and crop mixtures occupying the land during the year. Foodcrops excluding rice, sugarcane, coffee, and cocoa occupied a total of about 2,880 acres, of which a third was classed as "complex mixtures." In the Pomeroon, these mixtures included various combinations of coconuts, citrus, bananas, plantains, other fruits, and ground provisions; in Parika, they included plantains and ground provisions, with a few vegetables. In Black Bush Polder, a more diverse mixture of tree fruits with vegetables and some ground provisions prevailed. Roughly similar combinations were found in the Timehri area.

The Locus of Decision-Making

Decision-making on Guyana's foodcrop farms is rather strongly concentrated in the hands of the household head and members of his family. The only share tenant encountered in the survey was working under a temporary arrangement with his brother. Contract production was virtually limited to farms producing cane for the sugar mills. Moreover, it does not seem to be customary for the household head to take any overt steps for gradual transfer of decision-making responsibility to a younger member of his family. As long as the household head remains on the farm, he tends to retain full

responsibility for farming decisions; subsequently, responsibility commonly passes to his widow, who is often 5 to 10 years his junior. Mature sons are often important members of the farm labor force, but it is not so evident that they exert a strong influence on the decision-making process.

Most foodcrop producers in the sample areas were either full owners or could claim roughly equivalent security of tenure under long-term leasing arrangements. Without such tenure security, of course, few would be likely to plant and maintain long-lived tree crops. In certain localities not covered in the sample survey, however, lack of tenure security may inhibit the planting of perennials and represent a constraint on foodcrop production.

The Producers and Their Families

Given the tendency for full management responsibility to remain with male household heads and later with their widows, it is not surprising that many producers on the sample farms were men or women over 50 years of age. In three of the four sample areas, the number of operators over 50 was larger than the number of 40 or less. Only in Parika did the opposite hold true. Ten percent of all farm operators were females, but more than half of these had fewer than 5 acres of land in crops.

Within the combined sample of 321 foodcrop farms, the operator's age was directly associated with the acreage of land in crops, as may be noted by comparing the percentage of operators below 41 and above 50 in the following three groups:

Land in crops (acres)	Operators under 41	Operators over 50
	------ percent	------
0.1 - 4.9....	44	30
5.0 - 9.9....	39	43
10 or more...	23	44

One may suspect that the concentration of decision-making responsibility in the hands of mature to elderly individuals lends some conservatism to management of foodcrop farms. Support for this notion was provided by casual comments of some of the younger men encountered in the survey.

Average household size on the survey farms was 6.5 persons, with households ranging from 1 to more than 15 persons. Sixty percent of the households were of 4 to 9 members. Almost exactly half of all household members were children under 14 years of age.

Among household members 14 years or more of age, 14 percent were still in school (table 35). Some of these students helped with farm work and a few had off-farm jobs, but their total employment was very limited. A few household members over 60 were fully retired, but most of the farm operators in this group reported continuing activity in farm work.

Nine percent of all household members of 14 years or more were individuals under 60 employed for 3 days or more per week in off-farm work during 1973, and 5 percent had off-farm work of less than 3 days per week. Such off-farm employment was much more common for males than for females; about 25 percent of all males of 14 years or more were engaged in off-farm work to some degree, whereas the

Table 35. Percentage Distribution of Household Members of 14 Years or More, by Age, Sex, and Occupational Status

Age and occupational status	Males	Females	Both sexes
Students, 14 or more	7.5	6.6	14.1
Producers, 14 to 60			
Reporting off-farm work:			
3 days or more per week ...	4.0	0.1	4.1
Less than 3 days per week .	2.0	0.2	2.2
Reporting no off-farm work ..	17.1	2.3	19.4
Others, 14 to 60			
Reporting off-farm work:			
3 days or more per week ...	3.8	1.1	4.9
Less than 3 days per week .	2.0	0.7	2.7
Reporting no off-farm work ..	12.6	33.1	45.7
Persons over 60			
Producers	4.4	0.7	5.1
Others	0.5	1.3	1.8
Totals	53.9	46.1	100.0

corresponding proportion for females was only 5 percent. Time spent in off-farm work by males of 14 or more amounted to about 16 percent of the total days available for work.

Among off-farm occupations mentioned by respondents, work on other farms predominated in the Pomeroon, while nonfarm work predominated in the other three areas. Household members with nonfarm occupations included teachers, carpenters, sawmill workers, watchmen, tailors, seamstresses, shopkeepers, and a troolie cutter.

Seventy percent of all farm operators were no more than 60 years of age and reported off-farm employment, if any, for less than 3 days per week. Most of these operators, it may be presumed, possess the necessary time, physical capability, and long-range planning horizon for supplying an intensive and sustained effort in the management and development of their farm businesses.

Other producers whose potential for intensive management input is diminished by reliance on off-farm work or income, or by advancing age, can apparently look to a son or other family member already employed on the farm to supplement their own managerial inputs. This seemed to be the case on some 8 percent of the sample farms.

On about 13 percent of the sample farms, however, the operator was past 60 years of age and lacked the presence of a younger family member presumably capable of intensive management and development inputs. On the remaining 9 percent of the sample farms, the operators relied heavily on off-farm work and lacked the presence of a presumably capable on-farm substitute. Lacking an available substitute or potential successor, then, some 22 percent of the farm

operators can scarcely be expected to conduct their farm businesses with the same aggressiveness as others who have a relatively long-range planning horizon and rely heavily on the farm for employment.

From the foregoing data, the sample farms may be grouped as follows:

		Percent
Class I -	Under entrepreneurship satisfying specified criteria for aggressive management:	
IA -	Operators not over 60 years of age and engaged in off-farm work for less than 3 days per week.....	70
IB -	Operators not meeting the criteria of Class IA, but having an available substitute or potential successor.....	8
Class II -	Under entrepreneurship failing to satisfy specified criteria for aggressive management:	
IIA -	Operators over 60 years of age, without an apparent potential successor.....	13
IIB -	Operators relying heavily on off-farm employment and income, with no on-farm substitute.....	9
	Total.....	100

Whereas at least 22 percent of the sample households appeared to lack an operator or family member in a position to supply an intensive and sustained managerial input, some 27 percent not only possessed one operator or family member in such a position, but also one to three sons -- already out of school and mostly in the 18-to-30 age bracket -- who could presumably be spared to undertake similar responsibilities on new or other farm units. These sons represent

an excess farm-operator potential of 40 for each 100 farms in the sample. Although they no doubt perform useful work on their parents' farms, they have scant opportunity to exercise any entrepreneurial talents they may possess, particularly in view of the small size of the farms where they are typically found. In addition, there was evidence that many daughters beyond school age were remaining with their families and engaging in farm work in the absence of other employment alternatives; a number of these daughters as well as youths still in the student category should probably also be considered potential operators for new farm units.

It is commonly held that coastal residents are unwilling to consider a move to the interior. The experience of various observers in the interior tends to support this belief. Yet when operators of sample farms were asked if they had ever lived elsewhere, a rather surprising degree of mobility was evident.

More than 60 percent of the Pomeroon operators, for example, had lived elsewhere than in their current residence, and 23 had lived outside the Pomeroon River area. Thirteen percent said they had thought of moving elsewhere, and most of these were able to name specific possible destinations, including the Rupununi, Matthew's Ridge, the Bartica/Potaro Road, Kuru Kuru, Georgetown, and Venezuela. Six had lived at interior locations previously, two had given thought to returning there, and two more were considering such a move. In the other sample areas, equally large numbers had moved to their present farms from another residence, but interest in further migration was mentioned less frequently.

Labor Inputs by Household Members

Respondents were asked to report the number of days each family worker spent at work on the farm and in other employment in 1973. This was obviously a difficult question, and it was anticipated that results would not be highly reliable, partly because of the problem of recall for a period of an entire year and partly because farmers tend to count themselves as employed on their farms whenever they are present, even if the workload is very limited.

In most cases, interviewers were able to record for each family worker an estimated average number of days per week spent (wholly or partially) at work on the farm unit, as well as the number of days spent at work on other farms or at nonfarm work. Farmers were not asked to report the number of days of hired labor employed, but they were asked if they hired labor "often," "occasionally," "seldom," or "never." From these data, inferences can be drawn about labor requirements for the typical system of cultivation of the Pomeroon and of Parika, providing it is accepted that variations in intensity of cultural practices do not appear to be great, at least for farms in the medium-size range.

When the relationship of labor inputs to the area of cropland was examined, farms where hired labor was seldom or never used were separated from those which used hired labor occasionally or frequently. In each group, the number of days of family labor (including operator labor) employed on the farm increased with the acreage of cropland, but the ratio of family labor inputs to crop acres declined as size increased. This relationship was to be expected, partly because labor may have been used more intensively on the

smaller farms (although there is little evidence that this was the case), and partly because effective labor inputs were probably considerably overstated on the farms with small areas of cropland.

In both the Pomeroon and Parika areas, most operators with fewer than 5 acres of cropland relied mainly on family labor, whereas most of those with 25 or more acres of cropland reported occasional to frequent use of hired labor (table 36). For the 21 farms in the latter group, it must be supposed that total labor inputs would have been appreciably higher than the inputs of family labor alone; for the 119 units with fewer than 5 acres of cropland, it is more likely that a considerable share of the family labor input was redundant (a conclusion supported by informal field observations and by examining the schedules on a case-by-case basis).

The 30 Pomeroon producers with 10 to 24.9 acres of cropland were about equally divided between those that seldom or never used hired labor and those that used it occasionally or frequently. Inputs of family labor, in man-days per cropland-acre per week, averaged 0.7 for the former group (which still may have some redundant family labor), and 0.6 for the latter group (which also employed at least small amounts of hired labor). On balance, a figure of 0.7 man-days per week per cropland-acre, or 35 man-days per year, would seem to be a generous estimate of the actual labor input for the system of farming practiced on Pomeroon farms with 10 to 25 acres of cropland. Note that the average input was only 1.0 man-days per week per cropland-acre on the 18 farms with little if any hired labor in the next smaller size group (5 to 9.9 acres of cropland). It may be surmised that the high family labor input shown for the

Table 36. Inputs of Operator and Family Labor Per Acre of Cropland on Survey Farms in the Pomeroon and Parika Areas, 1973

Cropland Size class (acres)	Seldom or never using hired labor			Occasionally or frequently using hired labor		
	Farms (no.)	Cropland (acres)	Input[a] (days)	Farms (no.)	Cropland (acres)	Input[a] (days)
Pomeroon						
1-4.9	24	56	2.4	5	19	1.9
5-9.9	18	127	1.0	4	31	2.0
10-24.9 ...	16	226	0.7	14	222	0.6
25-49.9 ...	3	103	0.3	7	267	0.2
50 or more	--	--	--	9	1,086	0.05
Total .	61	512	0.9	39	1,625	0.2
Parika						
0-4.9	55	88	4.4	35	77	4.2
5-9.9	8	51	2.5	11	62	1.6
10-24.9 ...	1	12	1.2	8	99	1.1
25-49.9 ...	--	--	--	2	70	0.3
Total .	64	151	3.5	56	308	1.8

a/ Man-days per week of operator and family labor per acre of cropland.

remainder of the units with fewer than 5 acres of cropland are more indicative of redundant labor than of a more intensive cropping system.

The nine Pomeroon producers with more than 50 acres of cropland appeared to focus a larger proportion of their efforts on copra production than was true for the smaller units, and they reported considerable use of hired labor. To some degree, this was also true for the seven producers with 25 to 49.9 acres of cropland. Under present practices, total labor inputs for such units may be at least 0.3 man-days per week per acre of cropland, or about 15 man-days per year.

In Parika, inputs of family labor in each size group were higher than in the Pomeroon. It is possible that farming systems were intensive enough to account for some of the additional labor inputs, but it seems more likely that the major contributing factor was redundant labor. It is difficult, for example, to believe that a 7-acre farm with no other crops than a 2-acre mixed planting of plantains, cassava, and eddoes could have provided effective employment throughout the year for a 35-year-old producer, his wife, and two sons of 18 and 15, although these four individuals probably did expend some effort on the farm on most of the days of the year, in the absence of other more productive employment.

None of the nine operators with 10 to 24.9 acres of cropland reported using hired labor more than occasionally, which suggests that a figure of about 1.2 man-days per week, or 60 man-days per year, per acre of cropland would probably be a generous estimate of total labor inputs for their system of farming.

More generally, it appears that actual labor inputs for the systems of mixed foodcrop production followed in Guyana commonly fall in the range of 15 to 60 man-days per year per acre of cropland. Labor inputs on the Pomeroon farms with 10 to 25 acres of cropland fall at about the mid-point of this range.

Management Problems on Foodcrop Farms

The farm survey included a carefully ordered series of questions which sought to explore each producer's evaluation of the potential of his farming resources and the feasibility of expanding output from them. On the whole, the respondents seemed to have little difficulty in grasping the thrust of the questions and in replying with the thoughts upermost in their minds about potentials, problems, and constraints.[1/]

Expanding Acreage in Crops

Apart from land planted to rice at Black Bush Polder, 87 percent of all cropland on the sample farms in the four areas was planted to solid or mixed stands of tree crops and only 6 percent was idle (appendix D, table D-8). On the limited number of farms where idle cropland was reported, its existence appeared to be related, at least in part, to a change of tenure or management, or some catastrophic loss to fire or flood. Such transitional idleness can

1/ Interviewers were cautioned to avoid suggesting possible responses, and the diversity of answers received in each area suggests that they were reasonably successful in exercising such restraint. Notwithstanding the preference for unprompted responses, it did seem necessary to refer to the possible need for drainage improvement on bushland in framing one of the questions which appeared early in the series; this may have tended to swell the frequency with which drainage was mentioned thereafter; however, many

scarcely be avoided; hence, the possibility of expanding the total acreage of land in crops on present cropland is very limited.

On the other hand, nearly all producers with bushland or idle cropland felt that all or most of it would be suitable for crops after clearing and drainage. This represents a large potential for expansion, inasmuch as only 55 percent of all farmland is in crops, with much of the remainder being in bush.

Improving Drainage

How much of the drainage improvement on bushland could be on-farm and how much would need to be external is a matter not determined through the survey.[1/] Many respondents expressed dissatisfaction with the state of drainage on existing cropland, but a number seemed unable to solve the problem through their own efforts, leaving the inference that external drainage might be impeded. Others suggested that they could improve drainage if they had more funds. However, this seems an unlikely solution for external drainage problems, and no large cash expense should be necessary for opening internal drains on small farms with an apparently redundant family labor supply -- the setting where lack of funds was commonly mentioned as a constraint to the improvement of drainage.

In any event, it appears that these producers are unlikely to convert much of their sizable acreage of

---

respondents had brought up the topic before it was raised in the series of questions.

1/ See the discussion concerning drainage in chapter VI.

bushland to cropping unless public efforts are directed toward improving external drainage and/or educating and assisting farmers to improve their on-farm drainage.

In total, more than 150 of the 321 foodcrop producers mentioned unsatisfactory drainage as a constraint to production. Apart from precluding the conversion of bushland to cropland, it narrowed the choice of crops to be grown on existing cropland, accounted for part of the sizable difference between planted and harvested acreage, and adversely affected yields from the harvested acres in various cases. Drainage problems were mentioned by producers in all areas and size groups, although in Black Bush Polder they were mentioned less often than elsewhere. In the Pomeroon, complaints about unsatisfactory drainage and the associated problem of flooding were nearly universal, inasmuch as the survey followed devastating floods in two successive seasons.

Hazards and Risks

Farmers throughout the world operate in an uncertain environment and are usually accustomed to bearing substantial risks. Few, however, operate in a more risky and hazardous environment than farmers in Guyana, to judge by information from the survey and various other sources. Weather, to be sure, may have been especially adverse in the last year or two, but wide variations in rainfall are by no means unusual in Guyana, according to the long-term records cited earlier. Losses to floods in 1973 were mentioned by 71 respondents in the Pomeroon, 10 in Black Bush Polder, 5 in Parika, and 4 in Timehri -- a total of 90. Losses to wild or domestic animals and to thieves were mentioned by 13 scattered respondents; the threat of such losses, however, seems to be much more widespread, discouraging the planting of the most susceptible crops in given localities.

Inasmuch as weather and other risks and hazards influence or limit farm management systems and practices, new strategies for dealing with them may be needed. Crop insurance, share-cropping, and contract production are but a few of many strategies which have evolved in various countries at various times in response to physical and economic risks, hazards, and uncertainties.

Predial Larceny

Larceny of foodcrops is a pervasive and rapidly increasing hazard to foodcrop production. Risks tend to be highest near population centers along the coast, and also for such crops as tomatoes, corn, and pumpkins which can be carried away easily and consumed without milling. These factors may explain why farmers in such localities as the Canals Polder and Buxton have tended to switch from foodcrops to rice and sugarcane.

Guyana's larceny laws provide a maximum penalty of $25 for stealing cultivated crops, which makes theft a gambler's risk. Proving a loss is difficult, moreover, unless the thief is caught in the field. If he is caught on the road, the produce must be identified as coming from the field of the accuser.[1/]

Insects and Plant Diseases

Insects and disease are an ever-present threat to most crops, and average yields are more or less continuously depressed by attacks which cannot be effectively controlled

1/ Guyana Statutes, Sec. 32-46, Chapter 14.

under prevailing farm conditions. In some cases entire stands of permanent crops can be seriously damaged or destroyed rather swiftly. Stands of plantains and coconuts have apparently suffered such damage in recent years. Possibly the predominance of highly mixed stands of food-crops reflects, in some measure, a search for a strategy of diminishing risks, although the effectiveness of such a strategy may be debatable.

In total, close to 100 survey respondents mentioned insect and disease hazards as a limiting factor in growing certain crops or in achieving higher production. A number mentioned attempts to control one infestation or another, but such attempts apparently had seldom been very successful.

Mention of insect and disease problems was most frequent in Black Bush Polder, where rice as well as a variety of other crops have been affected. In Parika, mention of insect and disease problems came mostly from producers with at least 10 acres of farmland; perhaps the numerous operators of smaller units were not as quick to recognize the presence of pests and disease.

A survey reported in 1970 by research station personnel found that crop failures and generally low yields of coconuts in the Pomeroon were caused mainly by a combination of bud rot disease, red ring disease, and poor drainage.[1/] In a sample of 320 palms, 30 percent were found to be infected

1/ N. Daleep Singh, "A Survey of the Red Ring Disease of Coconuts in the Pomeroon River," Agricultural Research: Guyana, Vol. 4, 1970 (Ministry of National Development and Agriculture, Central Agricultural Station, Mon Repos, East Coast Demerara), pp. 164-171.

with bud rot and 7 percent with red ring, both important contributors to high rates of early mortality in palms. The palm weevil was associated with red ring in 17 of 22 cases, and other death-causing insects were encountered in 6 percent of the sample trees. However, the study reported that estates with good sanitation and a good drainage system rarely suffered from insects.

The Ministry of National Development and Agriculture has reported that control measures for Moko disease (a bacterial wilt, causing great damage to bananas and plantains) include improved drainage, liming of acid soils, use of disease-free suckers for planting, disinfection of tools, and removal of diseased plants. Fallowing for 9 months or rotation with another crop may be advisable where the disease is serious.[1/] Notwithstanding these recommendations, the disease seems to continue as a major problem in the Pomeroon.

Soil Suitability and Fertility

Only about 40 respondents, widely scattered through the various size groups of the three sample areas other than Black Bush Polder, mentioned problems of soil suitability or fertility as constraints on crop selection and output. Beyond these explicit comments, there seemed to be an under-current of thinking exemplified by a remark of a respondent who categorized his land as "weak, after being worked for 60 years" (he was cropping 2 acres of a 47-acre farm). Some mentioned the desirability of maintaining a rotation between crops and bush, although there was little evidence that this practice was being followed to an appreciable extent on farms in the sample.

1/ Ministry of National Development and Agriculture, The Farm Journal, Vol. XXI, No. 1, p. 18.

Fertilizer Use

More than half of the 321 foodcrop producers reported using fertilizer, and several others indicated awareness of its possible usefulness on their farms. Applications in 1973 totaled some 2,200 cwt., or 110 long tons, but more than half of this total was acquired for the rice plots in Black Bush Polder. Of the 71 Black Bush rice growers, 67 reported using a total of about 1,300 cwt. on their 930 acres of rice; only 4 of these 67, together with one other rice grower and one producer with a homestead plot only, reported using fertilizer on vegetables and miscellaneous foodcrops. The fertilizer for rice in Black Bush Polder is excluded, being a total of about 900 cwt. applied on the farms of about one-third of the 321 foodcrop producers. This is equivalent to an average of about 34 pounds for each acre in crops other than rice; applications were much higher, no doubt, on the acres actually treated.

It is obvious that fertilizer applications on foodcrops (excluding rice) in Black Bush Polder were very low unless some fraction of the rice fertilizer was actually used on the homestead plots without being so reported. Similarly, in the Pomeroon, only 17 producers reported using fertilizer, and their total applications amounted to only 72 cwt. Ten reported fertilizing citrus, 3 fertilized bananas or plantains, and 4 named other crops. In the Timehri area, two large growers with 56 acres of citrus and a few acres of sugarcane accounted for 85 percent of the 303 cwt. used by 14 of the 24 respondents.

The bulk of the fertilizer used on foodcrops (500 of the 900 cwt.) and the widest participation in such use (72 of 120 growers, including 51 of the 90 with less than 5

acres of cropland) were in the Parika area, where total applications averaged about 120 pounds for each acre of land in crops.

In Parika, variations in fertilizer use according to the area of land in crops were as follows:

Land in crops (acres)	Percentage of producers using fertilizer (percent)	Application per acre in crops (pounds)
0 - 4.9.....	57	184
5 - 9.9.....	68	132
10 -24.9.....	100 a/	24

a/ Only two farms in class.

In these data, there is some indication (much less than conclusive) that farms with less than 5 acres of cropland are being worked somewhat more intensively than the larger units.

In Parika, 49 growers reported using fertilizer on bananas and/or plantains, 24 on vegetables, 5 on citrus, and 3 on miscellaneous crops. Respondents were not asked to identify the individual types of fertilizers applied, but urea, triple superphosphate, and 15-15-15 were mentioned in several instances.

The cost of fertilizer was seldom if ever mentioned explicitly as a constraint, although it would be plausible to expect larger use of fertilizer if it were free or heavily subsidized. Problems in the physical distribution of sizable quantities of fertilizer to farms in the Pomeroon and other riverine locations would be formidable. Moreover, world

fertilizer supplies are currently tight, and may remain so for the near future.

Risks and hazards such as those already mentioned tend to discourage the use of expensive cash inputs. This is particularly true when funds must be borrowed and then repaid. It is also easy for farmers to overcompensate for risks, as they reach the point of feeling that the crop will succumb to one hazard if not to another.

Acquiring Additional Land

The problem of finding additional land was mentioned by 14 producers and may have been taken for granted by others whose comments suggested that soil fertility problems were related to the limited possibility for rotation from crops to bush and back. Six of the 14 were operators of very small units in Parika, and some of their neighbors with less than an acre of farmland (and hence excluded from the sample) also mentioned a desire for more land.

Among the virtually landless families of communities like Parika, then, one may suppose that there are numerous individuals who have some interest in acquiring land and establishing themselves as farm operators. Whether or not they possess the essential qualifications for becoming successful farm operators is a much more difficult question, which could not be addressed within the scope of the present survey.[1/]

1/ In Guyana's First Development Plan, it was noted that: " ...on the coastlands of the country there are more than 25,000 people who are willing to engage in agriculture but have no land to cultivate. This does not include the large number who eke out a precarious existence on the coastlands by cultivating merely the abandoned trenches and narrow dams

In the Pomeroon, Parika, and Timehri areas, only one operator with as much as 5 acres of farmland expressed a desire to acquire more. His entire 5 acres were planted to crops (eddoes, yams, cassava, corn and black-eyed peas), and his household of nine included six individuals between 14 and 53 years of age, all of whom were at work on the farm except as engaged in studies or housework. A son of 18 was a full-time worker on the farm and was counted among the group with "excess operator potential," already mentioned; two younger sons were rapidly approaching this status, although they were still students.

The remaining six producers who felt a need for acquiring more land were in Black Bush Polder and had one or more mature sons (including some with families of their own). The informants expressed a desire to acquire additional plots to accommodate their sons, and not necessarily to expand the size of the existing units.

In the total sample, then, almost no producer with more than 2 or 3 acres in crops evinced more than a casual interest in expanding his cropland area. Such producers did not seem to be giving serious attention to acquiring additional land or to converting land from bush to crops, although they saw drainage improvement as the only major obstacle to such conversion. In the Pomeroon, one or two producers had taken some steps to acquire or strengthen their claims to "second-depth" or interior land, but perhaps more as an investment

---

of the coconut plantations of landed proprietors, or by tending cattle merely for the milk, until the owners are ready to slaughter them." (British Guiana (Guyana) Development Program (1966-72), p. XI-5 [Georgetown: Government Printery].)

than as a way of expanding their farming units. Notwithstanding the pervasive indications of redundant labor on most foodcrop farms with fewer than 10 acres in crops, the impression is strong that producers are well satisfied with the scale (but not the output) of their present units.

A corollary is that continuing attention needs to be given to the creation of additional farming units (as has been done in settlement projects like Black Bush Polder and the Backdam area of Parika), while certain specific problems of crop yields are simultaneously attached (see appendix E).

Farm Credit

Few producers reported use of credit in any form, except for fertilizer and machine services furnished on open account to rice growers in Black Bush Polder by the Guyana Rice Board. Several individuals mentioned that they had applied for a bank loan at one time or another, and one or two large operators had financed farming operations from funds borrowed or otherwise available for their nonfarm business interests. Credit for land acquisition was scarcely mentioned, and few respondents had received production credit, even from a relative or other individual.

On the other hand, around 40 percent of all respondents reported lack of money or finance as a limitation on increased output. How they proposed to use additional money to increase output, except through hiring manual labor for ditch digging and land clearing, was not very evident. In fact, a number who mentioned money as a constraint on acreage expansion seemed also to have a supply of family

labor far in excess of plausible inputs for the crops grown and production realized. Perhaps few of those who mentioned lack of money as a constraint could have satisfied conventional criteria for the extension of production credit. It is also possible that they did not distinguish sharply between loans and grants. Only an occasional respondent indicated that he might use more fertilizer and other input materials if production credit were available.

Cost-Price Relationships

The rice growers in Black Bush Polder and a few other farmers expressed concern about recent increases in the price of fertilizer and other materials, and about high charges for machine work by custom operators or the Rice Board. There was little evidence, however, that increased costs or lack of credit affected output in any direct way. Most of the Black Bush rice growers were planting and fertilizing the entire area of rice land assigned to them. Little mention was made of rising fertilizer prices in Parika, where most of the remaining fertilizer users were encountered. Conventional practice in the Pomeroon calls for very limited purchases of farm input materials; fuel and repair parts for outboard motors probably rank fairly high on the list of expenditures. In sum, there were few indications that there would be much short-term response in aggregate foodcrop output to moderate variation in the absolute or relative prices of farm input materials. On the other hand, some growers did express the feeling that they had learned much from extension workers and would like to learn more about the use of improved technology.

Although many growers indicated that a shortage of funds was a constraint to expanding output through investing in land improvement, only one respondent volunteered that low product prices, relative to cost levels, might be inhibiting his output response. (This respondent was a rice grower in Black Bush Polder, rather than the operator of a unit principally devoted to the production of other foodcrops.) The silence about price-cost relationships is scarcely surprising, given the low level of cash inputs, the large proportion of foodcrop farms devoted to long-lived tree species, and the strong implication from survey results that many producers and their families do not place a high enough premium on additional production and income to warrant expending their spare time on clearing the available bushland and digging ditches to improve on-farm drainage.

With respect to acreage substitution among the annual foodcrops, one might expect to find much more evidence of responsiveness to change in relative prices. Such inferences as may be drawn from survey data are consistent with this expectation. Eight of the 71 rice growers in Black Bush Polder, for example, had converted part of their rice land to vegetable production, during a period when vegetable prices may have been rising faster than rice prices. In Parika and Timehri, several growers who had recently begun to grow cabbage were encountered; how these growers viewed the outlook for relative prices is unknown, but it would be surprising if they made the shift without some reason to expect a remunerative price.

On the other hand, the scope for short-term substitution among foodcrops on farms such as those encountered in the survey is sharply limited by a number of factors apart from those imposed by the high proportion of land in tree

crops. Soil suitabilities vary from farm to farm; moreover, farmers tend to view corn, for example, as a crop especially appropriate for exploiting the accumulated fertility of newly cleared land, whereas a resort can be made to cassava after fertility has been depleted below the norm for other crops. The state of the operator's knowlege about cultural practices for new products is also a matter of importance, whereas any limitations on the available labor supply are probably of minor concern. Only a few scattered respondents, such as the larger copra producers in the Pomeroon and one or two operators of the larger farms in Timehri, alluded to wage rates or labor scarcity as a constraint.

V. MARKETING

In 1972 the farmers of Guyana produced roughly $21 million of foodcrops (table 37). Of this amount some $18.3 million of produce was marketed, most of it going to consumers to be used as fresh produce. Only about 5 percent of the output other than copra was processed; this modest quantity was made into jams, jellies, juices, and some starch products. Processed output was smaller than domestic consumption, so substantial additional quantities of processed products were imported.

The value added by the marketing system amounted to nearly $12 million. Most of this was absorbed by transportation, handling costs at wholesale and retail levels, and profits. The cost also includes the value of waste through loss of quality and spoilage.

On the average, the farmer received about 61 percent of the consumer's dollar. The share was higher for coconut oil, provisions, and pulses. These are among the less perishable commodities. The share was lowest for vegetables and fruit where losses tended to be high -- yielding the farmer respectively only 60 and 45 cents of the consumer dollar. The high risks of spoilage for these commodities required substantially higher mark-ups than the less perishable items.

Table 37. Volume of Foodcrop Marketings and Value Added by the Foodcrop Marketing Subsector, 1972

(In millions of dollars except as noted)

Foodcrop	Farm value of production	Value of marketings		Value added	Farmers' share of retail dollar (¢)
		Farm level	Retail level		
Coconut oil....	3.7	3.6	5.4	1.8	67
Provisions.....	6.2	4.9	7.4	2.5	66
Vegetables.....	8.0	7.1	11.8	4.7	60
Fruits.....	2.4	2.1	4.7	2.6	45
Pulses and nuts.....	.7	.6	.9	.3	67
Total.....	21.0	18.3	30.2	11.9	61

Source: Data derived from 1970 Consumer Expenditure Survey and price data collected by the Ministry of National Development and Agriculture.

An Integrated Concept of Marketing

The marketing subsector is an integral part of the foodcrop sector, connecting functionally and economically the demand and production subsectors. It has these basic components superimposed upon one another:

- The physical system that moves commodities in space and time from farmer to consumer[1/]

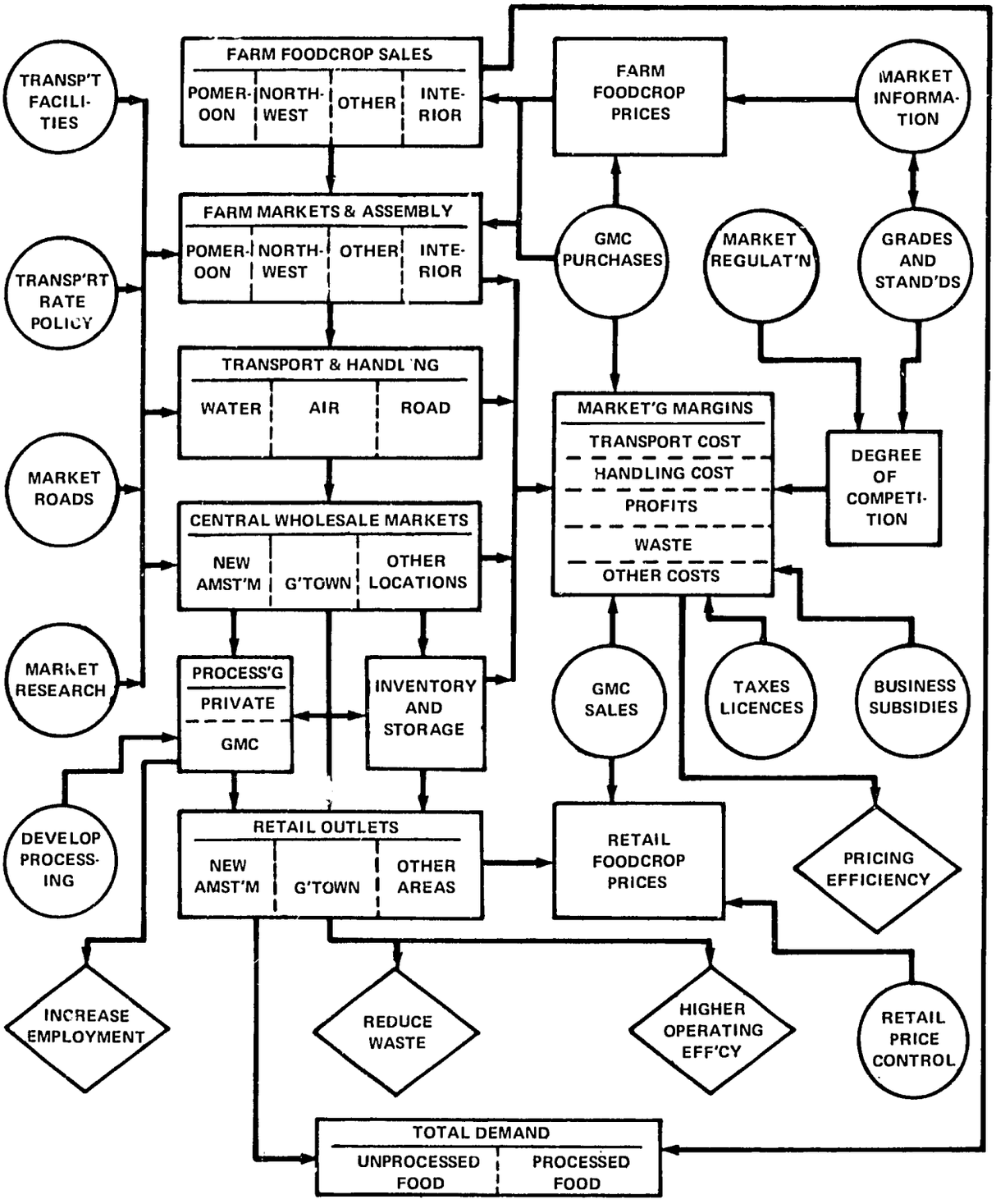
- The economic system which equates supply with demand through price signals and other information that induce market participants to determine what, how much and when products should move from farm to retail

- A system for Government intervention either as a market participant or to influence market participants to act in certain ways that are in the public interest.

These basic components of the marketing subsector and their interrelationships are illustrated in figure 11. In a physical sense, marketing covers all of the functions required to move produce from the farm gate to the consumer. A large part of the foodcrops move almost directly from farm to consumers in local communities; the remainder flows through a more formalized system that carries produce from distant farms to the large consuming centers such as Georgetown, New Amsterdam, and Linden. These functions include: operations at assembly points in foodcrop farming areas; a transportation system for moving products by land, water or air; wholesaling and distribution; in some cases, processing and storage; and, ultimately, retailing. In addition, these

1/ The marketing system can also be considered to include the movement of farm inputs -- fertilizers, seed, pesticides, etc. -- to the farmers. Since these inputs are nominal in Guyana's present foodcrop economy and are so closely linked to institutions, farm inputs are discussed in the following chapter.

FIGURE 11. A SCHEMATIC OF THE MARKETING SUBSECTOR MODEL



KEY:

- □ PHYSICAL AND ECONOMIC SYSTEM
- ○ GOVERNMENT PROGRAMS, POLICIES AND ACTIVITIES
- ◇ PROGRAM OBJECTIVES

functions involve all of the methods and practices used to exchange title and the incentives that make the system dynamic.

The economic activity of the marketing subsector is governed jointly by nature of demand -- what consumers are willing to pay for the foodcrops they want; and by the nature of production -- what farmers are willing to produce at the prices they are offered. But both farmers and consumers generate a demand for marketing services. This is supplied by marketers as long as the differences between farm and retail prices -- the marketing margins -- are sufficient to pay all costs involved in marketing, including an allowance for risk and sufficient profits to the entrepreneurs.

The size of profits in the marketing margin depends largely on the degree of competition. If competition is restricted to a few traders, there may be opportunities for monopolistic pricing and wider-than-normal margins. Another imperfection in marketing is the inefficiency in pricing which occurs when some market participants are less informed than others about the nature of the market at the time of sale. Usually farmers and consumers are less informed about prices, quality, and volume of supplies than are the traders. Under these conditions traders may be able to extract excess profits from those who are less informed if competition is limited.

A far more typical cause of wide margins is inefficiency in the functional aspects of marketing and high losses which result in high costs. In Guyana this seems to

be the major cause of wide marketing margins. Functional inefficiency does not, as is often supposed, always result from technological ignorance. Much of the efficiency in marketing is related to the scale of operation. In small marketing systems like that of Guyana, there is limited room for large-scale operations. This fact, however, does not preclude some technological progress as the market grows, although these steps to improvement need to be of modest scale and in keeping with a market flow that is expected to increase by only some 20 to 30 percent by 1981.

Government intervention is the third integral part of the Guyana marketing system. It is an outgrowth of the pricing and functional inefficiencies that have existed. In many instances, the Government has intervened to provide farmers with access to markets and to increase employment in areas where the private sector would not venture. In addition, in some cases intervention has been motivated by the intention to offset suspected monopolistic elements in the marketing system.

Most of the Government's market intervention has been through the Guyana Marketing Corporation (GMC) and its predecessor agencies. Over the years these agencies have also operated a modest price support program for foodcrops. Available funds have limited the effectiveness of the program of production incentives, but the program has provided some low-level supports.

The Government provides very little marketing information or grades and standards for general private-sector use. Little marketing research has taken place to try to improve

the physical and economic efficiency of the foodcrop marketing system. Most exceptions have been pilot projects in processing that the GMC has conducted for its own account. The Special Projects Division of the Agricultural Department conducts a number of pilot processing projects with a quasi-research intent.

The marketing system of Guyana moves the vast majority of foodcrops consumed. In 1972 total purchases of foodcrops were estimated to be about 84 percent of total foodcrop consumption, ranging from 79 percent for provisions to 98 percent for pulses (table 38). Essentially two marketing systems in Guyana move the foodcrops produced by farmers. The first is a highly localized system that moves possibly one-half to two-thirds of the produce that is marketed. The remainder of the produce moves through a more formalized system that centers largely on the Georgetown market.

The Local Direct System

The local marketing system is basically a primitive one through which farmers sell their produce directly to neighbors and to consumers in their communities. In many cases the sales are to other farmers since very few produce the full range of products that they consume. Some of the sales are made through small roadside stands; in other cases, consumers call directly at the farmer's home or have the produce delivered by him. In any case the formal marketing system is bypassed so that there are no middlemen between the farmer and consumer, with each performing part or all of the functions in marketing. As a rule all sales are for cash, and the margins or market costs tend to be minimal.

Table 38. Estimated Total Consumption and Purchases of Foodcrops, 1972

Foodcrop	Total consumption	Total purchases	Purchases as percent of consumption
	---- million lbs. ----		- percent --
Provisions			
Plantain	19.1	15.9	83
Cassava	13.8	11.0	80
Eddoes	9.1	7.8	85
Tannias	.6	.5	84
Yams	1.9	1.5	79
Sweet potatoes ...	2.8	2.5	89
Other	negl.	negl.	34
Total	47.3	39.2	82
Vegetables (fresh)			
Callalo	11.3	9.4	82
Boulanger	8.3	7.2	88
Pumpkin	4.9	4.3	86
Okra	3.5	2.9	82
Tomato	2.4	2.3	96
Cabbage	.9	.9	97
Cucumber	1.8	1.8	96
Eschallot	.4	.4	93
Carrots	.1	.1	96
Lettuce	.3	.2	84
Peas & beans	3.0	2.5	84
Other	3.1	2.4	76
Total	40.0	34.4	86
Fruits (fresh)			
Orange	12.9	12.0	94
Grapefruit	1.1	1.1	96
Lemon	.2	.2	95
Lime	.9	.8	89
Banana	8.1	7.1	88
Mango	2.8	2.4	86
Pawpaw	2.2	1.4	64
Pineapple	1.0	.8	92
Avocado pear	.2	.2	99
Sapodilla	.2	.2	99
Guava	.3	.2	84
Other	.5	.4	78
Total	30.4	26.8	88
Pulses and nuts			
Black-eyed peas ..	1.3	1.3	99

Continued--

Table 38 (continued)

Foodcrop	Total consumption	Total purchases	Purchases as percent of consumption
	---- million lbs. ----		- percent --
Pigeon peas	.3	.3	98
Other pulses[a] ...	2.2	2.1	95
Nuts	.2	.2	99
Total	4.0	3.9	98

a/ Excludes split peas.

Source: 1970 Consumer Expenditure Survey. All data adjusted to 1972 by allowing for population and income increases.

The Distant Marketing System

The more formal system that carries foodcrops to markets some distance from where they are produced is functionally and economically more complex. In general the producer takes his produce to a concentration point by truck or by small boat. This initial haul in some cases may be as much as 30 miles, with costs approaching $1 per cwt. At a number of rural concentration points, private buyers and the GMC compete for the farmers' produce. At times, however, and in certain locations there may be only one or two buyers for any one commodity. Farmers in Guyana, as elsewhere, often feel that the buyers have all the market power to set the price and the quality specifications, so that they have few options when their crop is ready for market.

The GMC by law is required to buy all offerings of produce at the minimum prices that are announced. In this role the agency might be expected to offer farmers less than the private buyers. However, it is alleged that the GMC tends to be more critical than private buyers with respect to grade and quality specification, suggesting that in some cases they may attempt to circumvent their price support role by downgrading quality.

Both private buyers and the GMC ship a large part of their produce to Georgetown by boat since the major foodcrop areas are in the riverine regions. Some produce, however, is grown near the large consuming centers and so is accessible by road. In East Berbice and the Corentyne, for example, nearly all of the foodcrops are moved by car or truck.

In addition to the coastal marketing areas, the Interior Development Department operates eight inland centers for assembling foodcrops from 17 production areas. The produce is shipped by air at subsidized rates to Georgetown, where the GMC takes possession and assumes responsibility for distributing the produce through its channels.

Private farm buyers usually sell their produce to wholesale dealers, and sometimes to the GMC. The wholesale distributors move products to various outlets. These outlets include: (1) retail centers owned by the wholesale distributors, in some cases located near the area where the produce is purchased; (2) retailers in Georgetown; and (3) other distributors, who buy the produce after it arrives in Georgetown and reship it to rural areas and smaller consuming centers.

The wholesale and retail levels of the marketing system appear to be reasonably competitive. Information on supplies and prices flows readily by word of mouth, so that the pricing system appears reasonably efficient.

Much of the produce flows through organized wholesale-retail market centers in Georgetown and other parts of the country. These centers are typically operated by a Board of Commissioners whose main function is to allocate retail space. The Board employs a market clerk and market supervisors who are responsible for collecting the rental fee from those who operate retail stalls and from those who bring wholesale produce into the market. The fees for a designated space vary with size and location and from market to market. The Board does not supervise trade practices,

nor does it interfere with the pricing system. The Price Squads of the Ministry of Trade and Commerce and the police carry out the policing of retail price controls.

Some of the retail stalls at central markets are under roof but many are out in the open and parallel to the street. Each stall operator is responsible for his own procurement, display and sale of the produce, and determines the price that he wants to ask for each commodity. Some of the retail transactions are based on weights and measures which are controlled by the police. However, most fruits and vegetables are sold by the "parcel." "Parcels" commonly sell for the same price over an extended period of time, but the size of the "parcel" may change with changes in the supply situation or with quality. Thus, while there is little formal grading, there is in effect a modest quality differentiating market.

The GMC purchases a number of products on the basis of grade, but the standards do not seem to be well publicized. Farm buyers and wholesalers occasionally do some sorting according to their own standards of the day. However, for the most part retailers sort for quality differences on the retail counter by arranging their produce into appropriately sized "parcels" to match the "parcel" price and quality.

Modern market facilities and handling equipment are very limited even in the formal marketing system. The private sector has virtually no cool, cold or dry storage facility for foodcrops at any of the assembly, wholesale or retail points. The GMC has a warehouse for handling and storing. It has about 50,000 square feet for fresh produce

and about 70,000 square feet for coffee beans. The agency also has small storage sheds at most of the country assembly points so that produce can be stored for a day or two until it can be loaded for shipment.

Guyana's transportation system is an important component of the marketing system for foodcrops, determining where foodcrops can be grown, influencing the costs of moving foodcrops from farm to market, and, through the technology and quality of service available, affecting the waste incurred due to damage and spoilage.

The movement of goods in Guyana remains heavily dependent on water transportation. A wide range of sloops and small steamers operate on Guyana's major rivers and along its coast, including vessels operated by the Department of Transport and Harbours. Road transportation is confined mainly to some 400 miles of paved roads along the coast, with the 45-mile Soesdyke/Linden Highway being the only paved artery away from the coast. Movement between the interior and the coast is almost entirely dependent on air transport, which consists of a series of landing strips and a fleet of six aircraft operated by Guyana Airways, having a total cargo capacity of 16.5 tons.[1/] The absence of alternative modes of transport to the interior is clearly one of the principal constraints to the development of the interior, and also influences the type and quantity of

1/ The fleet consists of two DC-3's, two Caribous, and two Twin Otters (the latter including one on order). A DC-6 is operated by Guyana Airways for international cargo. Small private aircraft also operate in Guyana.

foodcrops which can be produced economically over much of the interior.

The important role of water transport is determined in large part by its low unit costs compared to road and air transport. This cost advantage is brought out in table 39. The average cost per ton-mile for water transport is only 3 cents, compared to 10 cents for road transport on paved roads and to over $1 for air transport. These costs represent economic rather than private costs, so that the tariffs actually levied by transport operators may not always correspond to these differences. However, these costs do not reflect publicly incurred costs for infrastructure, which are much higher for roads than for either air or water transport. In economic terms, the cost differences are likely to widen, given the marked increases in the costs of petroleum products.

These transport costs do not reflect wide variations in the quality of service. The boats and sloops that carry produce from producing areas to Georgetown and New Amsterdam are not equipped to handle perishable products. The holds where produce is carried are hot and poorly ventilated, and handling at all points is crude and damaging, and considerable spoilage therefore occurs in shipping. Where there are roads, it appears that an increasing volume of produce is being transported to market by truck. The handling is still crude and damaging; however, because the produce tends to be handled fewer times over shorter distances and because the trucks are better ventilated, much less damage occurs than by ship.

Table 39. Economic Costs of Transportation in Guyana

Transport mode	Dollars per ton-mile (assuming full capacity)
Lorries (5-6 ton vehicle on paved road).....	0.10
Air transport:	
DC-3 (3.54 tons).....	0.93
Caribou (3.22 tons).....	1.53
Twin Otter (1.54 tons).....	2.18
Water transport (weighted avg.)..	0.03
30-ton sloop.....	0.06
60-ton sloop.....	0.03
140-ton sloop.....	0.02
320-ton steamer.....	0.03

Source: Central Transport Planning Unit, Ministry of Economic Development. The data for lorries and water transport are for March 1974; for air transport, they are for 1972.

The Northwest

The farm produce marketed in Kumaka and Morawhanna is purchased by six private dealers and the GMC. A fair degree of competition at most times is therefore suggested, although buyers tend to specialize by commodity. In general, farmers believe that private dealers usually pay slightly higher prices than the GMC in its price support role. The proportion of the produce purchased by the GMC in 1972 varied from 1.6 percent of marketed cassava to 100 percent of the grapefruit and bananas that were sold. On the

average, the GMC handled about 20 percent of the total volume of produce shipped (table 40).

All produce is shipped to Georgetown by boat. Currently only one boat per week hauls fresh produce from the Northwest. This schedule is too infrequent, since perishable produce can become overripe in less than a week; when in this condition it will not withstand shipping, especially since it is packed in 100- to 150-pound sacks.

The weekly boat from the Northwest leaves Kumaka partially laden at 10 p.m. each Tuesday, and proceeds to Morawhanna to finish loading. It arrives in Georgetown on Thursday, and is sometimes not unloaded until Friday. During that 36 to 56 hours, the perishables are stacked six to ten sacks deep in the hold of the ship. There is very little ventilation, so that the heat from the ship in addition to the pressure on the bottom sacks results in very high temperatures and rapid spoilage. It is reported that on occasion as much as 80 percent of some of the highly perishable products have been dumped after arriving in Georgetown.

The exact level of spoilage in shipment and handling from the Northwest could not be determined. However, some dealers ventured to estimate that losses and damage could run as high as 20 to 30 percent, depending on the commodity and its condition at the time of shipment. A loss of 25 percent would represent a value of about $1 million.

In addition to heavy losses in shipping, farmers in the Northwest also suffer occasional losses in the field because the weekly boat arrived before the crop was ready or after

the crop was too ripe. Several growers are reported to have lost last December's yield from about 50 acres of oranges due to this problem. Such occurrences raise questions reqarding the performance of the GMC in its price support role.

Table 40. Total Foodcrop Shipments and GMC Purchases, Northwest, 1972

Product	Total shipments (lbs.[a])	GMC purchases (lbs.[a])	Percent handled by GMC
Plantain.....	260,428	61,815	24.3
Cassava.....	204,965	3,334	1.6
Eddoes.....	714,883	20,835	2.8
Sweet potatoes.....	380,531	133,303	35.0
Yams.....	1,165,286	901,221	77.3
Tannias.....	295,479	14,976	5.1
Oranges.....	250,902	223,539	93.1
Limes.....	2,593	428	16.5
Lemons (no.).....	8,015	6,139	76.6
Grapefruit (no.).....	97,561	97,562	100.0
Bananas.....	22,846	22,846	100.0
Pears (no.).....	5,269	350	6.6

a/ Except as noted.

Clearly the major problem in marketing is the high loss that occurs in shipping. A study to determine the extent of the loss would seem to be justified before action is taken to remedy it.

The Pomeroon

The Pomeroon is sometimes referred to as the breadbasket of Guyana; it might more appropriately be referred to as the breadbasket of Georgetown. The buyers of farm produce are represented by the GMC and eight private dealers who handle a wide range of foodcrops sold by farmers from that area. Several large copra producers sold copra and other produce in Georgetown.

Although the GMC purchases produce only 3 days each week, its buying prices seem to serve as a basis for pricing by the private dealers. Pricing practices vary somewhat by season. When supplies are scarce, private buyers tend to pay more than the GMC. However, farmers sell the bulk of their produce in peak seasons, at which time the GMC buys a proportionately larger volume, and private buyers at such times pay no more than the GMC.

Nearly all of the produce handled by the private dealers and by the GMC is transported to Georgetown by sloop or boat. In recent months the GMC used one truck in addition to water transportation to ship foodcrops to Georgetown from the area. Private dealers estimate that the cost of transporting produce by water is about $6.25 per ton. The trip takes only about 11 hours from Charity; hence the spoilage and bruising damage is not as great as that from the Northwest.

As in the Northwest, all produce, except plantains and bananas, is placed in bags which are loaded and unloaded by crane or by hand. Handling is in general extremely rough,

so that each time the bags are moved some damage occurs. This, in addition to the heat in the holds, causes spoilage and waste that are estimated by private dealers to run from 12 to 20 percent for the more perishable commodities. Another 15- to 20-percent loss in value results from damage. Although the damaged produce can be retailed, its value and shelf life are reduced to about one-half.

The GMC losses appear to be higher than those of private dealers, although it was not possible to get from agency records the difference between the volume of foodcrops purchased from farmers and the volume sold to their various outlets or the loss in value due to loss of condition. However, even if GMC losses were no higher than those of private dealers, the loss would still amount to about $30,000 of foodcrops purchased from the Pomeroon which were valued at $160,000 in 1972. While there are no data on the total annual volume of produce shipped by all parties from the Pomeroon, it seems likely that the total loss could well exceed $100,000 before the produce gets to the consumer.

Interior

The Department of Interior has been promoting the production of foodcrops in the Rupununi region and other interior regions. In 1966 the combined value of foodcrops marketed from 17 interior producing areas was only about $7,500. By 1971 this value had risen to over $100,000, increasing at an average annual rate of more than $14,000. In 1972 the volume dropped to $68,000.

The produce from the interior areas is assembled at eight major points for shipment by air. The most important of the shipping points in terms of volume are Lethem and Kamarang. In fact, about half of the total value of interior foodcrop shipments came from those two points -- mostly tomatoes from Lethem and cabbage from Kamarang (table 41). Lethem is by far the most important point if the 2.5 million pounds of beef that are shipped from there are also included.

Guyana Airways is paid about 4 cents per pound for flying the produce to Georgetown. The remainder of the normal rate of 16 cents per pound is subsidized through the National Budget.

The handling of produce shipped from interior points is generally good, and little damage occurs. Farmers purchase cardboard boxes from the local merchants in which to pack their produce -- small ones cost 10 cents and large ones about 25 cents each. In Lethem, the agricultural field assistant arranges for a truck to go to the production area on specific days each week to haul farmers' produce to the airstrip. Farmers usually go along on the truck to collect their money. Each farmer who trucked produce pays for it in proportion to the volume he shipped.

The Interior Department makes all the marketing arrangements for the interior farmers. However, the price paid to the farmer is set by the GMC, which receives all of the produce in Georgetown.

An emerging marketing problem for the interior is posed by the planned expansion of potato production. For the time

Table 41. Value of Aircraft Shipments of Foodcrops From Interior Regions, 1966-72

(In dollars)

Area	1966	1967	1968	1969	1970	1971	1972
Lethem	4,910	5,939	6,731	7,583	11,191	22,709	17,106
Aishalton ...	350	654	2,356	6,942	5,175	306	1,506
Monkey Mountain ...	1,080	--	77	6	460	215	3,571
Lumid Pau ...	--	6	57	2,058	105	54	97
Orinduik	--	44	77	2,669	61	1,236	490
Wichabai	58	594	138	658	391	168	--
Opoteri	--	--	148	421	120	52	210
Annai	112	9	148	796	806	291	2,046
Kurupabari ..	--	167	1,948	1,567	26	1,763	364
Karanambo ...	3	427	10	536	32	39	119
Karasabai ...	--	--	44	870	427	306	548
Kamarang	1,047	952	20,429	9,058	4,186	35,192	18,131
Good Hope ...	--	--	--	54	--	--	--
Paruima	--	--	6,990	13,722	33,416	26,726	17,645
Matthew's Ridge	--	--	--	2,489	3,167	2,916	2,054
Paramakatoi .	--	--	--	1,349	2,394	8,039	1,248
Kato-Buru ...	--	--	970	292	1,609	3,805	1,514
Total ..	7,560	8,575	39,372	51,051	63,566	103,814	67,793

being, transportation from Kato and Paruima poses no serious problems as long as the production of potatoes is still in the pilot stage. The current air transport system could possibly handle the potatoes produced from about 200 acres which yield about 500 tons in excess of seed. This represents about 1.4 three-ton planeloads per day for about 120 harvest days per year, which may begin to tax the present capacity of Guyana Airways. It is clear, however, that an ambitious undertaking which would provide Guyana with the 6,000 tons of potatoes needed for self-sufficiency at current prices would be impossible by air. It would require 2,000 planeloads per year, or nearly six planeloads per day if each day of the year were a harvest day.

Berbice and
Corentyne Coast

The Berbice and Corentyne Coast region produces few foodcrops that are surplus to the area, and for the most part is self-sufficient in the foodcrops for which Guyana as a whole is self-sufficient. As a result, the marketing system tends to draw supplies from farmers in close proximity. This structure permits farmers on the Berbice coast to market a high percentage of their produce without large transportation costs.

The two exceptions to this system are (1) the Skeldon market, which is at one end of the coast and which draws substantial supplies from the Corentyne River areas and (2) the New Amsterdam Market which is at the other end of the coast and which draws supplies from the Berbice River area. About three or four hucksters purchase produce from the Skeldon wholesale market and from roadside farmers and

distribute it to retailers in numerous village markets and ultimately in New Amsterdam. On their return trip they purchase different foodcrops in New Amsterdam and from roadside farmers and redistribute them to the same retailers in small village markets and occasionally in Skeldon. Two truckers operate on a similar basis between New Amsterdam and Georgetown, hauling produce both ways and distributing it on the way.

A few of the retailers from the coastal villages believe that they can obtain better-quality produce at lower prices by buying directly in Skeldon, New Amsterdam, or Georgetown rather than from hucksters. However, they handle only a small average volume and their unit costs tend to be high. The cost of transportation for produce, when added to the personal travel expense of the dealers, averaged about $23 per ton of ground provisions. The GMC is not a major buyer in Berbice. In places where the agency did operate, farmers felt that the average prices they received when selling directly to hucksters or retailers were generally higher.

The Volume of Marketings

It is estimated that the receipts at the three major Georgetown markets -- Stabroeck, La Penitence and Bourda -- combined with shipments made by the GMC represent perhaps 85 to 90 percent of the total volume of produce sold by retailers in the Georgetown area.[1/]

1/ Data on the volume of receipts at markets are available only for three of the wholesale-consumer markets in Georgetown. Some data are also available for a limited number of commodities delivered to the market in New Amsterdam.

The GMC reports the volume and value of individual foodcrops that it purchases, but does not report its volume or values of sales. Therefore, market information is limited to prices paid by the GMC, wholesale prices at the three Georgetown markets, the selling price of the GMC, and unweighted averages of retail prices at eight Georgetown retail outlets.

The total volume of ground provisions and plantain handled by this system averaged nearly 19 million pounds in 1972-73, nearly one-third of the national production of those products (table 42). This represents a slight decline from the 1970-71 average of some 20.1 million pounds, a trend which appears to be consistent with the price increases that have occurred since then.

Private dealers are an important factor in the marketing systems for foodcrops. They handled approximately 60 percent of all marketings in 1970, 74 percent in 1971, almost 80 percent in 1972, and 59 percent in 1973. However, the GMC handles a much larger volume of marketings than any single private dealer. Thus in its role as a marketing agent the GMC would appear to be a strong factor in determining prices paid to farmers as well as those paid at the wholesale and retail levels.

Facilities

A very large percentage of the foodcrops that pass through the marketing system are consumed almost immediately in fresh form when they are in season. There is comparatively little storage or processing, which constrains the

Table 42. Georgetown: Selected Foodcrops Moving into Three Municipal Markets and GMC Receipts, 1970-71 and 1972-73 Averages

Commodity[a]	1970-71 average			1972-73 average		
	Municipal markets	GMC	Total	Municipal markets	GMC	Total
	(Thousands of pounds)					
Plantain	3,920	4,610	8,530	2,940	3,640	6,580
Cassava	3,725	275	4,000	4,370	1,115	5,485
Eddoes	1,540	280	1,820	1,685	750	2,435
Sweet potatoes ...	1,445	425	1,870	1,245	265	1,510
Yams	1,500	1,080	2,580	1,250	590	1,840
Tannias	1,280	25	1,305	1,115	25	1,140
Corn	930	1,490	2,420	145	350	495
	(Thousands of units)					
Pumpkins	65	490	555	885	410	1,295
Squash	40	30	70	80	40	120
Coconuts	260	765	1,025	310	90	400

a/ Includes all foodcrops for which municipal markets keep records.

seasonal availability of foodcrops and limits the time that produce can be held from peak production seasons into the period when products are more scarce.

The storage and processing problem is not so severe for ground provisions and plantains, which are available most of the year with only moderate seasonal peaks. The problem is more pronounced with respect to specific types of fruits and vegetables. Many of these are highly seasonal and cannot be stored for long periods without refrigeration. Nevertheless, although specific types of fruits and vegetables are highly seasonal, some variety of the product is generally available most times of the year, so that consumers can substitute from season to season.

Current Processing Capacity

There is a very limited capacity for processing foodcrops other than copra in Guyana so that substantial quantities of some processed foodcrops are imported. The most significant ones are tomato pastes, citrus juices and a few canned and dried products. Most imports of processed foods have been banned except as they may be available from the CARICOM area.

The fruit and vegetable processing plants are limited in number and capacity. Among them are:

. Guyana Canning, which is a pilot canning plant at Ruimveldt Industrial Site operated by the GMC. It also serves as a research facility and has a rated daily capacity of 5,000 pounds. This cannery has been

in operation for several years and in 1972 processed about 15,600 pounds of orange juice, 66,000 pounds of guava and pineapple jelly, and 127,000 pounds of pineapple.

. Ball-type cannery at the College of Agriculture at Mon Repos with a capacity of about 2,000 pounds per day. It is used to process foodcrops mainly for the dining room and as a teaching facility.

. A peanut butter and bean processing plant at Ruimveldt Industrial Site which is operated by the Ministry of National Development and Agriculture. Although it operated for only a portion of 1973, it produced about 27,000 pounds of peanut butter and employed eight people.

. A can-reforming plant designed to prepare tin containers for the small cannery plants. This plant now operates only part-time but has the capacity to handle the needs of a number of small canneries.

. A privately owned lime-juicing plant is operated in the Mabaruma area. It produced less than 5,000 pounds of concentrated juices in 1972, most of which was marketed in Georgetown. It employs six people.

. Two copra plants to produce coconut oil and its by-products. Items are on hand for adapting the equipment to soybean oil extraction. The two plants have a combined capacity of 35 tons per day and now employ about 80 people. There are no plants for processing

the palm oil which is expected to be harvested in small quantities after 1976.

. In addition, three small canneries have been under construction for the past 2 years, one at Black Bush Polder, one at Charity, and one at Mabaruma. They are expected to be in operation in the near future. The delay has been caused by a lack of some essential pieces of equipment.

. A number of small plants throughout Guyana process starch and flour from plantains and cassava. In total they produced about 1.3 million pounds in 1972.

In sum, the current Guyanese cannery and processing capacity for fruits and vegetables is capable of producing less than 500,000 pounds of finished product. This capacity is not large enough to absorb the surpluses that occur during peak marketing seasons. In addition, there are no processing plants for some foodcrop products such as ginger. This limited capacity, together with the absence of dry, cool or cold storage, means that the fresh marketing system has no outlet for surplus supplies except through price variations or waste.

Demand for Processed Fruits and Vegetables

About 4.1 million pounds of processed fruits and vegetables were consumed in Guyana in 1970-71 (table 43), an amount equivalent to some 10 to 15 million pounds of raw product measured on a farm-weight basis. Approximately 85

Table 43. Consumption of Processed Fruits and Vegetables, Selected Averages, 1964-72

(In thousands of pounds)

Foodcrop	1964-65	1967-68	1970-71	1972
Special products				
Dried fruit and peel ..	712	666	645	103
Dehydrated vegetables .	7	4	5	1
Canned and processed				
Fruit	418	355	261	198
Jams, jellies, etc.a/ .	125	66	119	74
Citrus juicesa/	1,519	2,008	1,450	938
Other fruit juicesb/ ..	449	280	204	462
Vegetable soups and juices	722	391	283	506
Tomatoes and paste	678	781	784	703
Vegetables	730	676	372	489
Total	5,360	5,227	4,123	3,474

a/ Includes estimates of domestic production.
b/ Excludes lime juice.

percent of this amount was imported. Since the demand[1/] for these products tends to respond more to increases in incomes than does the demand for fresh products, it is expected that demand for them will increase some 20 percent by 1976 and about 42 percent by 1981.[2/]

Current Demand

Except for tomato paste and citrus juices, processed products are not important in the diet of most Guyanese. Of the 395 households located in Georgetown and New Amsterdam and covered in the 1970 Consumer Expenditure Survey, 203 were reported to have consumed some tomato paste (or puree). In sharp contrast, only 7 of the 395 households were reported to have consumed any other canned fruit or vegetable products. A considerable number were reported to have consumed "drinks" as refreshments, and some share of these drinks no doubt contained modest amounts of fruit juices.

It seems probable that most of the canned fruit and vegetable products now produced or imported into Guyana are consumed by a small portion of the households -- mostly

1/ The major components of demand for processed fruits and vegetables are citrus juices and tomato paste, both of which have been reflected in the earlier foodcrop demand projections in their fresh-form equivalents. The discussion in this chapter of demand for processed fruits and vegetables is intended to provide a background for the discussion of processing facilities in this chapter and the program alternatives in chapter VII.

2/ The major empirical evidence of the demand for processed fruits and vegetables is through the import statistics. The few processing plants that are in existence produce a small part of the total quantity. The import statistics of the past do not, however, seem to coincide with the growth in incomes and population. For many of the items, imports

high-income households -- since these are luxury goods to most Guyanese. Even tomato paste tends to be a moderate luxury. An interpretation of the data from the 1970 Consumer Expenditure Survey suggests an expenditure coefficient for tomato paste of 1.5 to 2.0; for other products this coefficient is likely to be higher. Therefore, much larger increases in consumer expenditures than are in prospect, or substantial declines in their prices relative to the prices of other consumer goods, would be required before processed fruits and vegetables in general would be important in the purchases of middle- and low-income Guyanese. This generalization applies to a lesser degree to tomato paste and citrus juices.

The record of recent changes in the consumer prices of these products is too fragmentary to develop much of a picture of the relationships between price changes and changes in consumer demands.[1/] However, data available for tomato paste and canned grapefruit show there is a fair degree of correlation between the price of grapefruit juice and its per capita consumption, and the regression of quantity

---

are shown to have declined since the mid-1960's. It is not known to what extent this has resulted from Government intervention or to what extent it represents a real decline in basic demand -- both total and per capita. Of special significance in this regard is the sharp drop in imports and consumption of some items in 1972.

1/ Consumer price indexes are available for tomato paste, grapefruit juice, raisins, guava jelly and canned peas for the years between 1967 and 1972 but not for earlier years. Unfortunately, the imports of raisins, guava jelly and canned peas are buried in broader commodity classes, making it impossible to compute price-consumption effects for them.

per capita upon price suggests a very elastic demand. By 1970 the per capita supply of grapefruit juice had declined to less than 50 percent of the 1967 level; at the same time the consumer price had increased only about 25 percent relative to the All-Items Consumer Price Index. Grapefruit juice sales were subject to retail price ceilings after 1970 and, in spite of continued reductions in per capita supplies, the price of grapefruit juice is indicated to have declined somewhat between 1970 and 1972 relative to the All-Items Consumer Price Index.

Per capita supplies of tomato paste showed no consistent trend between 1967 and 1972, and the year-to-year variations in the per capita supply of tomato paste are not well correlated with year-to-year changes in the relative price of tomato paste. In spite of the lack of empirical evidence, there are theoretical reasons for believing that the price coefficient for this commodity, like its income coefficient, is high. As with grapefruit juice, only modest increases in the price of this product are likely to cause sharp reductions in per capita demands, and vice versa.

The Prospective Demand

The demand pressures that generate future increases in the basic demand for processed fruits and vegetables are similar to those for the commodities previously analyzed. The principal difference is that the expenditure effects are, as stated, generally much greater.

Thus, if the price effect (for which there was inadequate data) is ignored, it is estimated that there will be a demand for processed fruits and vegetables of nearly 5 million pounds by 1976 (table 44). In spite of current plans, it is unlikely that Guyana will have the capacity to produce more than 20 percent of the 1976 demand. There will consequently be an unfilled demand of about 4 million pounds which could still be absorbed by increased domestic processing rather than imports, an amount which would roughly require an additional 10 to 15 million pounds of raw product and an additional 400 to 500 man-years in the industry. By 1981 the demand for processed fruits and vegetable products will be nearly 6 million pounds. At the current rate of growth of the processing industry, this too is not likely to be filled from domestic production.

The future demand for processed fruits and vegetables is expected to be largely in juices from citrus and other fruits. In addition, there is a strong demand for tomato products as well as for dried fruits and peel. Together these three categories constitute 80 percent of the total future demand for processed products.

A small element of the future supply of processed fruits and vegetables will probably continue to be imported because the raw materials are not produced in Guyana. These products, which are of minor significance, include such items as canned peas, apple juices, and some varieties of jams and jellies of temperate climate origin.

Processing Cassava Products

In 1972, Guyanese consumed as food about 1.34 million pounds of starch and flour made largely from cassava and

Table 44. Projected Consumption of Processed Fruits and Vegetables, 1976 and 1981

(In thousands of pounds)

Foodcrop	1970-71a/	1976b/	1981b/
Special processes			
Dried fruit and peel	645	786	922
Dehydrated vegetables	5	6	7
Canned and preserved			
Fruit	261	318	373
Jams, jellies, etc.	119	145	170
Citrus juices	1.450	1,725	2,045
Other fruit juices	209	249	295
Lime juice	5c/	6	7
Vegetable soups and juices	283	345	405
Tomatoes and paste	784	933	1,105
Vegetables	372	454	532
Total	4,133	4,967	5,861

a/ Total consumption assumed to be equal to imports for dried fruit, and to imports plus domestic production for other products.
b/ Assumes that population will increase from 710,000 in 1970-71 to 782,000 in 1976 and 856,000 in 1981; that per capita private consumption expenditures are $355, $380, and $400 for the respective years; and that expenditure elasticities are 1.5 for fruit juices and tomato products and 2.0 for all others.
c/ Reported amount produced in 1972.

plantain. This amount equaled about 1.84 pounds per capita, of which 0.44 pound was consumed as flour, and 1.40 pounds were consumed as starch.

The future demand for these products will grow with population and consumer income in about the same magnitudes as wheat flour, rice and provisions. Thus, with current food habits, consumption will approach 1.7 million pounds by 1981. However, this demand is miniscule compared to the untapped potential of cassava flour as a substitute for wheat flour in bread-making. If a regulation were passed requiring that 15 percent of the flour for bread-making be cassava flour, close to 15 million pounds of cassava flour would be required by 1976. To this amount can be added an additional 1 million or more pounds of cassava starch to be used as a flocculent in bauxite processing, a practice which has already been started. Thus, in total the prospective demand is 10 times the current domestic demand. In addition there is some possibility for using cassava as livestock food. Even without livestock feed, the above-mentioned uses of cassava starch and flour represent a potential for processing an additional 45 million pounds of raw cassava and imply that current production could be tripled by the addition of about 9,000 acres at current average yields.

Processing Vegetable Oils

The current processing facilities for vegetable oils are fully adequate to process the copra that is currently produced and will be produced by 1981. However, future needs for facilities for soybean and palm oil processing are

uncertain. Although with some modification existing mills will probably be able to handle any soybeans that are likely to be produced, new facilities will be needed as oil palm production reaches a sufficient scale.

By 1981, one or two small-scale palm oil extracting plants would appear to be feasible. Small plants tend to be very inefficient, extracting only about 50 to 60 percent of the oil. It will likely be some time beyond 1981 before Guyana will produce at one location the 3,000 to 10,000 acres of oil palm needed to justify a moderately efficient facility that can extract up to 95 percent of the oil.

The Structure of Competition

Farmers' Access to Buyers

In some areas where produce is purchased from farmers, there are comparatively few regular buyers for any one commodity. Therefore, a farmer has limited alternatives with respect to buyers and may occasionally be forced to accept whatever price is offered for his produce. In many areas farmers have the option of taking the produce to nearby market centers or of selling it at roadside stands. These alternatives are, however, not generally available to farmers in the more remote areas. Alternatively, many individual retailers go to farmers to buy their produce. In addition, the GMC through its 15 buying stations tends to increase the degree of competition, although the GMC can exercise a degree of monopoly power in areas where it is virtually the only buyer.

This monoply power seems to be evident in GMC's purchases of red kidney beans in 1972 and 1973. The agency purchased almost 50 percent of the national production of red kidney beans in 1973, mainly from interior points where it was the only buyer. These were bought at a price of 23 cents and sold at wholesale for 33 cents per pound -- a mark-up of 43 percent. This compared to a mark-up of 81 percent in 1972 when the average price paid farmers was 27.5 cents and the wholesale price was 50 cents. In both years the retail price was 68 cents per pound. This suggests that the GMC did not reflect fully the retail price to producers.

At most levels it is fairly easy to enter the marketing system for most foodcrops, as individuals with only small amounts of capital can purchase some quantity of produce, rent a stall and become a dealer or retailer in fruits and vegetables. One exception is the larger amounts of capital needed to become a buyer in the less accessible areas like the Northwest, the Pomeroon and some other riverine areas.

According to long-time retailers and wholesalers, the number of retail fruit and vegetable dealers in the Bourda market is 2.5 times greater than 2 years ago; 1.5 times greater at La Penitence market; and about 2.0 times greater at Stabroek market. Greater numbers of dealers tend to increase the degree of competition and hold down profits. However, these factors are offset by the higher marketing costs caused by the inefficiency of small-scale operations. For example, one transport agent, a large trucker, could haul the produce of many farmers at a much lower unit cost than if every farmer or every small dealer hauled his own

produce. Similarly, one relatively large wholesale dealer could service a large number of small retail dealers, and one efficient retailer could do the job at less cost than eight or ten. Such operations are, however, subject to a larger portion of fixed costs and operating cash outlays than those of small dealers whose major input is their own labor, the cost of which can be adjusted far more readily than for hired labor.

In the formal marketing system that conveys foodcrops from farmers to consumers in the major centers, consumer prices range from 32 to 221 percent above the prices received by farmers for various foodcrops (table 45). Alternatively, the farmers' share of the consumer dollar ranges from a low of 31.1 percent for oranges to a high of 75 percent for black-eyed peas. In general the wholesale-retail margin absorbed only one-sixth to one-third of the farm-retail margin.

Marketing Margins

Marketing costs in Guyana are influenced mostly by the technical efficiency of the marketing facilities and of transportation. While there is some room for improvement in pricing efficiency, excess profits do not seem to be a major cause of wide margins. If excess profits do occur, their incidence is likely to be occasional and not very serious.

Dealers' margins reflect the costs of transportation, containers, interest and labor, the large amount of waste, and a sufficient return for the dealer's entrepreneurial effort (table 46). Any reduction in these costs would benefit both farmers and consumers.

Table 45. Average Wholesale and Retail Mark-ups on Select Foodcrop Commodities, 1973

(In percent)

Product	Farm-wholesale mark-up	Wholesale-retail mark-up	Farm-retail mark-up	Farmers' share of retail dollar
Plantain.....	69	22	107	48.3
Eddoes.....	81	38	150	39.9
Sweet potatoes.....	74	30	126	44.2
Cassava.....	65	37	125	44.4
Bananas.....	57	70	168	37.2
Oranges.....	140	34	221	31.1
Grapefruit.....	66	57	160	38.4
Cabbage.....	74	21	112	47.2
Tomatoes.....	109	29	170	37.1
Black-eyed peas.....	1	31	32	75.0
Red kidney beans.....	43	106	196	33.8

1/ Source: Ministry of National Development and Agriculture.

In Charity, dealers paid an average of 7.7 cents per pound for ground provisions. When the dealers' costs are added to this, the produce must obtain 11.3 cents per pound in Georgetown, or a mark-up of 47 percent above the price paid to farmers. This figure approaches the margins that actually occurred (table 45). In the Northwest District, farmers at Kumaka and Morawhanna received an average of 6.9 cents per pound for ground provisions; however, when the total marketing costs are added, the dealer must obtain an average of 11.8 cents per pound in Georgetown, or a mark-up of 71 percent to break even. Likewise, for tomatoes shipped from Lethem, a farmer received 24.8 cents per pound, but when all costs were

added to the purchase value the dealer had to have a minimum of 32.9 cents per pound, or a mark-up of 33 percent to break even. In the Berbice area farmers were paid an average of 9.7 cents per pound for ground provisions but dealers had to have a minimum of 14.0 cents per pound, or a 45-percent mark-up, to break even. These calculations do not include a margin of profit and are based on moderate estimates of spoilage and damage. A wider margin would be needed if the dealer had higher losses.

Table 46. Estimated Marketing Cost per Hundredweight from Various Supply Points, 1973

(In dollars per 112 lbs.)

Item	Supply point			
	Charity[a]	Mora-whanna[a]	Lethem[b]	Skel-don[a]
Costs:				
Transportation to Georgetown.....	.31	.35	4.00	1.15
Handling costs....	.14	.18	.12	.15
Containers.....	.12	.12	.48	.15
Total costs....	.57	.65	4.60	1.45
Shipping losses:				
Spoilage.....	1.05	1.71	1.24	1.16
Damage.....	1.57	2.03	2.48	1.65
Total losses...	2.62	3.74	3.72	2.81
Total cost & losses.	3.19	4.39	8.32	4.26
Wholesale value.....	11.35	11.88	33.00	14.16
Break-even farm price.....	8.16	7.49	24.68	9.90
Farm price paid by GMC.....	8.62	7.73	27.78	10.86

a/ Based on shipments of ground provisions.
b/ Based on shipment of tomatoes.

In sum, the wide marketing margins in Guyana appear to be justified largely on the basis of costs and losses through damage and spoilage. In most cases the cost of spoilage substantially exceeds the operational costs including handling, transportation and containers. Even moderate losses in shipping ground provisions from Charity and Morawhanna amounted to more than 85 percent of the total cost of moving the produce to Georgetown. In Berbice, where most products move by truck, the losses on ground provisions averaged 65 percent of the total cost, and in the case of tomatoes from Lethem the losses in airshipment and handling were 45 percent of the total.

The marketing costs of private dealers were reported in general to be lower than those of the GMC. Private dealers supervised more closely the loading of their products onto boats and did not permit those handling the produce to toss or roughly handle the products. The GMC had no such control since the handlers were hired personnel with no personal investment in the produce they handled. Also, private dealers loaded their produce on the deck of the boats where it had better ventilation and was usually not stacked more than three bags high. In contrast the bags of produce purchased by the GMC were frequently stacked eight to ten bags high in the holds of the ships.

Current Government Marketing Programs

The Government of Guyana spends over $6.0 million per year on marketing programs of various types (excluding rice and sugar). Of this amount roughly $2.4 million can be said to be directed more or less specifically to foodcrops (table 47).

Table 47. Government Marketing Programs: Total Expenditures by Major Purposes, 1973

(In thousands of dollars)

	Total	Foodcrops
Improve marketing efficiency		
Market information, grades and standards	15	10
Market research	10	5
Expand marketing facilities		
Processing operations:		
Ministry ND&A	125	125
GMC	-225	50
Storage, handling and retailing operations (GMC)	-180	-100
Reduce transport costs		
Market roads construction	100	50
Interior roads	5,000	1,500
Air subsidy	130	100
Price support activity		
GMC foodcrop purchase program	630	630
GMC milk program	460	--
Total	6,065	2,370

Two items in the marketing budget dwarf all others with respect to foodcrops -- the interior roads program and the GMC foodcrop purchase program. The interior roads program is run by the Department of Interior to develop roads throughout Guyana's hinterland. These roads are generally into areas that produce foodcrops, but they also serve other industries and social purposes. Thus it was supposed that only about $1.5 million of the total program costs of $5.0 million could be considered for the purpose of serving new foodcrop areas.

The GMC foodcrop purchase program in 1973 had a deficit of about $630,000. This deficit, in addition to losses sustained at the milk plant and in some other enterprises, had to be covered by a combination of a $500,000 appropriation from the Treasury and profits of $400,000 from such other GMC operations as the fish market, wholesaling, processing and the New Amsterdam market.

With the exception of a few thousand dollars spent by the GMC for its own internal operations, Guyana spends virtually nothing to achieve marketing efficiency either in pricing or in a technical sense. No programs are directed to improving the efficiency of the private sector, which has a much larger role in marketing foodcrops than does the GMC.

The only other item of note in the budget's marketing programs is an amount of about $130,000 spent by the Special Projects Unit in the Ministry of National Development and Agriculture. Their primary activity centers around setting up a number of pilot canning units and other processing facilities throughout the country.

Special Projects Unit

The Special Projects Unit of the Ministry of National Development and Agriculture was started in 1971 to seek alternatives in domestic production when Guyana began to restrict processed foodcrop imports. Since then the agency has imported several Ball canning units that can be used temporarily to displace imports and can also provide canning experience prior to the introduction of commercial-scale facilities. The foodcrop-related activities and plans of the agency include:

. A small tomato processing plant at Black Bush Polder which could handle about 2,000 pounds of tomatoes per day. As a practical matter a plant of this size could turn out about 160,000 pounds of ketchup, paste and juice in 135 full operating days if a supply of tomatoes were available. In early 1974, the agency was trying to contract for tomatoes at 20 cents per pound. This price appeared unrealistic in view of the fresh market price that generally prevails even in season: in 1972 the GMC paid farmers an average of 27.5 cents per pound for its purchases, although this included some higher priced tomatoes purchased from the Rupununi.

. Various research studies and development efforts concerning the utilization of cassava for flour, starch, cassarep and livestock feed have been undertaken. These studies includes the possible use of a slush separator-centrifuge to separate starch from cassava juice, and the potential for quick fermentation of cassava with an inoculant to increase the protein content for human food or livestock feed.

. A multiproduct canning facility at Mabaruma is being developed that is capable of canning and bottling a wide variety of products from fruits and vegetables as well as producing dried fruits. The building for this facility has been completed and the plant should get underway soon.

. The equipment needed for lime and coffee processing plants is being installed in the Northwest area.

. A multiproduct canning facility at Charity similar to that at Mabaruma is in the planning stage.

. The operation of the cannery at Ruimveldt was handed over to the GMC in March 1973. Experiments had been carried out in the production of coconut milk and dessicated coconut, and production is now judged feasible enough for the establishment of a facility at Victoria, East Coast Demerara.

. The operation of the peanut butter and bean processing facility at Ruimveldt began in April 1973 and is still in the preliminary stages of operation.

. The operation of the can reforming plant.

. The operation of the compact canning center at Mon Repos since January 1973.

. In the planning stage are a compact multiproduct cannery at New Amsterdam and a processing complex at Lethem to handle primarily meat products but also a variety of vegetables, vegetable and meat combination products, cashews, and dried fruit.

. Development of a research facility to determine the best system to use in processing and preserving foods. The equipment has been ordered.

. Training staff in the science of processing is another function. Last year 23 persons were trained, and 5 were identified for further training at U.W.I. in Trinidad.

Guyana Marketing Corporation

The GMC was established in 1964 to absorb and broaden the functions of its predecessor agency, the Marketing Division of the Department of Agriculture. The GMC is a Government corporation that is self-supporting except for a Government subsidy which has amounted to about $500,000 per year in the past few years.

Today the GMC operates six programs, some of which are deficit operations and some of which produce a profit. These are:

- A minimum price support program for purchasing food-crops from farmers on the coast and at interior points.

- A wholesale operation to distribute purchased commodities to institutions, wholesalers, retailers, and consumers.

- A ham and bacon factory which provides an outlet for pork.

- A milk plant for which supplies are purchased from producers at minimum prices and sold to consumers at a loss.

- A cannery at Ruimveldt.

- Retail outlets in Georgetown and New Amsterdam.

The GMC conducts very little research, although several of its operations over the years could be categorized at least partially as pilot schemes. Basically, however, the GMC acts as a market participant to fill gaps where private enterprise would not venture, and in some cases to deliberately provide an element of competition.

The most important program of the GMC with respect to foodcrops is the produce purchasing program, which lost nearly $630,000 in 1973. It was set up originally in 1939 to encourage the production and distribution of foodcrops and to operate a price-support program for 10 major commodities. The price support activity was gradually extended until in 1967, 35 different foodcrops were included.

The 1939 legislation which is still in effect today requires the GMC to purchase from farmers, at some minimum price, any quantity of crops provided that the produce is of marketable quality and standard. The latter is interpreted by the GMC as a matter of policy.

The minimum prices are set mostly through negotiations with producer representatives. The current policy of the GMC is to purchase at all times even above the minimum price so as to better utilize its facilities. This policy in essence reflects a changing role from strictly price support to direct competition in the market. A few GMC purchases are made on contract with producers giving them an agreed-upon price above the minimum.

In 1973 another price policy change occurred: the minimum price for some foodcrops was set at a level equal to

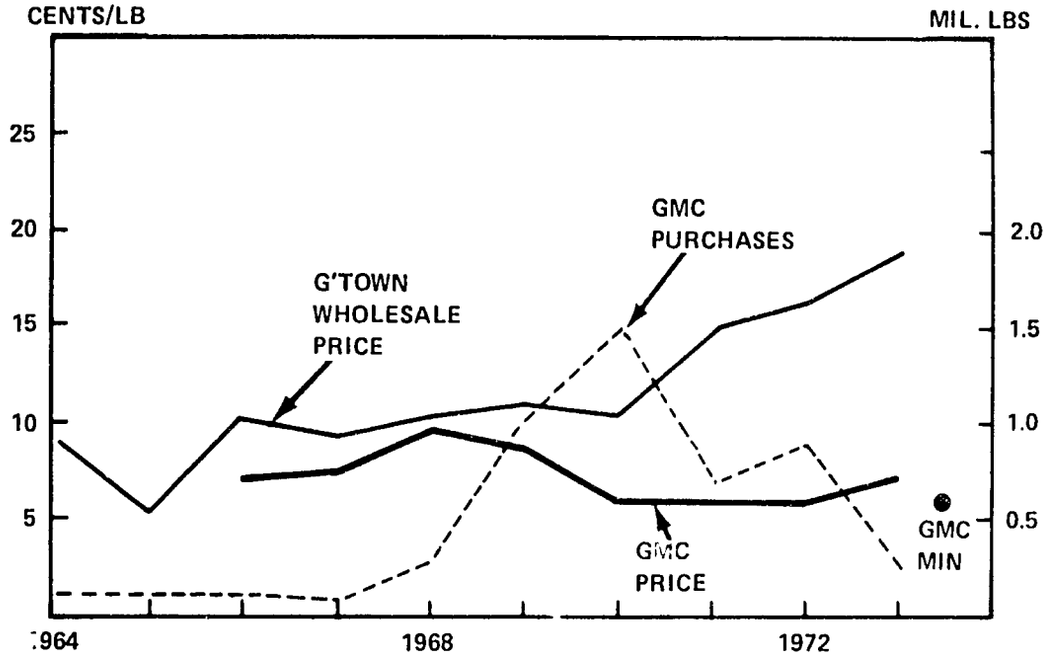
the landed import price of that product. By setting the price at the same level as the c.i.f. prices, the Government hoped to encourage increased production of the imported products.

Questions have already been raised in earlier parts of this section about the effectiveness of the GMC purchase and price support program. The agency purchases produce in a limited number of areas, and the published buying prices are often not posted prominently at the buying stations and in producing areas. The prices that were announced in January 1974, for example, were published in the newspaper with the largest circulation in Guyana -- about 115,000 papers daily. Because this circulation is mainly in the urban areas, farmers in many areas of the country -- especially in the riverine areas -- did not know of the changes in buying prices.

Over the years the GMC minimum buying prices for most foodcrops have tended to lag behind the general upward movement of wholesale prices. For commodities such as cassava, corn, pumpkin, and black-eyed peas, this lag began to be corrected to some degree beginning about 1972. However, for yams, sweet potatoes, plantains, eddoes, bananas, oranges, cabbage and tomatoes, the lag still persisted in 1973. This is illustrated in figure 12 for one commodity (yams); GMC price data for 1964-72 for most other foodcrops are in appendix K.

In January 1974 the GMC announced a new price "incentive" program that was to support the Government's effort to stimulate the country to feed itself. An examination of

FIGURE 12. GMC PRICING POLICY FOR YAMS, 1964-74



this list, however, suggests that the incentives were applied only to a few commodities for which the market had already generated higher prices (see figure 13 with an illustration for black-eyed peas). These included tomatoes, black-eyed peas, peanuts, corn and to some extent bananas. Most of the other "incentive" prices, however, were at or below the minimum levels of the previous years (table 48).

The GMC clearly has a problem of internal conflict of interest in performing its price support function. If it raises its incentive prices too high, it runs the risk of running high deficits in that operation. This creates difficulties since the budgetary allowance is fixed at $500,000 and there is a limit to the profits that can be earned from some of its other enterprises and passed to the support program. With these financial constraints it is not an unreasonable management strategy to limit "incentive" prices to commodities where there is little risk of losses through price support activities. In addition, this constraint also gives some possible credence to farmers' allegations that the GMC sometimes avoids buying in glut seasons by claiming that the farmers' produce is not of marketable grade or quality.

FIGURE 13. GMC PRICING POLICY FOR BLACK-EYED PEAS, 1964-74

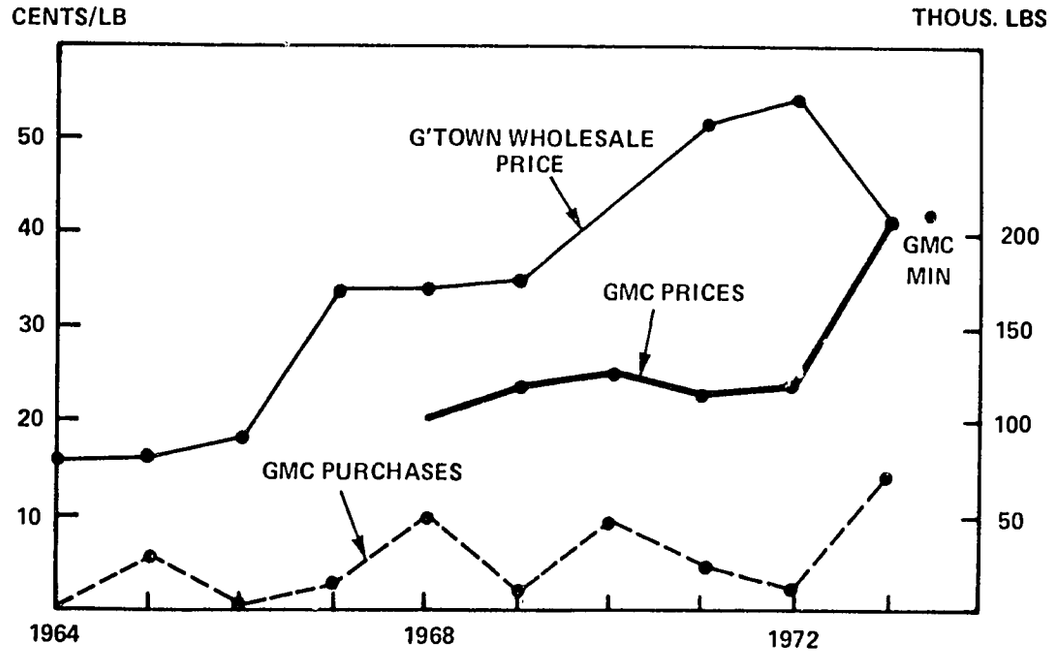


Table 48. GMC Buying Prices, 1973, and Minimum Prices, 1973 and First Half 1974

(In cents per pound)

Foodcrop	Average price, 1973	Minimum price	
		1973a/	1974b/
Plantains	8.3	4.0-9.0a/	7.0
Cassava			
Sweet	11.5	7.0	6.0
Bitter	3.9	4.0	4.0
Eddoes	6.9	7.0	6.0
Bananas	5.4	c/	6.0-8.0
Oranges	6.5	c/	6.0
Pineapple	9.8	4.5-10.0	6.0-10.0
Cabbage	17.1	15.0-17.0	15.0-17.0
Tomatoes	23.9	10.0-25.0	30.0-40.0
Boulanger	9.9	c/	c/
Pumpkin	5.0	2.0-6.0	2.0-4.0
Black-eyed peas	41.8	36.0-40.0	40.0-45.0
Red kidney beans	23.0	c/	c/
Pigeon peas (white) .	23.0	c/	c/
Peanuts	35.2	45.0	60.0
Corn	8.3	8.5	14.0
Starch	21.9	22.0	17.0

a/ Ranges indicate grade differences: Effective May-December 1973.
b/ Effective January-July 1974.
c/ Not listed on published sheets.

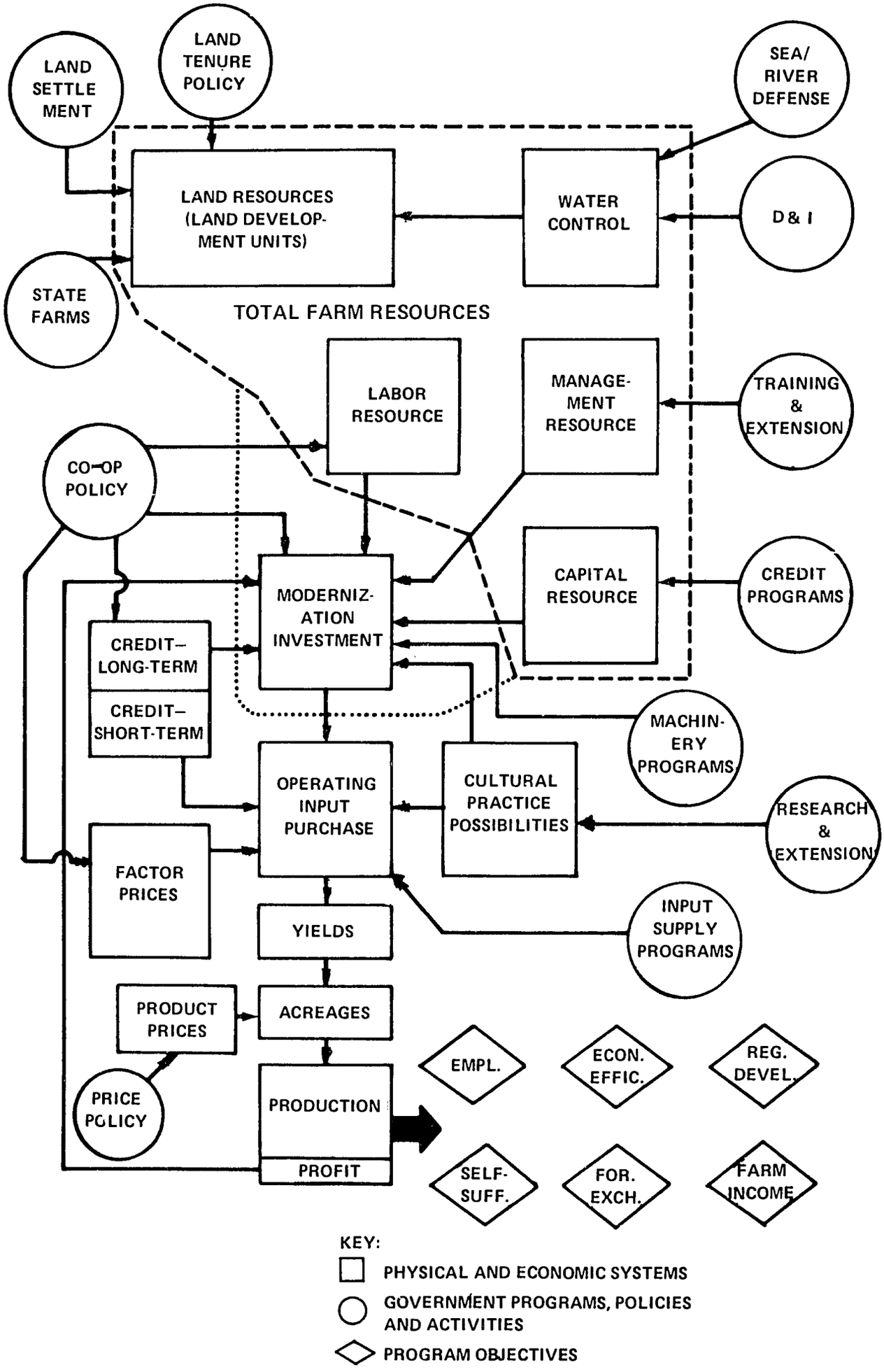
VI. INSTITUTIONS AND PERFORMANCE OF THE FARM INPUT SUBSECTOR

Many of the public agencies and other organizations allied to the agricultural sector are primarily concerned, in one way or another, with expediting the flow of farm inputs, broadly defined. The accumulation and dissemination of information, the extension of production credit, the assignment of rights to use of land, and the implementation of water control measures -- as well as the distribution of fertilizers and other production materials -- must all be considered elements of the farm-input delivery system. Few if any of these functions are performed by public or private agencies concerned only with foodcrops; most of them serve the agricultural sector as a whole, or some commodity or geographic subgrouping which is not coextensive with the foodcrops subsector.

A Conceptual Model

The performance of the organizations involved in the farm-input subsector is determined by relationships between some combination of policies, programs and activities, on the one hand, and the goals they are intended to achieve, on the other. Some of the major interrelationships among such elements of the farm input subsector are illustrated by the conceptual model of figure 14. More details pertaining to

FIGURE 14. MAJOR ELEMENTS OF THE FARM INPUT SUBSECTOR



the delivery system for farm input materials appear in figure 15.

In this model, public policies, programs, and projects act upon inventories and/or flows of resources, and also upon factor and product prices, to influence attainment of national goals of various classes.

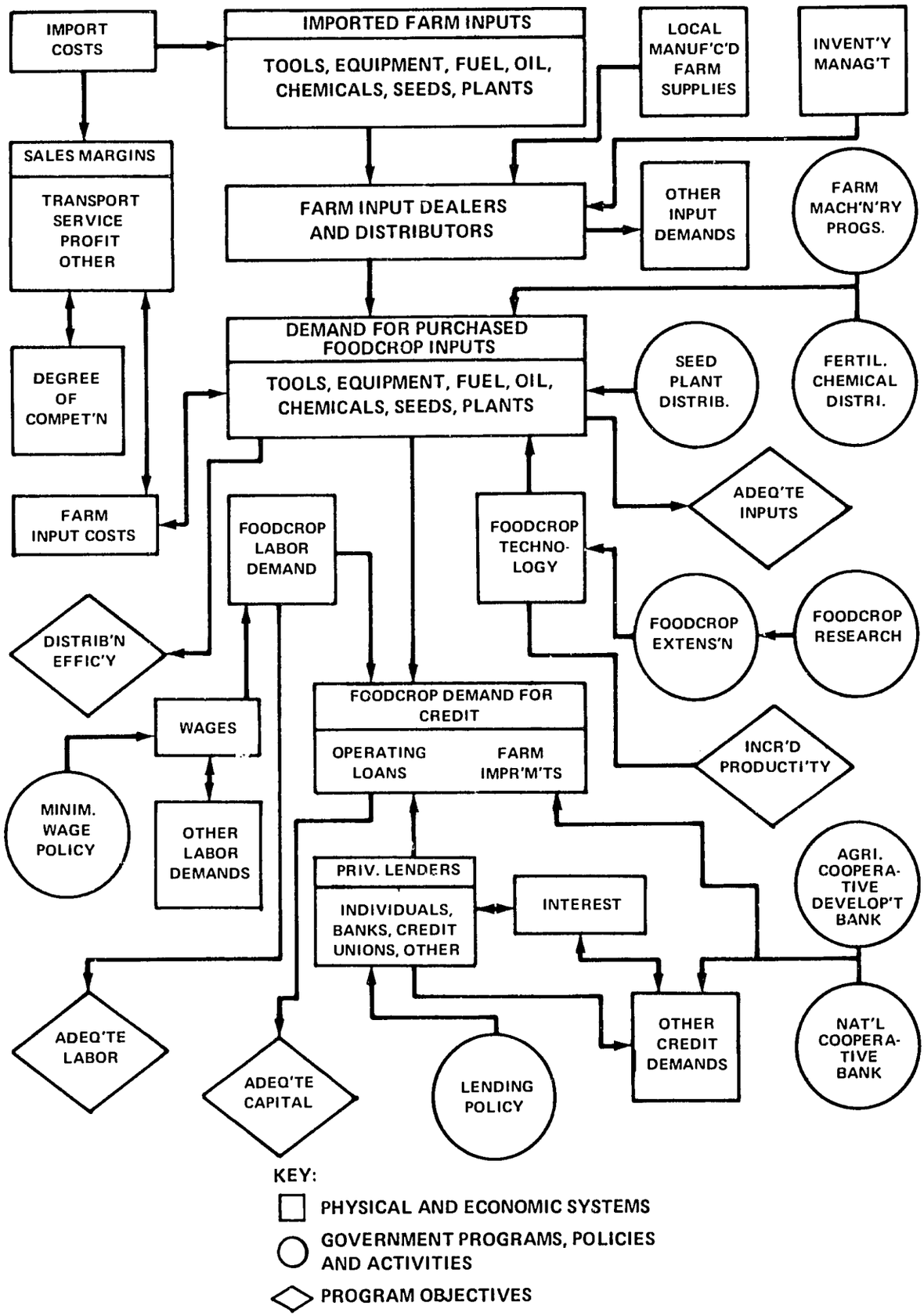
Central to the model is the idea that available supplies and potential use of production resources (rectangles within the dashed line in figure 15) can be affected by modernization investments. Foodcrop acreage, production, and farm returns are then adjusted in response to the new farm resource situation, taking account of such variables as price relationships, credit availability, and options with respect to cultural practices.

Also implicit in the model is the notion that the performance of the foodcrop sector can be influenced by modifying public expenditures for various programs and projects. Hence, after a discussion of the major responsibilities and professional resources of the principal Ministries, attention will turn to the agricultural portion of the national budget and the circumstances surrounding its development, before subsystems for the delivery of specific farm inputs are considered.

Key Ministries and Administrative Units

Responsibility for most policies and programs affecting foodcrop development rests with the Ministry of National Development and Agriculture. Currently, the Minister who heads this entity also serves as Deputy Prime Minister. He is assisted by a Minister of State for Agriculture and by

FIGURE 15. A SCHEMATIC OF THE FOODCROP FARM INPUT SUBSECTOR MODEL



six Regional Ministers (figure 16). Recent changes have brought together under this team most functions directly related to development of agriculture and the interior. In fact, the Minister holds broad responsibility for the social, economic, and political development of Guyana.

The Ministry now includes the following departments:

. Agriculture -- dealing with the technical aspects of crop and livestock production

. Lands -- dealing with surveys and administration of state and Government lands

. Land Development -- dealing with specific settlement projects

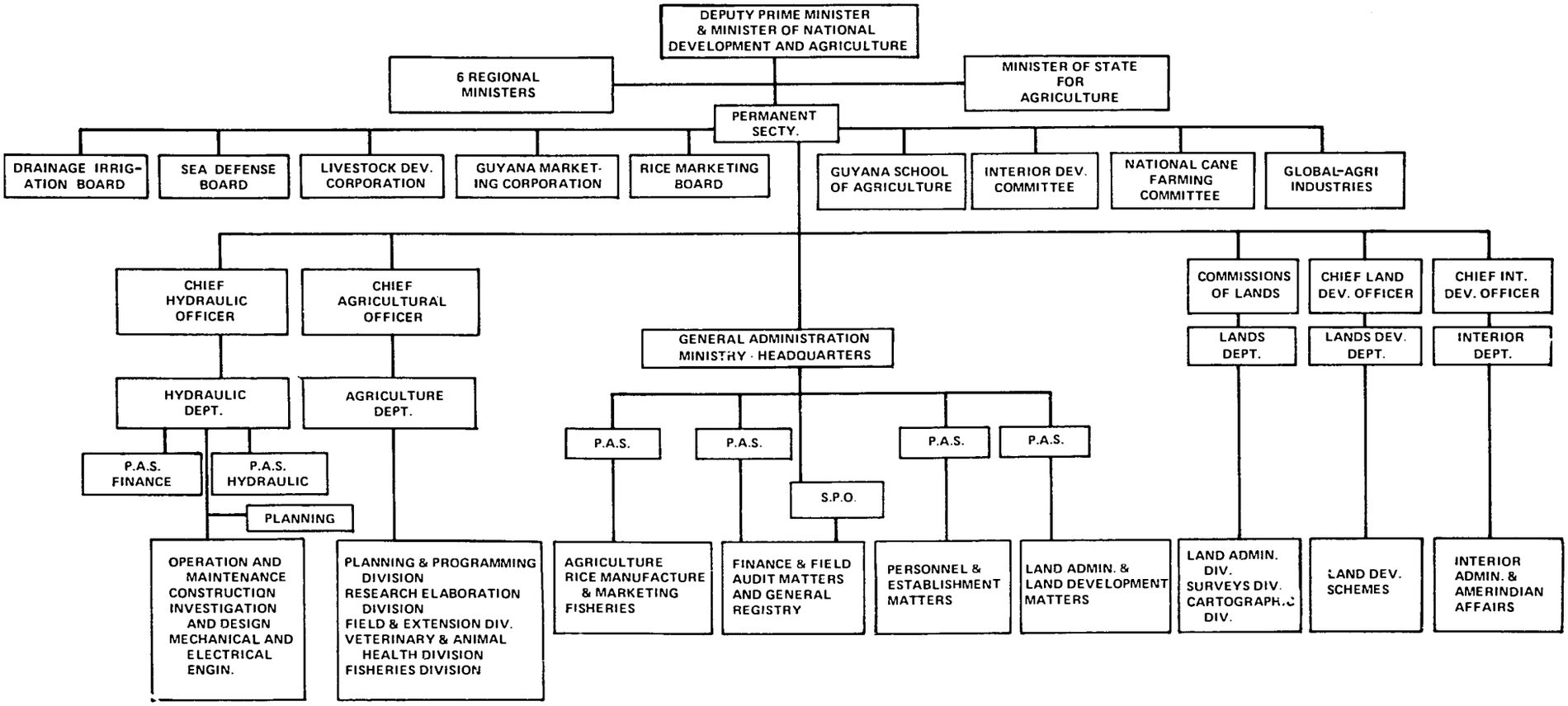
. Interior -- dealing with administration of the interior and Amerindian affairs

. Hydraulics -- dealing with irrigation, drainage, and sea defense.

The Guyana Rice Marketing Board and the Guyana Marketing Corporation also come within the purview of the Ministry.

Other Ministries are responsible for certain programs of direct relevance to the foodcrop sector. These include the Ministry of Cooperatives and National Mobilization, with its cooperative training program and the emerging National Service; the Ministry of Foreign Affairs, with its modest export market development program; the Ministry of Health and Education, with its food and nutrition programs; and the Ministry of Economic Development, with its planning and budgeting functions.

FIGURE 16. ORGANIZATIONAL CHART INDICATING ACHIEVEMENT OBJECTIVE AND DISTRIBUTION OF FUNCTIONS OF THE MINISTRY OF NATIONAL DEVELOPMENT AND AGRICULTURE



Management Personnel

The planning and management of Government programs require personnel with substantial training and practical experience. For its small size, the Guyanese Government has a fairly large staff of individuals trained for agriculture, including about 100 who have one or more university degrees. These professionals are supported by about 170 people with certificates or diplomas from the Guyana School of Agriculture or from a similar institution in the Caribbean area (table 49).

Considering the large number of agricultural programs and projects being implemented throughout the country, however, this staff is comparatively small and spread exceedingly thin. It is so thin, in fact, that consideration might be given to consolidating some of the ongoing programs and projects for more effective use of the available managers.

The National Budget for Agriculture

The total expenditure to achieve agricultural objectives for 1973 amounted to nearly $50 million, of which $22 million was spent by the departments and corporations under the direct jurisdiction of the Minister of National Development and Agriculture. In total, about 22 percent of the national budget for agriculture was directed toward foodcrop objectives (table 50).

More than $31 million was spent for farm inputs and production programs, but much of this was spent by the Rice Marketing Board. Sizable expenditures were also made in pursuit of livestock production goals. Thus, only about $7 million was spent to foster foodcrop production, and most of

Table 49. Professional Staff for Agriculture in the Ministry of National Development and Agriculture and the Ministry of Cooperatives and National Mobilization by Educational Attainments, 1973/74

Ministry	Ph.D.	M.Sc.	B.A. or B.Sc.	Diploma in agri.	Certificate in agri.	Totals
Ministry of National Development and Agriculture:						
Research	2	4	9	10[a]	15[a]	40
Extension	0	2	9	34	16	61
Veterinary	0	2	9	5	42	58
Resource and Development	0	2	2	1	0	5
Land Settlement	0	0	0	2	0	2
Interior	0	1	1	1	10	13
Lands Department	0	0	0	4	0	4
Drainage and Irrigation	0	3	15	0	0	18
Guyana School of Agriculture	0	2	4	3	0	9
Ministry of Cooperatives:						
Kuru-Kuru College	0	1	7	4	0	12
Other	0	0	0	6	2	8
Public Corporations and Boards	0	9	14	6	7	36
Total	2	26	70	76	92	266

a/ Rough estimate.

Table 50. National Budgetary Expenditures for Agriculture and Related Programs, 1973[a]

(In millions of dollars)

Program objectives	Ministry of ND&A	Other ministries	Total	Allocation to foodcrops
Production goals				
Supply new technology	5.74	--	5.74	2.18
Improve management	.53	.84	1.37	.83
Provide land to workers	3.71	--	3.71	1.85
Improve water control	6.76	--	6.76	.90
Supply farm inputs	6.13	--	6.13	.10
Supply farm credit	7.46	--	7.46	.60
Stabilize farm prices	-10.57		-10.57	.70
Subtotal	19.94	.84	20.78	7.16
Consumption goals				
Improve mutrition	--	.70	.70	.58
Consumption incentives	--	13.18	13.18	.47
Expand exports	--	.40	.40	.09
Subtotal	--	14.28	14.28	1.14
Marketing goals				
Improve efficiency	.67	--	.67	.02
Operate marketing facilities[b]	4.45	--	4.45	.15
Reduce transport costs	.13	5.10	5.23	1.70
Subtotal	5.25	5.10	10.35	1.87
Administration and overhead	2.48	1.60	4.08	.80
Grand total	27.67	21.82	49.49	10.97

a/ Includes capital and current accounts.
b/ Excludes a one-time expenditure for the construction of rice silos.

this sum went mainly to research and the operation of state farms.

One of the largest items of expenditure was the $13 million spent on the wheat flour subsidy. Expenditures for the attainment of marketing goals were concentrated in two major areas -- about $4 million for operating facilities of the Rice Marketing Board and about $5 million for construction of roads in the interior.

The Budgeting System

As indicated earlier, the national budget is the principal expression of the Government's agricultural policies. Yet certain characteristics of the present budgeting system impede the flow of resources to those agricultural programs and activities which could make major contributions to Guyana's development objectives. These characteristics reflect the way in which budget expenditures are classified and the process by which the budget is prepared.

Classification of Expenditures

Expenditures in Guyana's budget are classified, as in many national budgets, according to two key aspects: the departmental unit which is to spend the funds, and the object of expenditure, such as salaries, travel, supplies, and equipment. Such data are useful for budgeting and auditing, but the classification does not provide an adequate basis for informed choice in allocating public resources toward the attainment of national goals. The key deficiencies of the classification system are that:

. It does not permit identification of separate program components, so that costs and effectiveness can be assessed before budget decisions are made, and so that managers can be held accountable for results.

. It does not relate expenditures to national development objectives and agricultural targets. Since the purpose of the budgeting process is to allocate scarce resources among programs in a manner which best serves such objectives, there is some merit in a corresponding budget classification.

To overcome these limitations of the present budget classification, revised estimates of 1973 public expenditures related to agriculture are allocated in table 50 according to a suggested program structure that appears to be consistent with the objectives of the Guyanese Government. This exercise enabled us to identify relative expenditure levels for various agricultural purposes. The last column of table 50 is our estimate of expenditure for the foodcrop sector.

The program objective classification is based on the articulation of a set of goals for agriculture.[1/] For example, "increasing farm production" requires programs for research on technology and for supplying farm inputs including credit, improved water control, and production materials. Marketing goals, on the other hand, include programs to improve marketing efficiency, to expand marketing facilities, and to reduce transport costs.

1/ See appendix J.

A more detailed classification could, in turn, permit identification of the activities or projects which comprise the basic components of each program. "Crop research" expenditure, for example, could be shown for each station, or alternatively by crop or by research function. A budget organized in this manner would provide decision-makers with a clearer view of expected program contributions to each objective, thus enabling them to make more informed budget decisions. Accountability for progress toward goals could also be strengthened.

A program structure need not be incorporated in the official, published budget. Used only as an informal mechanism for organizing and compiling expenditures (within the Ministry of National Development and Agriculture, the Ministry of Economic Development, the Ministry of Finance, or any combination of the three), it can still make program analysis more effective. It is not suggested that the particular program structure used here is the most appropriate one for Guyana. There are undoubtedly several alternative program classifications which would more nearly serve the purpose of current policy-makers. Ideally, as national objectives and agricultural goals change over time, the program structure should also be changed.

The Budget Process

Throughout the budget process, a separation is maintained between the capital and current budgets, each of which is subject to adjustments at various levels of Government. Principal administrative units, such as Research and Interior, first formulate and submit their estimated requirements. These requests are reviewed by the Ministry, where an effort is made to integrate agency requests and

examine the merits of new programs. To facilitate this budget review, the Ministry has established a standing committee of senior officers, which is intended to function on a continuous basis rather than only during the "budget season."

The results of the Ministry's review of the current budget are passed on to the Ministry of Finance, while the capital budget is forwarded to the Ministry of Economic Development. Each is examined separately by the recipient ministry. It is only at the final stage of budget preparation that the two components are brought together, and then solely for the purpose of measuring total financial needs. The Ministry of Finance examines budget requests by items of expenditure (salaries, travel, materials, etc.) rather than by programs. Adjustments tend to be arbitrary, with the previous year's expenditures used as benchmarks. Bargaining discussions between the Ministry of National Development and Agriculture and the Ministry of Finance are a principal ingredient in the determination of budget allocations. Under these circumstances, current budget decisions for agriculture do not reflect a planned allocation of resources. This is particularly significant since the major share of the Ministry of National Development and Agriculture expenditure is from the current budget, which becomes an indispensible support for development efforts.

The Ministry of Economic Development is attempting to move toward a review of budget programs and away from emphasis placed solely on controlling expenditures. It has recently designed a project-based structure for the capital budget of each Ministry and has introduced new budget forms which request information on benefits, physical progress, project-related costs, and the like. These innovations are too new

to be assessed; their introduction will probably be a long and demanding task. Limitations of time and staff for analysis in the Central Planning Office, and financial constraints, often compel the Ministry of Economic Development to adjust budget allocations arbitrarily. Program evaluation in a formal sense is seldom undertaken, hurried "cuts" must sometimes be made because of resource constraints which become evident only when budget publication is imminent; and budgets are examined on an agency-by-agency basis, thus reducing the possibility of integrating complementary programs (those of the Ministry of National Development and Agriculture with those of the Ministry of Cooperatives and National Mobilization, for example).

In sum, the process of preparing the budget, while similar to that in many developing countries, clearly affects the allocation of resources to agriculture (and more specifically, to the foodcrop sector) and the achievement of Guyana's national development objectives. Different agencies examine different components of the budget independently, each using its own interpretation of objectives and criteria for making budget decisions. The separation of the current and capital budgets also reduces the effectiveness of the agricultural program in numerous ways, since the two budgets are highly complementary for most agricultural projects. The failure of the budgeting process to integrate complementary programs also affects program effectiveness. Few activities of Government have more interrelationships with other programs than do those of agriculture. In brief, the budgeting process does not incorporate the basic elements of planning, nor is there any assurance that the budget for agriculture necessarily reflects the accepted Five-Year Plan.

There is yet another element of the budgeting process which influences the effectiveness of agricultural programs: the procedure for releasing budget funds by the Ministry of Finance. The budget does not guarantee that the Ministry of National Development and Agriculture, or other agencies, will receive the funds allocated, since the Ministry of Finance must approve the release of funds on a quarterly (or sometimes monthly) basis. In the process of doing so, budget allocations are further adjusted. The Ministry of Finance may not release all the funds required for some projects and may postpone releases for others.

Decentralization of Development Planning and Administration

Prior to the 1974 budget year (January to December), all development plans, programs and projects were prepared by the Ministries. For 1974, a directive issued by the Deputy Prime Minister decentralized development planning to six regions under Regional Ministers.

The directive anticipated that identification and preliminary planning in the first instance could be better articulated on a regional basis and that well-conceived, integrated, and internally consistent regional programs embracing all "subjects" would form the basis for each national "subject" program (health, agriculture, education, etc.) for the planning period and for annual budgeting. Development, monitoring and review of performance throughout Guyana would essentially be implemented on the basis of geographic regions.

Knowledge for Agriculture

The Agriculture Department devotes a major portion of its resources to acquiring and disseminating knowledge for technological progress in agriculture. Its staff members also perform various administrative, regulatory and service tasks. Agricultural field assistants, for example, distribute planting materials, generate estimates of agricultural output in their respective areas, and sometimes are expected to initiate enforcement actions pertaining to the protection of public and private property. Here, attention will focus on activities in research, extension, and classroom instruction, particularly insofar as these support the production of foodcrops.[1/]

Foodcrop Research

Primary responsibility for foodcrop research in Guyana rests with the Crops Research Division. Its total budget in 1973 was about $1.7 million, of which an estimated $1.5 million was spent on foodcrops. Research expenditures on rice, livestock, poultry, and pastures would raise the total agricultural research budget to about $3 million, or about 2.5 percent of gross output value -- a comparatively high figure, particularly as sugar is a major contributor to output and does not require a corresponding public research input. Certain studies by the sugar companies and other

1/ Between 1969 and 1973, Guyana's activities in agricultural research, and to a lesser degree in extension and classroom instruction, benefited substantially from technical assistance provided on a broad range of topics by the University of Florida, under a contract made possible by USAID. Activities and results are thoroughly documented in a set of reports on file in the USAID/Guyana Memory Bank, and need not be reviewed in detail here. Since 1973, technical assistance specifically related to various aspects of

private firms, however, as well as research at the University of Guyana, are relevant to foodcrop production.

The Crops Research Division

This division not only conducts plant research on a wide array of topics[1/] but also has important responsibilities for propagating planting materials, assisting in the control of pests and disease, and performing laboratory analyses of soils. The division is headed by a principal agricultural officer. The staff is composed of approximately 2 people with doctorates (5 had Ph.D.'s in 1970), 4 with master's degrees, 9 with first degrees, 10 with diplomas, and 15 with certificates.

Planning and control of research projects is strongly centralized at the Central Agricultural Station, Mon Repos, which has all the division's laboratory facilities and 1,000 acres of land representing the three principal soil types of the coastal zone. Other environmental conditions required for a research program of national scope are to be found at seven additional facilities, as follows:

- The Central Horticultural Station, Timehri, which has some experimental plots but is also

developing the production and processing of soybeans has been provided by consultants of the University of Illinois, also financed through USAID and documented in reports to be found in the Memory Bank.

1/ See, for example, "A Bibliography of Soil Science Research in Guyana," by H.A.D. Chesney and K. Gordon, Central Agricultural Station, Mon Repos, 1973.

the major center for propagation of planting materials.

. The Ebini Station, where some trials with foodcrops are conducted on the brown sands of the Intermediate Savannahs. This is now primarily a livestock station.

. The Wauna Research Demonstration Plot, Northwest District, where trials with oil palm, citrus, and provision crops are made on podzolic soils with a high content of organic matter.

. Long Creek Research Plot, on the Soesdyke/ Linden Highway, mainly used for pineapple research and to develop farming systems suitable for the white sands of that area.

. Kairuni Research Plot, on the Soesdyke/ Linden Highway, used for research on the brown sands of that area.

. Matthew's Ridge Research Plot, used for research on a wide range of foodcrops and livestock.

. Black Bush Research Plot, used mainly for trials of tomatoes and other fruits and vegetables.

Most of the scientifically designed and controlled research is carried out at the central stations at Mon Repos and Timehri. The other facilities are mainly used to

demonstrate the feasibility of growing particular foodcrops in different areas of the country. This function is supplemented by field trials on farmer plots, at land development schemes, and on other Government lands. For instance, the St. Ignatius Livestock Station in the Rupununi has had limited trials with black-eyed peas, peanuts and tomatoes; potato trials are underway at several locations near Kato and Paruima; and Progressive Farmers' Schemes have worked with a number of foodcrops. It is now proposed to establish new crop research stations at St. Ignatius in the Rupununi and also in the Mazaruni.

Research at Mon Repos, and to some degree at other locations, focuses largely on yield improvement, with studies on soil fertility, fertilizer trials, variety trials, plant densities, time of planting, and chemical control of weeds and pests. During 1970, the last year for which a detailed description of experiments and results is available, crops studied included sorghum, which was the subject of several investigations; soybeans (at Ebini Station and Black Bush Polder on clay soil, as well as at Mon Repos); peanuts (at Ebini and Kairuni); black-eyed peas; cassava; sweet potato; pineapples; carrots; cabbage; tomatoes; corn; red kidney beans (at Kairuni, Mon Repos and Matthew's Ridge); citrus; and coconuts (primarily relative to disease and pest control). Only the coconut research took place predominantly in the field; this research included a field survey of coconut damage caused by bud rot and red ring diseases and by poor drainage.

Although the Central Horticultural Station at Timehri is primarily intended as a plant propogation center, it is the site for some research. During 1972, for example, fertilizer trials on citrus were continued for the 4th year,

citrus root stock trials were undertaken, and several varietal and fertilizer trials were conducted for such crops as grapes, tumeric, and corn. Most of this work is supervised by the staff at Mon Repos.

The Crops Research Division is generally tardy in reporting its results. This lack of reporting is not necessarily a serious matter since the division is small and oral communication is much easier than in large research institutions. Most of the research ultimately is published in an annual publication entitled Agricultural Research, Guyana and some appears in the Ministry's Annual Report (which may also appear only after a lapse of 2 to 3 years). Findings also reach the field through a series of extension circulars: 17 of these were released by research officers during 1970.

In view of the wide range of crops that are grown in Guyana and the introduction of new crops in recent years, the research staff can scarcely be expected to study topics in appropriate depth. Under these conditions, the division has wisely chosen to direct much of its attention to adaptive research applicable to the principal crops and major soils, rather than to emphasize basic research and plant breeding. It also seems appropriate that some of the division's resources be used, as at present, on propagation of planting materials for distribution to farmers, on soil testing work requested through extension, and on demonstration trials.

On the other hand, research which is largely geared to increasing crop yields may be a luxury in a country whose uncultivated lands are virtually unlimited. Moreover, recent developments in world fertilizer markets suggest that the time is ripe to explore cultural systems which incorporate soil-building rotations, fallowing schemes, and/or applications

of organic wastes (including sugar and rice mill byproducts). Nonchemical systems of defense against pests and weeds also deserve more study. Finally, Guyana has little if any research on the economical use of irrigation water -- an input which is costly to deliver, if not scarce in an absolute sense.

The University of Guyana

The University of Guyana's Geography Department has produced resource inventories for the Canals Polder, the Islands of Wakenaam and Leguan, and the East Bank Demerara area; another is being initiated for the Northwest region. In each case, a multidisciplinary team examines both physical and socio-economic factors affecting agriculture and foodcrop production.[1/]

Private Sector Studies

Both of the sugar firms conduct studies relevant to their own interests. Bookers has a Project Evaluation Unit charged with identifying profitable new schemes for diversification. The recommendations of this unit are supported by trials for soybeans, cassava, cotton, grasses, and market garden crops. Cocoa, oil palm, jute, and bananas have also been studied in the past. The Demerara Company has concentrated most of its recent research on a pilot oil-palm scheme at St. Jan on the West Bank of the Demerara River.

Geddes Grant, a firm engaged in distributing farm supplies, tests new chemicals for possible commercial distribution in Guyana through demonstration trials conducted

1/ Other University research has led to publication of a book on Guyana's Edible Plants, by Dr. Omawale, who is now studying the nutritional values of such plants.

with the cooperation of 8 to 10 farm operators. These field trials are concentrated along the coast and complement the Agriculture Department's tests conducted on farmers' plots throughout the country.

Foodcrop Extension

Primary responsibility for extension education pertaining to foodcrops rests with the Field and Extension Division. Although the division provides some assistance to cane farmers and to livestock producers, most of its $750,000 budget is spent in the foodcrop subsector. As in the case of research, this input is augmented to a limited degree by activities of private firms, and also by efforts of other public entities, such as the new Agricultural Co-operative Development Bank. Total extension efforts, including those for rice, accounted for expenditures of more than $2.5 million in 1973.

The Field and Extension Division

The staff of the Field and Extension Division is comprised of 2 professionals with master's degrees, 9 with bachelor's degrees, 34 with diplomas in agriculture, and 16 with certificates in agriculture. The division is headed by a principal agricultural officer, assisted by agricultural officers responsible for work in cane farming, fruit crop extension, apiary extension, agricultural credit, and agricultural communication.

Field personnel for extension are assigned to 44 locations in 7 districts, each supervised by a district agricultural officer. Also, there are three field officers for the land development schemes at Black Bush Polder,

Matthew's Ridge/Kaituma, and along the Soesdyke/Linden Highway. In addition, four agricultural field assistants are assigned to liaison work with schools. A few members of the field staff are stationed at such interior locations as Bartica, Hosororo, Wauna, Moruca, and in the Rupununi, but most serve portions of the coastal area from the Pomeroon to the Corentyne River. Staff size has declined since mid-1972, partly because some officers took employment with the newly formed Agricultural Co-operative Development Bank.

Extension workers employ a typical range of techniques in performing their duties. In 1971 they made 18,000 farm visits and completed 21,000 interviews; they distributed 3,000 circular letters; held 750 group meetings, short courses, and field days; conducted 300 farm tours; and presented nearly 3,000 group demonstrations. In addition, 222 radio broadcasts were made, 7,400 booklets were issued, 79 exhibitions were held; 24 film programs were shown; and 145 newspaper articles and 28,000 subject-matter circulars were distributed. Such numbers measure some of the intermediate inputs for extension education, but they tell little about the results, except that workers have attracted an audience.

The theme of current extension work is "Let's Feed Ourselves." This has entailed preparation and distribution of educational materials covering a wider selection of crops than was formerly the case. Some Progressive Farmers' Schemes have been organized with significant success -- for example, the egg and vegetable production projects at Bachelor's Adventure, the peanut project at Wauna, and currently the corn project in the Berbice River area.

The Ministry of Education and the Department of Agriculture participate jointly in a program of agricultural education in primary schools. This work entails appointment of diploma graduates of the Guyana School of Agriculture, formation of school gardens, and provision of extension advice to teachers and pupils.

Extension workers perform a variety of tasks under difficult conditions, and their efforts have met with mixed success. Such activities as distributing seed and planting stock might be classed as "service" rather than as "extension education," but the service activities open the way for educational contacts and often contribute to establishing demonstrations. The extension workers' general administrative duties as field officers of the Ministry are less clearly related to educational results, and sometimes may tend to reduce the willingness of farmers to confide in the extension worker.

More importantly, the main thrust of extension efforts over the years may have been somewhat wide of the mark. The long-term focus of extension efforts has been strongly placed on higher yields and the use of agricultural chemicals in achieving them. Evidence is lacking, however, that yields have risen substantially in the last decade or two. The program may have been weak in reaching farmers, or in convincing them, or perhaps in both.

In a country with only a fraction of its total land area under cultivation, acreage expansion is a plausible alternative to yield intensification as an economic source of additional output. Under such conditions, certain farmers might still benefit from the kinds of practices which have been encouraged by extension, but others would almost

surely be slow to adopt unfamiliar techniques requiring the use of costly inputs. Moreover, extension workers may sometimes have recommended practices more likely to yield economic benefits under controlled research conditions than under the high-risk environment of Guyana's foodcrop farms. Such questions need to be examined in reorienting both research and extension programs. Extension in land and water management, moreover, is virtually nonexistent, as is guidance on the appropriate selection, use, and maintenance of farm tools and machinery.

Technical Assistance from the Private Sector

In addition to the extension and education activities of Government agencies, the firms of Bookers and Geddes Grant provide limited technical assistance to foodcrop farmers as part of their commercial operations. Bookers, for example, has made minor efforts to promote contract growing of high-value foodcrops and has helped farmers with technical assistance. Geddes Grant, a major distributor of agricultural chemicals to farmers, provides manufacturers' guidelines to use of purchased inputs.

Classroom Instruction

For more than a decade, the Guyana School of Agriculture has held a key role in providing specialized training in agriculture for workers to serve in various public agencies and private enterprises. It is a public corporation which received a subsidy in excess of $150,000 from the national treasury in 1973. Total current expenses in that year were approximately $300,000. Other and newer sources of technical instruction pertaining to agriculture include

the Kuru Kuru Co-Operative College, situated near the Soesdyke/Linden highway, and the Burnham Agricultural Institute at Arakaka in the Northwest region.

The Guyana School of Agriculture

The Guyana School of Agriculture was established about 10 years ago to provide middle-level training for agricultural staff. Its objectives are:

- To train technical staff for the extension and research services of the Ministry of National Development and Agriculture and for private enterprise

- To train teachers of vocational agriculture

- To provide in-service training for Ministry of National Development and Agriculture staff, and for staff members of other Government bodies concerned with agriculture

- To train farmers

- To prepare academically inclined students for further studies.

Since its establishment, the school has produced 318 diploma and certificate graduates. The diploma course is of 2 years' duration and is for persons with a secondary school education. Some 54 teachers of agriculture for primary schools have been professionally trained and awarded a teacher's diploma. The certificate course is also a 2-year course, but for students with only primary education.

In addition, the school gives short summer courses in specialized subjects for active farmers. The school has not, however, provided in-service training for Government officers (although University of Florida advisers have provided some training of this sort, but not under school auspices). A limited number of students are from outside Guyana (Grenada, Belize and Montserrat).

A cannery has been established at the school to provide practical experience in the new food processing courses set up during 1973. Farm machinery courses will be upgraded by the planned appointment of an agricultural engineer. The school also has ties with the Burnham Agricultural Institute, established in 1973 in the Northwest District.

Notwithstanding the importance of water control to the agricultural development of Guyana, the only related subject taught at the school is a course in hydrology (meteorology and stream-gauging) and soil and water conservation. The one agricultural engineering course does not deal with pumps or other water-lifting devices.

Kuru Kuru Co-Operative College

The cooperative organization has been identified in Guyana as the vehicle for development of the country's resources. Accordingly, considerable importance is attached to the opening in 1973 of a college which aspires to become the main center of education on cooperatives not only in Guyana but also in the Caribbean.

The college, which occupies a 680-acre parcel 33 miles from Georgetown, is now in its first year of resident instruction, and will conduct a wide variety of on-campus and extramural courses for the following clientele:

- Extension workers, teachers, Youth Corps trainees, and Government and corporate officers in need of a knowledge of cooperative organization

- Cooperative society personnel in need of specialized training (including preregistration training)

- Management personnel from top and middle levels of Government and non-Government agencies

- Students at other educational institutions in Guyana.

Extramural courses will be run in all districts and will in many cases deal explicitly with agricultural management.

The Burnham Agricultural Institute

Another newly established instructional facility is the Burnham Agricultural Institute, which accepts applications from young men and women genuinely interested in a farming career. Entrance requirements include a sound primary education or high school training, together with farm experience in crop, livestock, or related farm activities. The institute accepts students of 16 years or more for 1 year of training embracing both crop and livestock production.

The Control of Water and Land Use

Some of Guyana's thorniest institutional problems concern the legal, organizational and administrative framework within which farm operators use land and water for crop production.

Like other agricultural inputs, land can be developed effectively only after it come under the control (legal or otherwise) of an entrepreneur who is willing to take the risks of production. At present, only a small fraction of Guyana's land surface and potential cropland is under effective control. The basic rights to land are vested largely in the state, and actual or prospective farm operators must depend on the state to assign new rights to the use of land and to defend rights already assigned.

Once the operator of a farm unit has established his control over the use of a given area of land, he is likely to find himself with almost no control over water flow. In some cases, there is a need to establish control over flows of water for irrigation, but the more common problem in Guyana is to prevent the entry or expedite the outflow of excess water. This has required the construction of elaborate sea and river defense structures and drainage works -- a task which is not ordinarily practical or economical on a farm-by-farm basis.

In establishing rights to land use, the problems are mainly legal and administrative, although the mere task of issuing titles as evidence of such rights cannot be accomplished effectively without solving the technical problems of identifying parcels accurately by survey or other means. In establishing control over water flows, the technical

problems to be overcome are much greater, but technical solutions cannot be implemented without institutional arrangements designed to permit an acceptable sharing of costs and benefits among farm operators and other individuals or groups. Such institutional arrangements interact with the institutions and problems related to land tenure.

The ability of foodcrop farmers to establish some degree of control over the use of land and over the flows of water upon it depends upon the effective functioning of institutions and programs related to land tenure, land settlement, and water management. Given the crucial role of water management in agricultural development, it will be convenient to consider related institutions as they have evolved in the course of land occupation, before discussing land tenure problems and land settlement projects.

Water Management and Land Occupation

When the early Dutch and British settlers first occupied lands previously held by Amerindians, they tended to locate on the banks of the rivers at some distance from the sea, thus avoiding the problem of erecting major sea defense works. In these locations, they were able to contend with drainage problems on a plantation-by-plantation basis. During the 18th century, however, attention turned from the depleted soils of the riverine areas to the unexploited clays nearer the coast, which could be reclaimed from the sea and brought under cultivation only with extensive drainage and sea defense structures. Slave labor made possible the substantial investments in the dikes, kokers, and seawalls which were initiated by Dutch planters and still continue in use. These structures permitted

development of the bulk of Guyana's agriculture on a uniformly flat coastal plain which lies several feet below mean high tide.[1/]

Typical structures included a sea defense dike along the plantation facade and dikes along the sides and back of the plantation to prevent the ingress of water moving toward the sea. The sidelines were common to two plantations and were bordered by main drainage canals fed by a system of internal drains and leading to sluices or kokers at the sea (or river). A main irrigation canal (middle walk trench) ran along the centerline of the plantation to supply irrigation and navigation water from the swamp (conservancy) at the back. By the late 18th century, this general pattern of occupancy and water control structures had been established at least for the first depth (some 9,300 feet) all the way from the Pomeroon to the Corentyne.

Drainage originally depended upon the gravity flow at low tides of empoldered plantation water. Providing drainage discharge outlets can be kept free of sediment and debris, effective gravity drainage of many areas is possible because of a tidal range which is 7.75 feet at Georgetown for spring tide and about half as much for neap tide, and which extends, in both low and high flow seasons, for some 40 to 50 miles up the major rivers. Because of a much narrower tidal range along such smaller rivers as the Canje, Abary, Mahaicony, and Mahaica, gravity drainage is insufficient to prevent flooding during the wet season and pumped drainage is

1/ Mean high tide is 54.4 G.D. (Georgetown Datum), but average land level in Georgetown is only 50.50 G.D.

required, as is now the case in other coastal areas where foreshore accretion has impeded the maintenance of discharge channels.

Because of complex interactions among physical, chemical, and biological forces, Guyana's coastline is subject to alternating periods of erosion and accretion which require either the rebuilding of sea defenses or the excavation of drainage outlets. Construction and upkeep of extensive water control structures were possible on a plantation-by-plantation basis prior to the abolition of slavery in 1838, but became much more costly thereafter.

Vacated plantations frequently were converted to villages occupied by freed slaves, who often held the land in common under a single deed, and by East Indians upon termination of their indenture contracts. Economic and social conditions made it difficult for either group to establish any viable and remunerative form of agriculture on the small parcels of land over which they sometimes had only tenuous control; on the other hand, they could scarcely make the necessary inputs for maintaining the water control structures necessary to effective farming.

Lands held in common descended to heirs as undivided rights now known as "children's property." These rights and the corresponding responsibilities became more and more ambiguous with the passage of time. When plantations were partitioned, they were often divided into long narrow strips, running parallel to the sidelines, which commonly provided an equitable distribution of the sandy and clay soils but complicated the problems of maintaining drainage on any one parcel. For such reasons, effective drainage and irrigation of the Canals Polder are exceedingly difficult to this day.

Between 1840 and 1940, public efforts were repeatedly necessary to avoid endangering the interests of large planters through the imminent collapse of a water management system partly dependent on support from resident and non-resident landholders in poor and often unorganized villages.

Sea Defenses

Because the breaching of sea defenses often caused major harm to the adjacent inhabitants, ordinances requiring maintenance of such structures were among the early measures for state intervention in water management. By 1923, sea defenses for the entire coast had become a responsibility of the Colony, at no direct expense to proprietors. This is essentially the situation in declared Sea Defense Districts at present, although the City of Georgetown contributes $2,500 to this purpose annually.

Sea defense works are now, for the most part, maintained by the Sea Defense Board. The Board oversees 210 miles of works, of which approximately 25 miles are natural reefs often overtopped during spring tides, and approximately 50 miles are seawalls of various types. The remaining sea defenses are earth embankments. Extensive rehabilitation and extension of seawalls is currently underway in East and West Demerara, and new embankments are being constructed in the Pomeroon, Essequibo Islands, and elsewhere.

Sea defenses outside declared areas and river defenses are the nominal responsibility of local authorities and private proprietors, sometimes with substantial central Government contributions or full central Government responsibility for maintenance and improvement.

River Defense

River defense is administratively more complicated. The central Government and local authorities share the responsibility; however, the extent to which the central Government will financially contribute and assume construction and maintenance responsibility is normally a matter for considerable negotiation only after serious floods.

Irrigation

Irrigation is, for most purposes, dealt with as part of "drainage and irrigation." The major exceptions to this are the water conservancies, but even these serve for both flood water storage and irrigation. Irrigation is hardly new in Guyana. The Tapakuma project, for example, began in 1828 as a joint effort of plantation owners along the Essequibo Coast to build a reservoir and water distribution works to their lands. Government began to appoint Conservancy Commissioners to supervise operation and maintenance of the works in 1874, but control was left in proprietors' hands until 1927 (and the demise of sugar in Essequibo). Evolution of control of the Boerasirie and adjacent conservancies in West Demerara was similar; it is now under the Drainage and Irrigation Board. Only the East Demerara Water Conservancy (which now includes the Lamaha Conservancy) remains in control of Commissioners who represent sugar plantation proprietors.[1/]

1/ The Drainage and Irrigation Board controls a small area in this Conservancy for drainage and irrigation purposes, and the City of Georgetown has representation on the East Demerara Water Conservancy Board for water supply purposes.

Drainage

Drainage responsibilities are presently divided among private proprietors, local authorities, Conservancy Commissioners and the Drainage and Irrigation Board. In many respects the gradual transfer of responsibilities from private proprietors and local authorities to central Government was similar to the process with respect to sea defense, but it has been slower in occurring. Full central Government responsibility for drainage (and irrigation) is not yet accepted.

Until 1923 drainage was considered solely a matter of local authorities. By 1923, however, it was clear that the new sea defenses were all too successful in preventing water flow -- both in and out.[1/] As a result the Government made it compulsory for local authorities and private proprietors to execute approved main drainage schemes -- with a 40-percent central Government subsidy and central Government technical support and supervision. Local authorities were to be fully responsible for internal drainage. Recommended works were completed by 1927 but, in fact, the central Government subsidy amounted to considerably more than 40 percent because of the difficult financial situation of local authorities.[2/] As maintenance of works deteriorated and arrears in payments increased, it became necessary by

1/ The sea defenses were designed to encourage foreshore accretion and to discourage erosion. This effectively blocked discharge channels from kokers. To save money, training walls from koker to low water level were not built and too few discharge channels were opened.
2/ From 1933 to 1942, drainage costs absorbed an average of 43 percent of annual local authority revenues, and essential works still could not be done.

the early 1940's to forgive all local authority debts for capital costs of main drainage works, thus establishing the principle that such costs are a central Government responsibility.

In 1944 a Drainage, Irrigation and Sea Defense Department was created with increased central Government responsibility for major works. Local authorities were limited to paying 80 percent of maintenance costs of gravity works and 60 percent of costs of pump works. Capital costs of works in declared areas and of "special" works outside these areas were entirely borne by the central Government.

In essence, this situation still exists today, although it has evolved to make it more responsive to the needs of Guyana. In 1973 the most recent of these changes placed the Hydraulics Department within the Ministry of National Development and Agriculture. This department provides technical services to the Drainage and Irrigation Board, which maintains facilities in 35 declared areas. Private proprietors, however, continue to have their own works -- primarily on sugar estates -- as do local authorities which have responsibility for most internal works in declared areas and for all works outside of declared areas (although they may receive financial and technical assistance from the central Government for these responsibilities).

In declared areas, local authorities collect drainage and irrigation rates intended to cover their costs and the amount due the Drainage and Irrigation Board. This amount is in theory 80 percent of the maintenance cost in gravity-drained areas. (The calculation is more complicated in pump areas but is a function of the 1938-43 payment.) The central Government thus agrees to pay a minimum of 20 percent of

maintenance expenses and to pay 100 percent in Land Development Areas and on state lands. In practice, however, rates in many areas are "pegged" at an exceedingly low level, with the unpegged portion of the local share being additional subsidy. Even so, many rates are far in arrears and effectively uncollectible.[1/] Moreover, many assessed valuations, which provide the bases for local assessments, have gone without revision for decades. In 1955, for example, one local authority was found to be using 1846 assessments for its rate computations. Aside from the fact that necessary financial resources are not mobilized, the present water payment system leads to inefficient water use.

As should be clear from the foregoing, local authorities retain responsibilities for drainage and irrigation in the following cases:

- All works outside declared areas
- Internal works inside most declared areas
- The collection of rates in all areas.

Local authorities, however, are proving now to be no more capable of effectively discharging these responsibilities than they were a century ago. They are being assisted by special grants, including recent "flood relief" monies, but no comprehensive program exists to ensure that the local authorities do provide the requisite drainage and irrigation works. As a result, many declared drainage and irrigation areas are without internal works,[2/] and undeclared areas (with the exception of sugar estates) are almost uniformly

1/ In the Vergenoegen/Bonasika area in 1974, for example, the intended share of computed cost is estimated at $4.42 per acre, but the rate to be levied is only 5 cents.
2/ See appendix F, table F-1.

poorly drained. Internal works remain difficult to construct because of local authorities' financial and organizational problems, the shape and fragmentation of plots, and uncertainties regarding land titles.

The consequent absence of effective water control in many areas constrains increased foodcrop production. On existing foodcrop farms, investments in yield improvement or acreage expansion entail high risks without water control. The establishment of new farms is also frequently conditioned by the prospect of water control, and, as pointed out later in this chapter, some land settlement schemes have been abandoned because drainage and irrigation systems were not developed.

One of the most striking features of recent drainage and irrigation history in Guyana is the magnitude of the decline in capital expenditures on drainage and irrigation works. These expenditures from 1965 to 1974 will be approximately one-tenth of the amount spent from 1955 to 1964.[1/]

Land Tenure Problems

Present land tenure in the coastal and riverine areas of Guyana has evolved from the peculiar interaction of the special problems of water management with the general course of agricultural and social development. Rights acquired under early grants and long-term leases were usually clearly defined, many of them still being reflected on present-day

1/ Slightly more than one-tenth if flood relief (1972-74) and sea defense capital expenditures are included.

maps (see, for example, figures 7-10). Large landholders still suffer a few inconveniences from anomalies in their tenure situation, but the rights of many smallholders are far more ambiguous. Although such ambiguities may present few obstacles to producers now engaged in foodcrop production, the situation is entirely different for those who would like to gain access to unutilized lands with some production potential, particularly in the riverine areas.

Rights to the use of land have been distributed in various forms: grants, provisional grants (homestead), conditional grants, provisional free grants, licenses of occupancy, leases, and permissions. Other lands are "state" lands or "Government lands", the latter class being those lands acquired by Government from private holders. At present, rights are mainly issued in the form of leases or permissions. Private lands may be acquired under transport (deed), letters of decree, certificates of registration, and leases. However, the transfer of private rights has often been difficult, and has been complicated by the existence of "children's property," which reflects undivided interests held under joint ownership. In addition to the above-mentioned methods of acquiring land, rights can be acquired through prescription or inheritance. Prescriptive rights refer to the acquisition of title to land by squatters after adverse possession of 12 years on private lands or 30 years on state lands. Inheritance, by tradition, implies an equal sharing by all children in the property of their parent, in the absence of a valid will to the contrary.

The process of transferring rights in land to potential users has often been cumbersome or impossible under circumstances which have evolved over time. As long ago as 1897, the Head of the Crown Lands Department told the

Chairman of the West Indies Royal Commission that "...private land is not so easy to obtain on account of much of it being locked up, and also on account of the titles of land in the river banks not being satisfactorily settled. Titles are not defined." Today, tenure rights to as much as one-half of all private lands may be uncertain.

To improve the situation, a Lands Registry Ordinance was enacted in 1959 to adopt the Torrens System of land registration, in place of the mixed Roman/Dutch and English systems, and to provide for the recognition of claims and issuance of certificates of registration. Under this procedure, certain parts of Guyana have been declared Land Registration Areas, whereupon the Land Court appoints a Lands Department Surveyor and the Registrar of Deeds provides a list of lands held in various ways. Presentation of all claims to these lands -- whether arising through transport, inheritance, or prescription -- is then invited.

The Lands Department surveyor and a representative of the Ministry of Housing subsequently prepare a plan for the area, identifying lands to be relinquished by legal claimants so as to permit needed infrastructure development. After meetings and advertisements, a judge of the Land Court authorizes issuance of a title, which is unassailable except in instances of proven fraud.

Installation of this system throughout the coastal and riverine areas can do much to resolve ambiguities in land tenure, and hence facilitate the establishment of additional foodcrop farm units by would-be farm operators. Unfortunately, the limited number of registered surveyors now engaged in the survey work is a constraint to rapid progress. Although their output might be enlarged by employing

additional aides, other constraints seem to affect overall progress.

In other countries, identification of common bounds on aerial photographs has been substituted with favorable results for the time-consuming process of ground surveys. Upon the initiative of the Commissioner of Lands and Mines, an act permitting this procedure in Guyana was promulgated in 1970 and a pilot project is now underway along the Mahaica River. If the test is successful, it will be appropriate to consider a much larger project.

The inability of would-be farmers to acquire reasonably secure tenure over lands not now under cultivation appears to be the major tenure constraint to expanded foodcrop production, although there are other constraints. Tenant rice growers, for example, are prohibited from changing the use of land without permission of the owner, who may also be a rice miller with an interest in a continuing supply of rice for his mill.

These and other concerns have led to a number of studies of land use and tenure problems. A land use study begun in 1970 was presented with detailed recommendations to the Government in January 1971. In March 1974 a Land Reform Committee was appointed to continue probing such issues.

The Second Development Plan endorsed recommendations of the 1970-71 study to the effect that uneconomic (fragmented) and unoccupied parcels be acquired by Government for redistribution. A decision was also made to rely on 35-year leases in future distributions of agricultural lands. Use of a land tax to encourage more intensive use of land in Guyana has also been proposed, but no action has been taken to date.

Public expenditures to resolve tenure problems consist of relatively small amounts expended by the Land Department for survey, cartographic, and administrative activities, and by the Ministry of Justice for the work of the Land Court and the Deeds Registry.

Land Settlement Projects

Guyana's experience with settlement projects dates back to 1880 when the Government began to distribute plots of land to East Indian laborers who desired to remain in the country after completing the period of their indenture. Since then, Government involvement in land settlement projects has continued under various agencies and along various patterns.

In a number of cases, these settlements have been on abandoned sugar plantations. Plantations on the East and West Coasts of Demerara were acquired and distributed by the colonial government between 1910 and 1913. The Anna Regina Plantation on the Essequibo Coast was acquired in 1923, and after undergoing several administrative phases came under control of the Department of Agriculture in 1954. Other projects were sponsored by the Local Government Department prior to 1943, when a Land Settlement Department -- now the Land Development Division of the Ministry of National Development and Agriculture -- was formed.

The Land Development Division has been responsible for some 12 separate settlement projects over the last two decades. (The number would be somewhat larger if additions to established projects were counted separately.) One of the 12 (Garden of Eden) was handed over to a Local Authority under the Ministry of Local Government in 1968 and is no

longer a responsibility of the Land Development Division. Two others (Cane Grove and Vergenoegen) also have been declared Authorities under the Local Government Ordinance, but certain responsibilities remain with units of the Ministry of National Development and Agriculture. Lands of the Mara Scheme (East Bank Berbice) were turned over to the Livestock Development Company, after various problems led to the abandonment of many of the parcels. Similar abandonment at the nearby Brandwagt/Sari Scheme reduced the number of active settlers to seven or eight members of a small co-operative society, operating under the Co-operative Department.

This leaves the Land Development Division with continuing responsibility for six schemes, the oldest being at Charity/Amazon -- now included with Anna Regina, Tapakuma, and associated extensions under the title "Essequibo Land Development Scheme." This project and the larger one at Black Bush Polder provide about 40,000 acres for some 2,000 families that are now established in growing rice and some foodcrops. As yet, the number of settlers firmly established along the Soesdyke/Linden Highway (in Demerara) and at Matthew's Ridge and Wauna/Yarakita (in the Northwest District) is relatively small, but around 160,000 acres have been designated for occupancy in these schemes (table 51).

Although the objective has been to turn settlement projects over to local authorities as soon as feasible, it is obvious that such progress has been slow. It has not been expected that the projects would generate budget surpluses or that the Government would recover its capital investments. In fact, however, project revenues have not even been sufficient to cover operating and maintenance expenses, particularly if allowance is made for public

Table 51. Features of Land Settlement Projects Now or Formerly of the Land Development Division

PROJECT	YEAR STARTED	APPROX. ACREAGE	SETTLERS TO BE ACCOMMODATED	MAIN CROPS	WORKS	REPORTED PROBLEMS	PRESENT STATUS
Garden of Eden, East Coast Demerara	1956	1,000	75	Now sugarcane, formerly foodcrops	Minor D & I	Land subsidence on pegasse; irrigation water	Now a local authority under Ministry of Local Govt.
Cane Grove, West Coast Demerara	1947	7,200	500	Rice, pasture, provisions	Minor D & I	Drainage, roads, water wastage, toxic soils	Land staff withdrawn 1960; now a local authority but under control of Ministry of ND & A
Vergenoegen, East Coast Essequibo	1946	3,400	200	Rice, cane	Minor D & I	Part-time farming	Land staff withdrawn 1960; now a local authority but under control of Ministry of ND & A
Mara, East Bank Berbice	1957	3,800	130 a/	Formerly rice, citrus	Minor D & I	Drainage, irrigation, transport	Most lands to the Livestock Development Company
Brandwagt/Sari, East Bank Berbice	1963	10,000	50 b/	Vegetables, citrus	Some D & I incomplete		One small co-op society of 7 to 8 members operates under Co-op Dept.
Onverwagt, West Bank Berbice	1955	6,000	400 c/	Rice	Minor D & I	Cattle pasture flooded or too dry	Proposed to establish a residential area
Anna Regina/Tapakuma, East Coast Essequibo – Extension	1954 / 1963	12,000	750	Rice	Major D & I, social infrastructure	Drainage	Included in a District Council Area in 1970; local authority now proposed
Charity/Amazon, Pomeroon	1944	170	180	Provisions, citrus	Village infrastructure	Flooding	Established
Black Bush Polder, Corentyne	1960	27,000	1,300	Rice, foodcrops	Major D & I, roads & social infrastructure	Water management, machinery schedules, unauthorized occupancy (also see Appendix D)	Plan for creating local authority in 1968 has not materialized
Wauna/Yarakita, Northwest	1960	34,000 d/	45 d/	Foodcrops	Roads, land clearing	Land clearing by settlers without occupancy	Proceeding slowly
Soesdyke/Linden, East Coast Demerara	1968	64,000 e/	400 f/	Pineapple, other fruits, vegetables	Roads, social infrastructure	Class IV soils	Proceeding rapidly
Matthew's Ridge, Northwest	1968	64,000 g/	640 h/	Citrus, pastures	Land clearing, social infrastructure	Land cleared faster than occupied; flooding	Proceeding

a/ Initial plan.
b/ In pilot cooperative.
c/ Nonresident.
d/ The pilot project is 1,500 acres and is to accommodate about 45 families.
e/ 2,000 acres allocated to date.
f/ Initial phase.
g/ Not more than 9,000 acres cleared to date.
h/ Early efforts directed toward accommodating the 640 former miners.

outlays to supplement rates paid the Drainage and Irrigation Board (table 52).

Expenditures directly related to the projects totaled almost $1.2 million in 1973, whereas revenues collected were only about $0.5 million (table 52). Other items raise the division's total outlays to nearly $3 million, with revenues of about $0.7 million. The division employs more than 1,500 workers. Its current staff is headed by a Chief Land Development Officer, a Senior Land Development Officer, 2 Project Managers, 13 Land Development Officers, and 10 technical specialists.

Emphasis in the earliest projects was simply on distributing land. Even by 1910-13, when houselots were sold and agricultural plots rented to settlers on 99-year leases at Windsor Forest, for example, the relatively intact plantation infrastructure provided some basis for the success of this type of settlement.

More recently, the division has had to clear or improve land and provide basic infrastructure (sometimes with assistance from other Government agencies). The division then lays out lots and selects settlers -- sometimes according to poverty criteria rather than on the basis of potential capability for farming. The Agriculture Department assists by preparing farm plans. This general pattern has been followed at the Essequibo Projects and Black Bush Polder. 1/ In the latter project, particularly, some control over cultural and marketing activities is made possible by

1/ See discussion in appendix D.

Table 52. Estimated Expenditures and Revenues for Designated Settlement Projects, 1973

(In dollars)

Project	Estimated expenditures				Estimated revenue
	Salary/ wages	Drainage & irrigation	Maintenance, miscellaneous	Total	
Anna Regina	60,000	93,000	47,000	200,000	75,000
West Demerara[a/] .		19,000	7,000	26,000	5,000
Vergenoegen	5,000	50,000	5,000	60,000	50,000
Black Bush	37,000	455,000	108,000	600,000	300,000
Amazon/Charity ..	5,000	4,000	10,000	19,000	8,000
Mara	17,000	13,000	30,000	60,000	1,000
Garden of Eden ..	--	11,000	--	11,000	10,000
Onverwagt	22,000	23,000	5,000	50,000	30,000
Cane Grove	13,000	71,000	28,000	112,000	30,000
Wauna	28,000	--	17,000	45,000	1,000
Total	187,000	739,000	257,000	1,183,000	510,000

a/ Windsor Forest, La Jalousie and Hague.

the fact that farmers rely on scheduled irrigation and machine custom services, and on other inputs advanced on credit to be repaid when the crop is acquired by the Rice Board.[1/]

To date, the project at Matthew's Ridge corresponds more nearly to a state farm, although individual settlers are expected to operate increasing acreages of land in the future. A considerable amount of central infrastructure developed in connection with manganese mining operations became available to the Government when mining ceased, and action was taken immediately to provide agricultural employment for members of the unemployed familes. Prospective settlers can now apply for up to 25 acres of land, including 3 acres cleared of forest cover and 1 acre prepared for planting. A total of at least 7,000 acres between Matthew's Ridge and Port Kaituma have reportedly been cleared to date, of which only about 400 are in citrus and other foodcrops.

Apart from the land settlement projects already mentioned, several state farms account for additional land being brought into agriculture. At Kibilibiri, on the Intermediate Savannahs, several thousand acres are being developed for mechanized production of such crops as corn, soybeans, and black-eyed peas, through Global-Agri Industries, Ltd., a relatively new public corporation which falls under the jurisdiction of the Ministry of National Development and Agriculture. The Interior Department has a

1/ Some significant distinctions among various types of settlement projects are suggested in a classification by Robert Chambers, Settlement Schemes in Tropical Africa (New York: Praeger, 1969), pp. 231-238.

project at New River, where settlers clear land for themselves, receiving a subsistence advance. Youth Corps projects come under the Guyana Defense Force.[1/] The Army already has a farm at Garden of Eden and proposes to increase its self-sufficiency by establishing units in the Northwest, Pakaraima, Soesdyke/Linden, and Intermediate Savannah regions.

The following general observations may be made with respect to land settlement projects in Guyana:

. Many projects were started on a crisis basis, and the hurried pace of initial development created difficulties. Matthew's Ridge, for example, has been plagued by supply and settler problems consequent to its hasty initiation at the closing of the mines.

. After some projects were begun, the settlers were abandoned to their fates before the promised infrastructure materialized. Mara, Brandwagt/Sari and Onverwagt are examples.

. There have been serious delays in surveying and in issuing leases to settlers. Cane Grove and Vergenoegen have been plagued by security of tenure problems for years.

. Water control difficulties have led to the abandonment of some projects and severely hampered

1/ For a description of the program to establish hinterland agricultural townships as part of National Service, see "State Paper on National Service by the Prime Minister," National Assembly Sessional Paper No. 3/1973, December 1973.

efficient operation of others. Effective water control has not always preceded settlement.

. Scheduling of irrigation and machinery services has in some cases been deterimental to maximum production due to lack of cooperation among such involved personnel as project administrators, Drainage and Irrigation personnel, Rice Corporation machinery schedulers, and Agriculture Department plant propagators.

. Rental charges are commonly unrelated to true soil productivity or to choice of cropping pattern.

. It is intended that control over the Land Development Division projects will go to the settlers, working together under local authorities. Although this process has been completed in Garden of Eden and is underway in other projects, it is slow, thus tying up valuable personnel who could be shifted to problem areas or new schemes.

Local Government

Local authorities in village and country districts have been established with responsibility for control and management of undivided lands, water control works not under the Board of Drainage and Irrigation, and certain roads.[1/] They

1/ For a useful historical description of the evolution of local government institutions in Guyana, see Alan Young, Approaches to Local Self-Government in British Guiana, Longmans, London, 1958.

are authorized to collect rates and fees and can require private proprietors to maintain watercourses. Local authorities can make agreements with neighbors and negotiate terms for drainage through lands of adjoining proprietors. Provision is made for declaration of "special works" for drainage and irrigation that can be eligible for central Government support. The central Government has District Commissioners in each district. In coastal districts (except the Northwest) these activities are coordinated by the Ministry of Local Government. In recent years another set of District Officers in the Interior Department, Ministry of National Development and Agriculture, has been assigned to deal with Amerindian affairs and hinterland development.

Interior Lands

Administration of state lands in the interior and of Amerindian Districts and villages is done by the Interior Department, Ministry of National Development and Agriculture. Amerindians continue to enjoy certain rights to unalienated Crown Lands and to waterways for collection of forest, fishery and mineral products. In 1966 an Amerindian Lands Commission was established to determine areas where Amerindians were ordinarily resident; to recommend the nature and areal extent of land rights to be distributed, and the persons within each group of Amerindians to receive such rights; and to recommend which freedoms or permissions should be continued. Thus the Government declared its intent to abolish the reservation system and to grant legal ownership of lands to Amerindians.

The commission reported in 1969 and, after some discussion of the needs of Amerindians in view of the agricultural system of shifting cultivation, recommended that freehold title to lands be vested in councils that

could grant freehold title to individuals with central authority approval. Individuals living in mixed communities such as in the Pomeroon would be given freehold title. The Government is in the process of implementing these recommendations.

Cooperative Organization in Agriculture

Although cooperatives are not directly responsible for provision of any one input to foodcrop producers, they are under certain circumstances capable of facilitating farmer access to input needs for attainment of Guyana's national goals. It is essential to bear in mind that Guyanese planners not only emphasize the ability of cooperatives to help mobilize savings and credit and to increase farmer control over supply and marketing, but that they equally stress the role in cooperatives creating a republic characterized by egalitarianism, self-reliance and national unity. In the Second Development Plan it was stated that:

> The attraction of co-operativism lies in its propensity to promote egalitarianism and the equitable distribution of the benefits of economic activity; in its ability to create self-reliance and, as a result, greater self-employment opportunities; and in its capacity to promote national unity, since various groups could live and work together in the co-operative unit.... Moreover, co-operatives are able to mobilize financial and human resources and human resourcefulness....1/

Thus, economic efficiency is but one of several criteria by which the performance and potential of cooperatives must

1/ p. 115.

be judged. It is apparent from numerous Government policy statements that cooperatives are to be a cornerstone of Guyana's development policy. Consequently, proposed alternatives for increasing foodcrop production must assume that cooperatives will be present, but the kind of cooperatives is in question.

In a preceding section, it was seen that Guyana's land settlement projects range from those that merely lease land to settlers to those that have a high degree of centralized control over production and marketing. Similar considerations apply to cooperatives in Guyana. Reasonable expectations about any change to be effectuated by the cooperative will depend on the type of cooperative under consideration. For example, a cooperative whose members perceive advantages in joint production, supply, and marketing activities, and who are dedicated and disciplined to realize those advantages, is naturally more likely to produce desired changes than is a cooperative whose members see it only as a way of satisfying a Government regulation.

Agricultural cooperatives in Guyana may be classified as follows:

1. Credit
    a. Credit unions
    b. Agricultural thrift and credit societies
    c. Cooperative banks

2. Land societies

3. Supply and marketing
    a. Primary marketing societies
    b. National/regional marketing societies

c. Machinery cooperatives
d. Processing societies
e. Input supply societies
f. Irrigation and drainage

4. Production cooperatives
   a. Collective production
   b. Mixed (collective and individual)

Unfortunately, no comprehensive list of Guyanese co-operatives, with facts about their functions and performance, is available. Kuru Kuru Co-Operative College is presently compiling such a list.

Credit Cooperatives

The Co-Operatives Division of the Ministry of Co-Operatives and National Mobilisation recorded 620 savings, thrift, and credit societies at the end of 1971. Many of these, however, are school thrift societies, nearly defunct credit unions unable to attract members' savings in significant quantities, or urban societies. There were 103 agricultural (thrift and credit) societies in 1971 with 9,500 members -- down from 10,500 members in 1962. The Co-Operative Bank now has responsibilities with respect to credit cooperatives.

Land Societies

There are 127 land societies, with almost 9,000 members, registered with the Co-Operatives Division. These societies have been allocated nearly 108,000 acres, of which about 48,000 acres are cultivated. The division, however, is able to classify only nine of these societies as "good"; that

is, as relatively free from major problems. Eighty-one societies report their lands are affected by drainage difficulties that severely hamper production, and 21 have serious problems with access roads.

Neither of these problems is surprising in view of the role of land societies in Guyana. Although land societies are encouraged to undertake cooperative activities for land improvement, credit mobilization, and the rationalization of supply and marketing, they rarely do so; instead they function solely to obtain Government and state lands on a priority basis. These lands, however, are nearly always in need of water control, and they tend to be isolated in third-depth or backdam areas where access is difficult, especially when the dams are muddy from rain. If these lands did not present these problems, they would probably be farmed already. The society receives these lands, but then divides the land into individual parcels for its members, and the idea of cooperation soon seems to be forgotten.

This is what is known as a "top-down" cooperative organization, whereby farmers form cooperatives to obtain favors from the Government, not to mobilize their collective resources to increase production. As a consequence, farmers do not tackle drainage and irrigation problems through the cooperative, or construct access roads or mobilize credit for improvement of the collective capital stock.

In the case of some land societies, of course, provision of adequate water control is beyond one society's capabilities because of the magnitude of the works required. For other societies, access to credit and technical assistance, as well as a cooperative spirit of self-help, would alleviate the most serious problems. Rarely do members finance their co-operative effectively.

The length of time required to get a land survey and to issue leases is a further difficulty which retards productive cultivation by land societies. This problem has been attributed to a shortage of trained and experienced land surveyors. In some cases, a decade or more has elapsed after society registration and land allocation without leases being issued. Under such circumstances, members of the society are reluctant to occupy their lands.

When societies have been able to raise some capital for development purposes, funds have sometimes been mismanaged, an outcome encouraged by lax controls and auditing.

Some societies have successfully farmed their allocated acreages and have cooperated to purchase machinery on credit or to improve water control. An example is the large Port Mourant Follow-Up Society that cultivates 6,000 of its allocated 7,100 acres. The 488-member cooperative has had membership participation problems, but has managed to provide subsidiary drainage and irrigation works that tie into the Bookers and Black Bush systems. The society lands still suffer from poor access, however; the group could also use technical assistance and further credit to improve their water control works. Other societies, such as the Parika Land Society, engage in few cooperative activities but will benefit from needed subsidiary works being constructed by the Drainage and Irrigation Department.

Supply and Marketing Cooperatives

A few primary cooperative societies exist in Guyana to expedite marketing and processing of members' crops. The performance of these societies is not fully recorded, but the

results are clearly variable. The Vergenoegen Producers' Co-Operative, for example, has operated a rice mill successfully for some time. On the other hand, the Ma Retraite Producers Marketing Co-Operative, which lies just to the north of Mara Land Development Project, failed after receiving large capital loan advances from the Guyana Credit Corporation. This particular failure was tied to the serious problems faced by the Mara Project.

Growers' associations also exist to represent farmers who sell individual crops to the Rice Board and the Marketing Corporation. The Rice Producers' Association is such a group. Pineapple growers in the Soesdyke/Linden area are represented by an association, as are peanut growers around Wauna. The Wauna Peanut Growers' Association does not restrict its activities to marketing, however, and has been successful in organizing purchase and storage of chemicals (always a serious problem in such an isolated area) and in obtaining credit for cooperative activities.

Some cooperatives focus their efforts on the supply of inputs: irrigation and drainage, machinery, or others. A number of currently dormant land societies, for example, obtained credit from the Credit Corporation for tractor and combine purchases or for water control works. Their fate helped to determine the fate of the Credit Corporation. Some societies, of course, have been successful, although it seems impossible to generalize regarding their characteristics. Some agricultural machinery cooperatives are small (five to seven members) and oriented towards tractor or combine purchase; a number (as at Vergenoegen) have shown considerable success over a period of time, but many have defaulted and allowed the equipment to deteriorate.

Production Cooperatives

A few cooperatives in Guyana are organized to perform production activities in common, either on members' private lands or on "communal" lands. Some land settlement societies in West Berbice, for example, have attempted mixed farming projects with livestock held and managed in common. Other cooperatives, such as the Migrate Co-Operative Group on the Pomeroon River, retain individual plots, but members work together for 2 days a week on each other's farms. This is patterned after the Amerindian "kyap" system. This group is also attempting joint transport of produce by boat to market in Charity.

Cooperatives Division

The Co-Operatives Division of the Ministry of Mobilisation and Co-Operatives is responsible for registration, supervision and assistance to cooperative societies. In the division's head office are 2 Co-Operative Auditors, 9 Co-Operative Organizers, and 16 Co-Operative Officers including 11 of "senior" or higher rank (only 4 of the 27 have agricultural training); in the field there are 7 Senior Co-Operative Officers, 8 Co-Operative Officers and 33 Co-Operative Organizers.

Credit for Foodcrop Production

Commercial banks have historically been the primary source of short-term loans to agriculture.[1/] Of $9 million

1/ No complete description of the agricultural production credit system in Guyana exists, so amounts and uses of credit from farm input suppliers, friends and neighbors, and commodity purchasers are unknown. Credit flows are known for

of commercial bank loans outstanding at the end of 1973, about 80 percent were directed to sugar estates, rice mills, and large fishing and livestock operations. "Other agricultural" loans, including any for foodcrop production, totaled $1.7 million -- down from 1972's $2.0 million but up from the $1.0 million outstanding at the end of 1971. Prior to 1971, less than $0.4 million in loans were annually classified in this category.

Agricultural machinery dealers have had $4.0 to $4.5 million in installment credit outstanding for the past 6 to 7 years. It may be assumed that little of the machinery so purchased is for foodcrop production. These loans have a poor repayment record.

The Guyana Credit Corporation was established in 1954 to finance agricultural mortgages and to issue medium-term loans for investment in land and livestock improvement. Unfortunately, the Corporation experienced a heavy volume of defaults and has been abolished. Assets of $0.5 million, plus outstanding loans of $3 million (of which only 35 percent are considered collectible --that is, fully covered by collateral), have been transferred to the Agricultural Co-Operative Development Bank.

The Agricultural Co-Operative Development Bank was established in May 1973 to assume major responsibility for providing agricultural credit from public sources. Although

---

commercial banks, the Guyana Credit Corporation, the Agricultural Co-Operative Development Bank and for other institutions that loan primarily to sugar, rice and livestock producers and processors, such as the Cane Farming Development Corporation, the Guyana Rice Board, the Guyana Marketing Corporation and the Livestock Project. Attention here will be limited to banking institutions which lend for foodcrop production.

major objectives were apparently to serve small farmers currently ineligible for commercial bank loans and to provide support to the food self-sufficiency campaign, the new bank is under severe pressure to avoid the loan defaults that so disturbed bankers who observed the operations of the Guyana Credit Corporation. As a consequence, indications from the first 9 months of operations suggest that small farmers will not be served and that foodcrops will not be emphasized. In fact, it appears that the direction of loans will not be significantly different from that of the commercial banks.

So far, most loans have gone to large farming or fishing ventures. This is partly a consequence of the bank's stiff collateral requirements and partly because the available professionals (recently, only 16 in total) are too few to man more than the headquarters office in Georgetown. This, in turn, is partly a result of the rather complex and time-consuming procedures for receiving applications and supervising loans that have been considered necessary to safeguard the financial integrity of the new bank. To expand the staff further would conflict with the personnel needs of other agencies. Hence, much remains to be done if the bank is to provide credit to a sizable clientele of small farmers.

There will be three types of loans:

- Short-term loans for periods not exceeding 24 months

- Medium-term loans of 2 to 5 years

- Long-term loans of 5 to 10 years.

Each loan application requires a project appraisal including a minimum of one field visit by a bank staff member. So far, processing of applications has taken 2 to 3 months. After the loan is made, the supervisory credit system is in effect, with periodic farm visits by bank staff to ensure adherence to the farm plan and to offer advice on unusual problems encountered by the farmer.

Between June 1973 and the end of February 1974, the Agricultural Co-Operative Development Bank committed approximately $4 million in agricultural loans,[1/] of which nearly $2.5 million have been disbursed. Of the $4 million, about half went to fisheries (3 loans), a quarter to rice (190 loans), a tenth to timber, a tenth to sugarcane (3 loans), and small amounts to poultry, livestock and food-crops. The total loan amounts committed to foodcrops were under $190,000, of which half went to one 300-acre cashew project and a quarter to small drainage and land clearing projects, mainly in the Pomeroon. It is apparently bank policy to give preferential treatment on drainage and land clearing loans to farmers who agree to cooperate on drainage for blocks of land. The Bank has budgeted loans for corn and soybeans, but no applications have yet been approved because of the high capital investment required. Most fruit loan applications are for citrus; less than $50,000 has been committed in such loans. Major efforts of the bank are directed toward fisheries, sugar, and rice. Loans for machinery and water control, including loans to service cooperatives, are expected to be of major importance.

The bank expects to have committed about $11 million by the end of 1974. Sources will be $0.5 million from the

1/ Excluding the loans assumed with the Credit Corporation's portfolio.

Guyana Credit Corporation, $2 million from the 1973 Government budget, and some indefinite amount from the 1974 Government budget, as well as domestic and international borrowing. (The bank can issue tax-free bonds for local sale with a Government guarantee.) It also expect $6 million in a loan from the Caribbean Development Bank. Of the $11 million, the bank has budgeted $400,000 to fruit and vegetable projects, $1.75 million for grain crops and soybeans, and smaller amounts on oil palm and interior development. To date, only small applications have been received from farmers in the interior.

In summary, the availability of agricultural credit for the foodcrops sector is subject to the following limitations:

. During 1973 a maximum of $2 million in loans to "other agriculture" was outstanding from banks: $1.7 million from commercial banks (including the National Co-Operative Bank) and $0.2 million from the Agricultural Co-Operative Development Bank. (These amounts exclude loans outstanding and essentially defaulted from the Guyana Credit Corporation).

. Interest of bank officers is focused on rice, sugar, and fisheries; foodcrop loans are not given priority.

. Nearly all loans go to large commercial operations. Collateral requirements and processing procedures exclude most small farmers from consideration.

. Food processing loans (other than in sugar, rice, livestock and fisheries) are rare; none have been made by the Agricultural Co-Operative Development Bank.

. Full implementation of a supervised credit program aimed at large numbers of farmers by the Agricultural Co-Operative Development Bank would require substantial increases in bank professional staff and establishment of branch offices. Agriculturally experienced credit managers are scarce in Guyana.

. The Agricultural Co-Operative Development Bank shows some interest in channeling machinery and land improvement loans through service cooperatives. Much of this interest, however, has focused on rice and sugar.

Notwithstanding the foregoing limitations, the availability of agricultural credit must be considered a constraint to expansion of foodcrop production only in certain specific contexts -- not on an across-the-board basis for existing foodcrop farms.

Until the time becomes ripe for emphasis on the introduction of a comprehensive program of yield-increasing technology, the cash production inputs of small-scale foodcrop growers will be minimal; their main credit needs may be to cope with relatively constant living expenses under a situation characterized by wide year-to-year variations in output and incomes. The small number of producers with sizable coconut estates, meanwhile, are not subject to the same constraints for credit to improve yields as are the more typical foodcrop producers.

If new foodcrop producers are to become established in the riverine areas and perhaps in oil palm production, however, they will clearly need credit for temporary subsistence and also for limited production resources. If steps are soon taken to encourage the establishment or sizable numbers of such units, the resources of existing credit institutions may be severely taxed, both in terms of funds and in terms of human resources for supervision and management.

The Supply of Production Materials

Foodcrop producers in Guyana make only limited use of the various kinds of production materials which elsewhere account for a large share of total inputs. Exceptions to this generalization occur, to be sure -- for example, on the state farm at Kibilibiri, where grains are produced with large inputs of fertilizer and machinery. Elsewhere, land and labor are the principal inputs for producing oilcrops, provisions, fruits, vegetables, and pulses; under the traditional technology, growers need to purchase only small quantities of seed, planting stock, fertilizers, other chemicals, and such inputs for transport as outboard motor fuel and supplies.

Marketing channels for agricultural inputs are correspondingly undeveloped, except for certain specialized purposes. The sugar firms, for example, have their own supply sources for fertilizers and various agricultural chemicals; these also provide materials for farmers growing cane and limited amounts for more general distribution. The Rice Board acquires and distributes relatively modest amounts of fertilizer and other materials to rice growers, and both the Interior Department and the Agriculture Department

acquire materials for their own projects and demonstrations. The Agriculture Department, through the Central Horticultural Station at Timehri and the District Plant Propagation Nurseries, provides most perennial planting materials and some of the seed used on foodcrop farms. This leaves a very limited role for private firms or cooperatives in developing comprehensive services for supplying input materials to agriculture and the foodcrop sector. Even packaging materials are primarily second-hand sacks previously used for transporting rice, coffee, or similar commodities.

Fertilizer and Liming Materials

The dominant role of sugarcane producers as users of fertilizers and lime is evident in the data of table 53 and figure 17. Inventory changes relative to accounting years are doubtless responsible for some of the discrepancies between imports and quantities distributed, as well as for some of the year-to-year variations. Of the quantities distributed to producers other than cane growers, almost all must have been destined for the rice crop, to judge by the following Rice Board data for crop years ending August 31st:

Year	Super-phosphate	Urea
	(thou. tons)	
1970-71.....	0.8	1.5
1971-72.....	1.9	3.3
1972-73.....	2.9	6.9
Projected 1973-74.	3.5	6.5

If, as is suggested in figure 17, some 700 tons were available for foodcrops, average applications would be no more than 30 pounds per acre -- a figure roughly consistent with farm survey data. Some farmers, however, do use

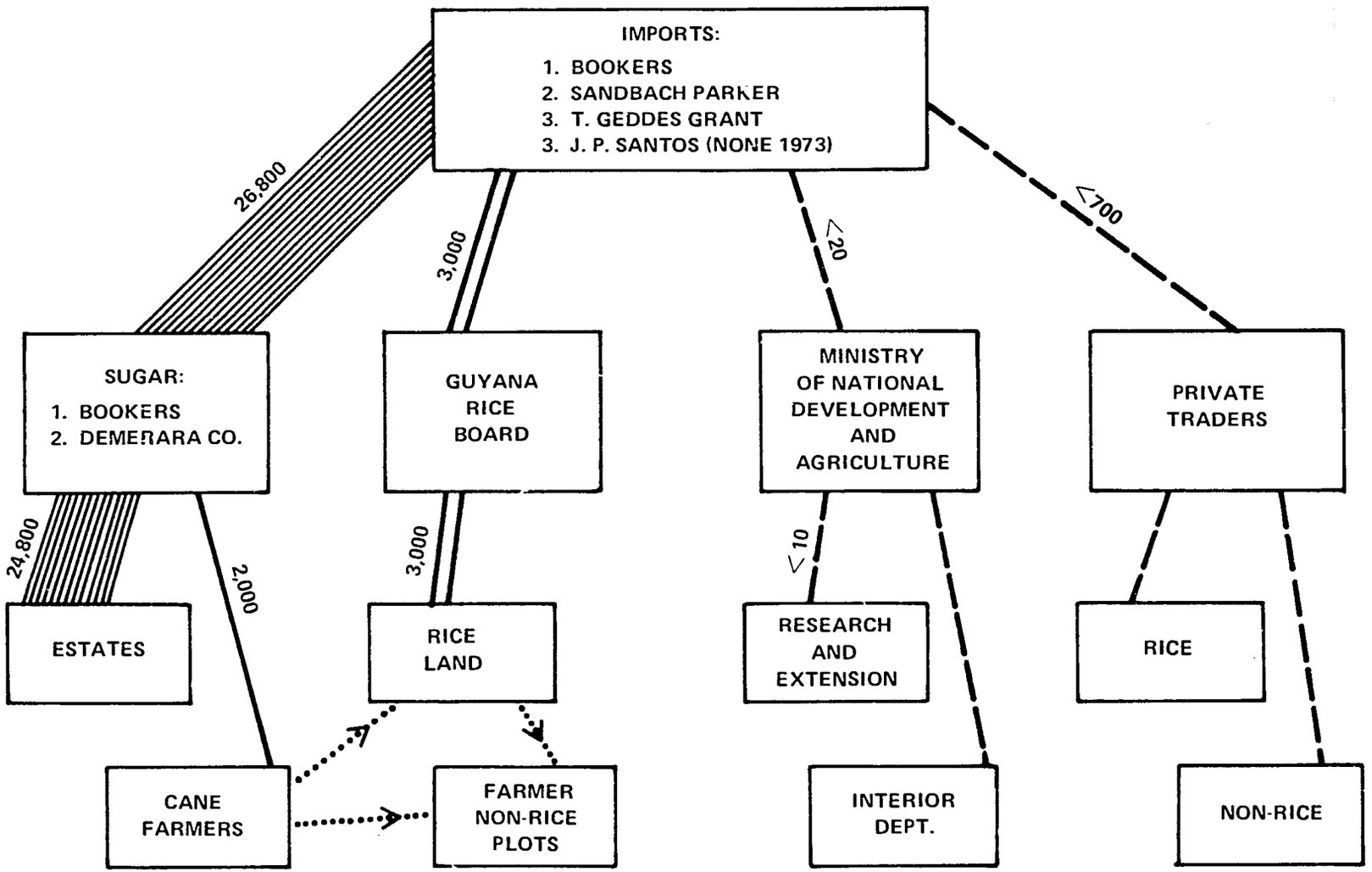
Table 53. Imports and Distribution of Fertilizers and Liming Materials, by Class and Major Uses for Selected Years, 1964-73

Item	1964-65 average	1968-69 average	1971-72 average	1973
Imports of fertilizers:				
Nitrogenous	20.6	27.0	31.0	30.5
Phosphatic	3.0	3.0	7.0	7.7
Potassic	1.6	3.2	2.6	2.6
Mixed and miscellaneous .	0.7	1.5	0.3	0.6
Total	25.9	34.7	40.9	41.4
Distribution of fertilizers[a]:				
To sugar estates	28.1	30.6	33.8	24.8
To cane farmers	0.8	2.5	4.2	2.0
Subtotal	28.9	33.1	38.0	26.8
To other farmers				
Nitrogenous	0.2	1.1	3.8	1.7
Phosphatic	--	0.3	2.0	1.3
Potassic	--	0.1	0.2	0.2
Mixed and miscel-laneous	0.5	0.5	0.9	0.5
Subtotal	0.7	2.0	6.9	3.7
Total	29.6	35.1	44.9	30.5
Imports of liming materials	19.2	19.5	15.2	n.a.
Distribution of liming materials[a]:				
To sugar estates	12.8	20.0	20.8	n.a.
To cane farmers	0.1	2.0	0.9	n.a.
To other farmers	0.1	0.7	0.6	n.a.
Total	13.0	22.7	22.3	n.a.

a/ Corresponds to sales for specified accounting years, which may not equal either imports or applications for the same years.

Source: Ministry of National Development and Agriculture

FIGURE 17. FERTILIZER SALES, 1973



fertilizers intended for cane or rice on other crops, either on their own plots or by sale to other farmers.

Four firms in Guyana import fertilizer: Bookers Stores, Demerara Company, T. Geddes Grant, and J. P. Santos and Company. The Demerara Company imports only for its estates and cane farmers, while Bookers imports both for its estates and for resale to other farmers. Over 85 percent of fertilizer imports are through Bookers, while most of the remainder is for the Demerara Company; T. Geddes Grant generally imports less than 1 percent of the fertilizer but specializes in the mixed fertilizers sold mainly to foodcrop producers; Santos imports varied from nothing in 1973 to 75 tons in 1969.

Bookers receives fertilizer imports directly into Georgetown for its Demerara estates, into Blairmont, into Rose Hall for East Berbice estates, and into Skeldon. Each factory has a warehouse capacity of 1,000 to 1,500 tons. Demerara Company imports into Georgetown and has warehouses at Leonora and Diamond. Liming material (aragonite from the Bahamas) comes in 3,500-ton bulk shipments as joint purchases between the two large companies. The aragonite is stored indefinitely outdoors and, although there were difficulties with shipping last year, handling is generally satisfactory. Sulphate of ammonia and urea come in 800- to 1,000-ton bagged shipments; other fertilizers arrive in 250- to 500-ton bagged shipments. Bookers Shipping transports the fertilizer.

Bookers keeps 1 month's supply on hand and orders in advance by 3-month periods. Use of fertilizer on sugar peaks during March/April/May and August/September/October. Use during 1973 was low compared with other recent years

(table 53). This was due to a decision to reduce the basic application rate from 4 to 3 cwt. of sulphate of ammonia in certain cycles; to postponement of December applications to ratoons until January; and to higher prices.

The Rice Board and the sugar companies supply fertilizer on a credit basis to farmers agreeing to use approved varieties. GRB bonds, used mainly to store seed, are also used for fertilizer distribution. These bonds are located as follows (with tonnage capacities in parentheses): Anna Regina (?), Adventure (10), Wakenaam (50), Leguan (50), Vergenoegen (20), Windsor Forest (30), Vreed-en-Hoop (30), Mahaica (200), Cane Grove (1,000), MARDS (1,000), Onverwagt (30), Stanleytown (100), Whim (50), Black Bush (500), and Corriverton (1,000).

The possibility that the Rice Board and Interior Department could distribute fertilizer on a general basis has been discussed with the Agriculture Department. These discussions terminated after recent increases in fertilizer prices (table 54).

The Interior Department supplies fertilizers to the Upper Mazaruni and Rupununi regions, although recent price increases have halted much of this program. The Agriculture Department distributes (but does not sell) fertilizers through demonstration projects. About 10 tons were distributed in the past; 40 tons are projected for this year, with perhaps half of that amount going to the Northwest for use on oil palm and peanuts.

Retail outlets for fertilizer are few. Georgetown is the major source of supply for most farmers, with New Amsterdam a weak second. Localities west of Black Bush are

Table 54. Average Wholesale and Retail Prices of Fertilizers and Limestone in Guyana, 1969-73

(In dollars per long ton)

Material	1969		1970		1971		1972		1973	
	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail
Sulphate of ammonia.....	123	138	127	139	108	128	118	141	159	170
Urea.....	195	212	195	236	195	236	214	255	272	300
Rock phosphate....	--	--	130	146	130	146	121	121	127	160
Muriate of potash.....	172	182	172	176	202	220	180	229	224	234
Potassium sulphate.....	--	--	220	257	240	277	247	301	356	370
Mixed fertilizers:										
10-20-0.....	205	225	223	233	236	257	282	295	284	300
15-15-15.....	225	244	230	251	222	248	293	331	312	327
12-12-17+12....	211	232	211	232	260	280	300	340	404	422
Ground limestone..	44	59	54	66	47	60	45	48	40	45

Source: Ministry of National Development and Agriculture.

supplied through Bookers and J. P. Santos outlets in New Amsterdam; a Geddes Grant outlet noted for being well stocked closed there two years ago. Small retail establishments at Corriverton and No. 64 supply to the Corentyne River (primarily citrus) and small amounts are sometimes available at Adventure, Charity, and Lethem. At Kumaka stelling, Chem Agron has a small outlet selling agricultural chemicals (small amounts of fertilizer) through the agricultural officer to the peanut growers' association. They use one-half of the Transport and Harbours bond. Attempts were made in the past by Global-Agri Industries to import directly for use at Kibilibiri, but the small volume involved made this impractical.

One complaint of farmers and agricultural officers alike is that only a limited range of fertilizers is available outside Georgetown. Such small quantities are purchased that few retailers can bother with a good stock.

Planting Materials

The major established supply source for perennial foodcrop planting materials is the Agriculture Department. Some years ago, the Central Horticultural Station produced most of the plants for direct distribution to farmers and for some transfers to the Regional Plant Propagation Nurseries (at Lesbeholden, No. 63, Whim, Pouderoyen, Suddie, Maria's Lodge, Charity, Hosororo, and Matthew's Ridge). In recent years, the regional nurseries have expanded their activities, so that their combined output is now roughly equal to that of the central station.

As revealed in table 55, interest in coconut plants was apparently low between 1970 and 1974, as compared with the 1965-68 period, whereas the reverse was true for citrus. Note that the various nurseries, collectively, undertake to distribute planting materials for more than 40 perennial fruits. If coffee, cacao, coconut, cashews, black pepper, tumeric, and ginger are added to the list, some 50 different species must be cultivated -- a considerable task requiring much detailed managerial input. In addition, the department has sometimes found it convenient or necessary to produce and distribute seeds for such crops as soybeans, peanuts, black-eyed peas, cabbage, onions, and potatoes.

Table 55. Planting Materials Distributed by the Agriculture Department, 1964-73

Year[a]	Coconuts	Citrus[b]	Mixed fruit[c]
1964.....	29	12	n.a.
1965.....	112	26	n.a.
1966.....	n.a.	n.a.	n.a.
1967.....	48	13	n.a.
1968.....	71	28	n.a.
1969.....	37	11	n.a.
1970.....	18	70	n.a.
1971.....	32	61	26
1972.....	13	52	26
1973.....	14	61	34

n.a. = not available

a/ Data prior to 1971 reflect distributions from the Central Horticultural Station, which has sometimes provided materials to the Regional Plant Propagation Nurseries. Materials from both the central station and the Regional Nurseries are included in the totals for 1971 through 1973.
b/ Includes orange, tangerine, grapefruit, lime, lemon, shaddock, sour orange.
c/ Includes annato, bilimbi, breadnut, cherry, custard apple, carambola, dunks, fat pork, genip, golden apple, gooseberry, granadilla, grapes, jack fruit, jamoon, malacca apple, mamey apple, mangoes, monkey apple, pawpaw, passion fruit, peach, pear, plumrose, plum, pomegranate, psydium, sapodilla, semitoo, soursop, star apple, spice, seaside grape, surinam cherry, sugar apple, tamarind, and whity.

Pesticides and Other Agricultural Chemicals

Imports of pesticides and similar preparations for various agricultural and related uses ranged between 1 and 2 million pounds from 1967 to 1970. Only a small fraction of the total was used in foodcrop production, and little is known about such flows.

VII. ACHIEVING FOODCROP GOALS

Policy-makers in Guyana face an unusually wide range of alternatives as they consider ways of achieving goals for the foodcrop sector. The number of individual crops to be considered is large; the area now occupied by these crops is minute in relation to the land which could be brought into foodcrop production; areas with land suitable for consideration are many; and the range of possible technologies which can be considered for the future is broad. Moreover, attention can logically be focused on import substitution in some cases and on export expansion in others. Implications of alternative production and marketing programs for employment, income, conservation, and regional development objectives further complicate the nature of the analysis.

A major issue in raising output is the broad choice between expanding crop acreages and increasing yields per acre. Increased output obviously must come from one source or the other, or from some interaction of changes in both.

A second major issue is whether Guyana wants to become self-sufficient in each individual foodcrop, or whether deficits of some foodcrops (like split peas, onions, and potatoes, in which Guyana's comparative advantage is not yet high) can be offset by additional output of crops with high export potentials. On narrowly economic grounds, the latter

option would seem advantageous, although it may not be fully consistent with the campaign for self-sufficiency and the current approach to regional development.

Alternative Production Targets

The outlook for 1976 and 1981, as developed in chapter III, provides quantitative projections of foodcrop production and utilization under a continuation of current economic and policy forces. In one sense, realization of these projects (if accurate) will require no major departures from current policies and programs. In another sense, existing policies and programs must be given a great deal of specific content if the projections are to be realized. To use obvious examples, the settlement projects implemented during the last 5 or 10 years are not the same ones which must be installed during the next 5 or 10 years, if present programs are to continue unchanged. The research completed last year does not need to be repeated next year, nor will the targets set in the last development plan serve for the next. Many of the programs and policies to be discussed in this chapter are those which can give specific content for the future to existing policies and programs. These can then give rise to attainment of the outlook projections of foodcrop output and utilization. But some of the alternative programs to be discussed have a potential for larger foodcrop production and smaller deficits or larger exports than contemplated in the outlook projections. In certain cases, smaller deficits would mean reduced imports; in other cases, more favorable consumer prices.

The production increases from the normalized 1972 base to the 1976 and 1981 outlook projections for principal crops appear in percentage terms in table 56. Except in the case

of pineapple (a crop with a very small 1972 base), the model data call for increases ranging between 8 and 26 percent for the 1972-81 period, with considerably smaller gains applicable to most items for the planning period ending in 1976.

In the outlook projections, deficits remained between production (or aggregate supplies) and consumption (or aggregate utilization) of certain foodcrops, as well as of wheat flour (tables 24-29). Some of the deficits were small, but large deficits remained for coconut oil, other vegetable oils, tomatoes (including their products), and also onions and split peas (two crops not now grown in appreciable quantities). Overcoming the residual deficits of vegetable oils and tomatoes by realizing higher than baseline yields on established farms, or by expanding plantings beyond outlook levels, would require the following increases by 1981:

. An increase of 120 pounds per acre in the yield (refined oil equivalent) from present coconut stands, assuming that imports of other vegetable oils continued at outlook levels. The resulting average yield would be 27 percent above the 1972 base.

. An increase of 8,700 acres of coconuts sufficiently matured to produce the same average yield as the outlook projection, again assuming that imports of other vegetable oils continued at baseline levels. (Owing to the time required to bring coconut trees to maturity, this alternative would be difficult to achieve by 1981, even if the plantings could be established during the period.)

. An increase of 120 pounds per acre in the yield (refined oil equivalent) from present coconut stands, plus the cultivation of some 19,000 acres of soybeans yielding 300 pounds of oil per acre -- a combination of changes which would eliminate the combined vegetable oil deficit if realized.

. An increase of 2,300 pounds per acre on the 900 acres of tomatoes projected for 1981 -- a gain of 53 percent over the outlook level for 1981, but still representing a very modest yield by commercial standards in competing countries.

. An increase of 500 acres of tomatoes above the 900 projected for 1981, with no change from the projected 1981 yield.

Beyond these additional production increases, the substitution of cassava flour for a limited proportion of the wheat flour now consumed would contribute to increased self-sufficiency, on the one hand, and require the planting of several thousand additional acres, as will be discussed later in this chapter.

Possibilities for increased plantings of foodcrops may be found on present foodcrop farms, on existing farms of other types, or on new farm units yet to be established in the riverine and hinterland areas. Increased yields is a meaningful alternative only on farms already engaged in foodcrop production. Hence, it will be convenient to begin by considering yield vs. acreage increases on existing foodcrop farms.

Production Potentials of Foodcrop Farms in the Established Areas

Nearly all of Guyana's coconuts, bananas, and plantains are grown in the established agricultural areas, on farms such as those included in the farm survey. Such farms also produce a large share of the country's total output of ground provisions, fruits, and vegetables, as well as some pulses. Corn, cassava, and pulses are already grown in appreciable quantities in the interior, and certain interior localities afford a more appropriate climatic environment for white potatoes and onions (and perhaps for certain other crops) than the established production areas. Accordingly, the potentials of existing farm units for contributing to future needs will depend in part upon the desired product mix.

Increasing Per-Acre Yields

If the outlook projections of increased production were to be attained entirely through the adoption of improved technology, with no change in the acreage under cultivation, yields would only need to increase by 1 to 2.5 percent annually between 1972 and 1981 for the items, other than pineapple, which appear in table 56. Such yield gains are no larger than increases which have been realized on a sustained basis in a number of other countries.[1/] They would not be easy to attain, however, in a country where

1/ In the United States, for example, crop yields grew at an average compound rate of 2.2 percent over the 15-year span between 1947-51 and 1962-66. (Byron T. Shaw, An Analysis of Agricultural Research in Relation to the Increasing Demand for Agricultural Products, Production Research Report No. 104, USDA Agricultural Research Service, 1969, p. 1.) Between 1950 and about 1967, meanwhile, crop yields grew at average compound annual rates of 2.5 to 4.0

Table 56. Indicators of Output Increases for Foodcrops Supplied by the Established Production Areas Under Outlook Projections, 1972-81

Production	1972 Normalized base		Percentage increases in production	
	Area (000 ac.)	Production (mil. lbs.)	1972/1976	1972/1981
Group A - products now mainly supplied by the established areas				
Coconuts[a/]	33.3	15.0	10	12
Bananas	3.3	9.8	5	12
Plantains	6.5	22.6	4	8
Group A	42.9	47.4	6	12
Group B - products now partly supplied by the established areas				
Ground provisions	7.0	38.8	14	23
Vegetables	6.0	44.8	10	21
Citrus	3.6	17.8	11	26
Pineapple	0.5	2.6	42	85
Other fresh fruits	1.8	7.2	6	15
Black-eyed peas ..	2.1	1.3	11	26
Group B	21.0	112.5	12	24
Group A and B	63.9	159.3	11	20

a/ Production in oil equivalent.

Source: Tables 24-29.

most crop yields have apparently shown almost no upward tendency in decades. In some cases, this static yield can be attributed to the absence of any substantial change in available and applied technology (probably true for ground provisions and most fruits); in some cases to accentuated losses to pests and disease (probably true for coconuts, plantains, and bananas); and in some cases to other special circumstances (for example, changes in the proportion of bearing and nonbearing citrus resulting from expanded plantings and also the increased proportion of the national pineapple crop now being grown on the white sands). In view of these circumstances, the relatively large percentage yield increases targeted in the 1972-76 plan (8 to 15 percent for the crops in Group A and 21 percent for ground provisions) appear unrealistic.

Although useful applied research on foodcrops has been completed in Guyana, much remains to be done before the base for an intensive campaign for higher foodcrop yields can be considered adequate. Variety testing has made some progress, but the task is complicated by the long list of crops and possible production locations, each with somewhat different characteristics. The list of pests and diseases to be studied and controlled is almost endless, and the interrelationships of alternative cultural practices with variations in location, variety, and other circumstances are largely unexplored. Hence, any broad program directed toward increasing yields must be limited to a few of the simplest and most dependable practice improvements. A more

---

percent in El Salvador, Guatemala, Mexico, Nicaragua, Japan, South Korea, and Taiwan; and at rates ranging between 1.0 and 2.4 percent in nine more countries of Latin America and seven more of Asia. (USDA Economic Research Service, Economic Progress of Agriculture in Developing Nations, 1950-68, FAER No. 59, May 1970, p. 14.)

complex program, moreover, might easily exceed the performance potential of the relatively small and unseasoned field staff for agricultural extension, which is already attempting to perform a wide range of educational, developmental, and administrative duties.

One simple practice which could probably contribute to higher foodcrop yields would be increased use of fertilizer. Moreover, there is some evidence that fertilizer use on foodcrop farms has already been increasing in limited measure during recent years. National statistics on this point lack detail, but it was surprising to discover that more than half of the 321 foodcrop producers in the sample survey could report some use of fertilizer in 1973, while several others indicated an awareness of its potential usefulness. After excluding applications on rice in Black Bush Polder, there remained a total of about 900 cwt. of fertilizer used in 1973 by about a third of the 321 sample foodcrop producers -- a quantity equivalent to about 34 pounds for each acre in crops other than rice. The bulk of these applications were made in the Parika area, where they averaged 120 pounds for each acre in crops. In this area, 49 growers reported using fertilizer on bananas and/or plantains, 24 on vegetables, 5 on citrus, and 3 on miscellaneous crops.

In October 1970, a University of Florida consultant team (responding to Task Order No. 11) found evidence that at then-current product prices and input costs it would have been profitable to more than double aggregate applications of fertilizer and lime in Guyana. After noting that sugarcane received most of the fertilizer applied at that time, they acknowledged that growers might remain unconvinced of the merits of fertilizer for crops with a low output value

per acre, even with potential yield responses of 100 percent. Hence, they apparently counted heavily on expanded fertilization of foodcrops in projecting sizable possibilities for increased national use of fertilizers and lime. (Their estimates postulated steps to reduce unit material costs to farmers.) They cited tomatoes and coconuts as two crops where the use of additional fertilizer would be particularly remunerative. However, increased returns from tomato production depend on a complex package of improved technology, while fertilizer applications on coconut trees suffering from bud rot or other disease or pest infestations are unlikely to produce the same responses which might be encountered under experiment-station conditions.

At least four major constraints must be recognized in considering any major program effort for increased yields:

First, worldwide experience suggests that full benefits of simple changes in practice, such as increased use of fertilizer, are seldom realized unless associated changes in crop varieties, pest and disease control, and associated cultural practices can be introduced as a total package. The knowledge and institutional base for implementing such a package program in foodcrop production simply does not exist in Guyana at present. An extended period of time would be indispensible in developing such a program base. Although additional use of lime and fertilizer would surely be at least marginally economic on various foodcrops in specific situations, there are probably few cases where the response to fertilizer alone (without various associated practice changes) would raise the value of output enough to provide inducements for overcoming the natural and rational reluctance demonstrated by farm entrepreneurs. Many of these entrepreneurs are well aware of the learning costs and risks associated with making repeated practice changes.

Second, the widespread adoption of modern technology almost invariably implies a higher degree of reliance on expensive cash inputs. Even when such expenditures produce beneficial results, on the average, they may prove unattractive in an environment characterized by high risks, unusual hazards, and great uncertainty. Such appears to be the situation of foodcrop producers in Guyana, to judge by information from the farm survey and other sources. Complaints about losses to flooding and other manifestations of unsatisfactory water control are widespread in the survey areas and elsewhere. Weather, to be sure, may have been unusually adverse in the last year or two, but wide variations in rainfall are by no means unusual in Guyana, according to long-term records (see table 31).

In the third place, the present outlook for fertilizer supplies and prices on world markets is scarcely favorable to the initiation of new programs for expanded use of fertilizer. Guyana, moreover, lacks a cheap source of liming materials, which would be needed for making fully effective use of phosphatic fertilizers on the prevailing soils.

Finally, any serious effort at increasing foodcrop yields is predicated upon effective water control. Improved drainage and irrigation is necessary not only to reduce the risk of flooding but also to provide the appropriate water environment for improved varieties, fertilizer use, and disease-control practices. It is difficult to imagine that a comprehensive program for water control can be implemented over the major foodcrop producing areas within the 1981 time frame: basic systems cannot be implemented this quickly, and where basic D&I systems now exist, the capital resources, technical manpower, and managerial skills required far exceed their availability. However, as discussed at other

points in this chapter, minor irrigation and drainage schemes using low-lift pumps and focusing on on-farm systems could provide a modest start on water control within which selected yield-improving efforts may be feasible.

For the foregoing reasons, the 1974-81 period does not appear to be a propitious time for a major effort, through extension and related programs, to raise foodcrop yields with a complete package of improved technology. Too much is lacking to favor success in putting together all the elements of an adequate package program for achieving economical yield increases -- primarily it is difficult to imagine that a comprehensive program for solving the drainage and flooding problem can be implemented within the indicated time frame. Moreover, during this period, such resources as can be applied in a package program for adoption of improved technology may well produce greater benefits if they are directed toward rice production rather than toward foodcrops.

This general conclusion does not mean, however, that all Government efforts to raise foodcrop yields should be abandoned. What it does imply is that these efforts must be highly selective, and should: (1) select those foodcrops which are significant in the production-consumption patterns; (2) focus on key problems which are known to have a serious effect on yields; (3) concentrate on practices which minimize the use of cash inputs; and (4) encourage practice changes only where adequate water control can be assured. Illustrations of such selective yield programs include: (1) the introduction of new tomato varieties with appropriate fertilization in an area with good water control, such as Black Bush Polder; (2) intensified extension efforts for controlling Moko disease of plantains and bananas, drawing upon present knowledge and practices; (3) the introduction

of minor irrigation schemes using low-lift pumps for supplemental water, thus permitting manipulation of planting and harvesting times; (4) tests of the feasibility of extracting and applying liming materials derived from local sources, such as the marine deposits at Shell Beach; and (5) a somewhat special program for increasing coconut yields (discussed below).

It would, of course, be appropriate to place continuing emphasis on adaptive research pertaining to foodcrops, so as to strengthen the basis for the future adoption of a new technology package (as discussed elsewhere in this chapter).

Coconuts - A Special Case

The limited number of large coconut estates comprise one of the special cases where selective efforts for the adoption of improved practices may be more applicable than in the foodcrop production activities of typical small producers. Although few in number, these estates account for around half of the total acreage devoted to foodcrops. The edible oils produced from coconuts and copra, moreover, continue to be scarce relative to demand in local markets.

Although Guyana may come to rely increasingly on domestically produced palm and soybean oil in the future, current scarcities of edible oils could probably be alleviated to a considerable degree by efforts to obtain larger outputs of nuts from present coconut stands, as well as by redirecting the processing of nuts from primitive processing operations to the more effective extraction of the existing central plants.

To this end, the few dozen large coconut and copra producers could easily be reached with technical assistance and economic incentives. Material requirements in the form of fertilizers and pesticides would be relatively modest, whereas sizable quantities of additional manpower could be put to good use in weeding, fertilizing, and protecting existing stands; in achieving a more complete and effective harvest of existing production; and in establishing replacement trees in decimated stands.

Notwithstanding a high level of unemployment in the economy as a whole, coconut growers complain of difficulties in maintaining an effective work force. A program of manpower mobilization under the National Service, the Guyana Defense Force, or by some other means could prove effective. The marginal public expenditure would be virtually nil, as growers could be expected to pay the full cost of materials used and provide some remuneration for labor, commensurate with the work performed. If a program of labor assistance to large-scale growers may seem unpopular politically, it should be noted that scarcities of edible oils are also unpopular. In any event, such a program could be instituted on a small and experimental scale. If successful, it could produce almost immediate results, whereas new plantings of coconuts or oil palm can have little if any effect on edible oil supply before 1981.

Expanding Foodcrop Acreage

The land area available for expanded plantings does not appear to be a major constraint, per se, on foodcrop farms within the 1974-81 time frame. The survey farm operators in the Pomeroon and Parika, for example, saw only drainage improvement as a major limitation in bringing additional

land under cultivation. Even their present cropland, however, seemed to be drastically lacking in drainage and flood protection. The latter problems are major constraints on acreage expansion and on total output in large portions of the established areas; moreover, they cannot be easily or cheaply remedied under prevailing circumstances. (See chapters IV and VI.)

Additional plantings of coconuts and tree fruits from 1974 onward can make no contribution to 1976 output, and only a relatively modest contribution to output in 1981. On the other hand, citrus acreage appears to have been rising gradually for some time, and trees which are now of nonbearing age will be counted among those bearing by 1981. Whereas a 10-percent increase in per-acre yields automatically corresponds to a 10-percent increase in output, the same is not necessarily true for increases in cultivated acreage of perennials. Moreover, if the 1981 production increases for all items listed in table 56 were to be achieved, over time, through increased plantings instead of through increased per-acre yields, the aggregate acreage needed would be only 10,000 acres, or an increase of 16 percent.[1/]

About 4,000 of the additional acres needed would be for coconuts; 4,000 would be for bananas, plantains, ground provisions and vegetables; and 2,000 for other foodcrops. With some interplanting, the combined acreage requirement would be even less. (The target increases in the 1972-76

1/ The acreage increase of 16 percent differs from the average yield increase of 20 percent owing to the difference in factors for weighting the individual percentage increases.

plan were 1,500 acres for crops in Group A, 2,600 for ground provisions, 2,600 for citrus, 1,600 for pineapple and 3,400 for black-eyed peas, or a total of 11,700 more than the 1970 base.)

Given the fact that respondents in the sample survey were using only about 55 percent of their total farmland for crops, with most of the remainder being in bush, it is difficult to believe that existing producers would be unable to find 10,000 more acres for planting the foodcrops adaptable to their districts. Whether they could be encouraged to do so is another matter; the survey produced some indications that a number of families attach scant importance to increasing incomes above present levels at the expense of added effort.

A program to test the possibility of breaking the combined barriers to expanded production on existing farms in an area with basic D&I facilities (for instance, around Parika) would need to include the following elements:

. An effective local drainage system, including on-farm works

. Credit (or grants) to pay wages or subsistence expenses of workers engaged in clearing and preparing a minimum of, say, 2 additional acres per farm

. Making available, by sale or lease, a few small garden tractors which would relieve the farm family of some of the more tedious and unattractive work of producing foodcrops, and which would enable them to cultivate more acres without an undue sacrifice of leisure

- Assistance in organizing group efforts for such activities as solving water control problems, and intensifying the input of educational assistance through extension

- Additional credit to finance any cash outlays needed for more intensive cultivation of the expanded unit.

A program which included these elements and which attracted the interest of 50 to 100 farmers could provide 300 to 400 additional acres of foodcrops in an area well served by transport and marketing systems and close to the consuming center of Georgetown. The key to the effectiveness of such a program is not capital (total capital and credit inputs would probably not exceed $500,000), but organizing farmers to participate in the program and cooperate on a community basis, taking advantage of sizable inputs of technical and development assistance for achieving effective management of cooperative and private efforts.

On the other hand, the survey also produced evidence that a number of the survey families and some of their virtually landless neighbors include individuals with farming skills who could provide the entrepreneurial and labor input for creating additional farm units. To foster the creation of such units at strategic locations in the interior would contribute to several explicit national objectives.

Employing Redundant Workers On New Units for Provision and Mixed Farming

Agriculture is an enterprise which requires an unusually high input of management, relative to the input of

other resources. This circumstance has often gone unnoticed during more than half a century of relatively cheap food and low returns to farming resources in general. In a number of countries, farm youths have turned to other occupations until the pool of individuals prepared to become farm operators has been seriously depleted. Today, with strong worldwide demands for the products of agriculture, Guyana is fortunate in having a reserve of farm-reared youths, at least partially prepared and ready to become farm operators. For each 100 families represented in the farm survey, as already noted, there appears to be an excess farm-operator potential of 40 sons who could presumably be spared to develop new units. As farm laborers, these sons are perhaps fully employed at home; as potential farm operators, they appear to be redundant at home, and available for effective performance elsewhere.

An analysis of labor utilization reported on the survey farms suggests that the total supply of manpower, as well as the entrepreneurial potential, is redundant for the group as a whole. In Parika and the Pomeroon, for example, producers with 10 to 25 acres of cropland, using hired labor only occasionally or not at all, followed what appeared to be the conventional farming systems of their respective areas with inputs of no more than 35 to 60 man-days of operator and family labor per acre of cropland annually. On the other hand, units with less cropland had several times as much labor available per acre (table 36). The smaller producers in Parika may have been farming somewhat more intensively, inasmuch as they did report larger fertilizer applications per acre, but it may be presumed that the larger amount of labor reported as available or in use on small farms was mainly redundant. (For details, see chapter IV.)

Under these circumstances, the manpower on existing foodcrop farms could probably be utilized more effectively if some were relocated to new, family-size units in accessible locations of the intermediate interior, on some of the higher ground in the riverine areas. Given (1) the constraints on yield increases and improved water management in the established production areas, (2) the Government's desire to broaden the geographic dispersion of development, and (3) the availability of potential operators and workers for new farm units, it is plausible that the Government should turn toward settlement opportunities in such locations. Past experience with settlement projects in Guyana has been decidedly mixed, but there is a reasonable basis for concluding that new farm units can be established under conditions which will be acceptable to the individuals involved and which will permit them to make substantial contributions to Guyana's growing needs for foodcrop production within the 1974-81 period. (See comments on the Black Bush Polder Project and the Backdam settlers in Parika in appendix D.)

Perhaps the most promising opportunities for such settlement are to be found along the banks of the Demerara, from Dora south, and along the nearby Soesdyke/Linden Highway. In these locations, Guyana's Land Use Capability Map suggests that it should be possible to identify a few thousand acres of land suitable for growing provisions, fruits, and vegetables without expensive drainage installations, on soils which are appropriate for the various species within these groups. Soils along the river banks may be more suited for provisions and citrus, whereas the white sands can be used for pineapple, cashew, and various other crops, particularly when complemented by poultry and swine enterprises, which represent important sources of

plant-food materials. The Demerara River is an ideal avenue for transporting produce to the Stabroek market; the Soesdyke/Linden Highway is also an important resource of the area.

A thousand new family units of 10 to 20 acres each, with an average of at least two workers per family, should be able to cultivate the bulk of the additional provisions, fruits, and vegetables needed for attainment of the outlook projections indicated for 1981. Infrastructure costs would be minimal in view of the nearness to market and existing transport alternatives, but some effort to augment boat service along the river would be indicated. (This, however, could scarcely be considered a direct charge to be included in project costs, because of the broader services it would render to the general public.) Settlers would also need to be assured of secure tenure, in some form, and of credit for subsistence and production expenses during the development period.

Considerable progress has recently been made in clarifying tenure by issuing new titles for lands along the Demerara River between Timehri and Linden. Completion of on-going efforts will help to set the stage for a new round of land development and expanded foodcrop production. In some cases, new title holders may be prepared to settle on their land; in other cases, they may stand ready to rent portions of it to prospective settlers backed by adequate credit and technical assistance; in still other cases, additional measures may be needed to assure that the land is brought into beneficial use and not held merely for speculation. When titles have been issued to existing claimants, remaining state or Government lands with soils appropriate for mixed foodcrop production can be made available for

settlement in units of 15 to 20 acres under the sort of 25-year leases which have already become well established. Accelerated efforts in this direction may require additional personnel for survey work, a matter already under consideration in the Survey Department's current planning.

If the family living and farm development expenses of a young settler under these conditions are estimated at $1,500 per year, and if it is assumed that most of this amount would need to be advanced for at least the first 2 years, total credit for 1,000 settlers would accumulate to $3 million by the end of the second year. Administration of a program of this scale should not present an insuperable challenge to the growing capabilities of the young Agricultural Co-operative Development Bank, although the bank would have to strengthen itself substantially if credit for this kind of effort is to be closely supervised with loan disbursals made contingent upon progress actually realized in farm development. (See chapter VI.)

The production potential of 1,000 such new units in the intermediate interior would correspond roughly to the additional local market needs for provisions and various fresh fruits and vegetables. If a limited number of new units on the adjoining areas of white sands are included, any likely targets for pineapple production and new plantings of trees for cashew nut production could also be achieved. Other sources would probably need to be considered to meet increasing targets for production of edible oils, tomatoes, onions, white potatoes, and pulses.

Even if further reconnaissance fails to identify areas where new units can be established without certain off-farm drainage facilities, the requirements for them will be

modest. Much of the soil is riverine silt, which offers better percolation and aeration than the coastal clays. The level of the lands proposed for reclamation is generally above that of surrounding lands, as they were formed from deposit of alluvial material during floods. Although some areas of suitable soils are only a few hundred feet wide, many are considerably wider. Tidal differences in the river are 5 feet on the average so that gravity drainage is possible, even if pegasse clay lands in the back are a foot lower than the river bank. Irrigation, if shown to be economic for crops grown, could be by low-lift pump from drainage trenches or by gravity flow from middle-walk irrigation trenches where water levels are sufficient.

The cost to reclaim such lands will be approximately $600 per acre, including land clearing. Government construction of main drains and irrigation trenches at 1/2-mile intervals perpendicular to the river and reaching back to the backdam -- about 4 miles on average -- would be indicated. Farm plots perpendicular to the river could be smaller than plots in back of the first 1/2-mile depth. A 1-mile stretch of river could yield about 2,400 acres on each bank if the depth were 4 miles -- enough for 120 plots of 20 acres each.

Internal drainage and irrigation works could be the responsibility of cooperative groups of settlers, with technical assistance and credit provided by Government.

Expanding Oilcrop Production

Whereas Guyana has traditionally relied mainly on coconuts as a source of locally produced edible oil,

important progress has been made during the last 5 to 10 years in exploring the possibilities of soybeans and African oil palm as alternative sources. At present, some 200 acres of the latter crop are approaching bearing age in the vicinity of Wauna in the Northwest, and others have been planted on the west bank of the Demerara River at St. Jan, opposite Dora, and (in small numbers) at Ebini and Mon Repos. Likewise, soybeans have been tested at various locations, including several hundred acres which have been grown on a commercial scale in recent years at Kibilibiri.

Program alternatives for expanding oilcrop production to meet 1976 and 1981 goals are sharply constrained, partly because both coconuts and oil palm are perennials which require several years of growth before coming to a full bearing stage, and partly because Guyana must consider herself still in the early stages of learning about economic possibilities for producing oil palm and soybeans. For 1976, it is already too late to realize additional production from oil palm. For 1981, a crash program of planting and mill installation might yield additional market supplies from oil palm, but the risks of this proving costly would be high. Soybean output could be expanded more rapidly, under the kind of technology which has been employed at Kibilibiri, but this has so far required very high cash inputs relative to the yields achieved.

In a 1973 study of the economic potential of the Intermediate Savannahs, it was estimated that all variable costs and certain fixed costs of soybean production could be covered, with a margin to spare, if yields of 1,800 pounds (360 pounds of oil equivalent) per acre could be realized and if the resulting production could be valued at 12.5 cents per pound of beans. To date, it remains to be demonstrated

that yields can be maintained at half that level; meanwhile, market prices have sometimes exceeded twice the projected level, but costs of fertilizer, machinery, and other cash inputs have also risen sharply. Further testing and development -- of varieties, inoculant materials, rotations, fertilizer use, and other cultural practices -- for Intermediate Savannah and other locations seem warranted before a major program for expanding soybean production is undertaken.

The same general conclusion as to timing may be drawn with respect to expanding oil palm plantings on a scale which would support an oil extraction plant of economical size. Such a plant cannot advantageously be located far from the production area because the fresh fruit bunches must be processed soon after harvest to avoid a rapid increase in free fatty acid content and a corresponding reduction in the quality of the oil output. Processing within no more than 24 hours of harvest is considered desirable, although this can be stretched to as much as 48 hours under certain conditions. This constraint makes it unrealistic to consider transporting the fresh fruit bunches for much more than 50 to 100 miles, particularly where transport is slow. For practical purposes, then, production of the Northwest would need to be processed in a mill near such places as Wauna, Mabaruma, or Port Kaituma, whereas production along the Demerara River or on the Intermediate Savannahs would need to be processed in a plant near one or both of these localities.

Modern plants for extracting oil on plantations, such as those in Malaysia, can be built in two stages, the first including all facilities for processing around 9 tons of fresh fruit bunches per hour of operation, and the second

including additional presses to double total output. Installing the first stage of such a mill in Guyana might require an investment on the order of $3 to $5 million; processing capacity on a single-shift basis would correspond to a range of 3,000 to 10,000 acres. The outlay for clearing land and bringing young stands to full production would probably total at least $1,000 to $1,500 per acre.

In Africa, palm oil destined for the rural subsistence market is commonly processed from the fruit of wild palms by traditional methods in village compounds. This processing results in a product with a high free fatty acid content, and as little as 40 percent of the oil available in the mesocarp may be extracted, compared to the 95-percent extraction efficiency which can be attained in a fully integrated mill. In most exporting countries, palm oil is processed in some sort of central mill, supplied by plantation production or producer cooperatives. Nigeria, however, has devised an export marketing system which provides for quality control under a system of state-owned Pioneer mills, distribution of hand-operated presses to villagers, and licensed agents who can buy from smallholders.[1/]

One may conclude that for the next few years, Guyana needs to evaluate its pilot activities rather than to forge ahead with major investments for increasing oilcrop production. Two major learning experiences -- one related to soybeans and one related to oil palm -- have recently been begun. Neither has been carried far enough yet to provide

1/ John Lyman, West African Production and Export Prospects for Palm and Palm Kernel Oil to 1980, U.S. Department of Agriculture, Foreign Agricultural Service, Report FAS-M-248, pp. 2-3, 22.

an adequate basis for evaluating the potential of the crop in question. The soybean is a crop of great general promise, but much experimentation remains to be done before a reasonably effective production system can be devised in Guyana. Similarly, the oil palm offers much promise in Guyana, but time is needed for observing bearing-age results of recent plantings before sizable investments are committed to the production and processing of this crop. In the meantime, there seems to be an opportunity to appreciably increase current output from existing stands of coconut, both on the large estates already discussed, and also on smaller holdings. Steps involved would include encouragement and assistance in controlling insects, disease, and weed growth; in improving sanitation; and in channeling more of the nuts to processing plants capable of extracting a high percentage of the oil content.

During the period beginning in 1977, Guyana should be prepared to evaluate results with both soybeans and oil palm, and initiate planning for sizable production of one or both if the experience by that time is favorable. If the evaluation favors oil palm expansion in the Northwest, it would be appropriate to examine the feasibility of a project for planting and processing on a scale of 5,000 acres or more, which would probably imply an investment of more than $10 million, apart from supporting infrastructure. Total employment for development, production, and processing would approach 1,000 workers. Employment in soybean production would be much less than for the same output of palm oil, given the high degree of mechanization which would presumably be essential to make a soybean project successful on the Intermediate Savannahs, or even if the soybeans were to be grown in rotation with rice on the coast. Expansion of oilcrop production on such a scale -- whether from soybeans

or from oil palm -- would roughly double the 1972 base level, and would change Guyana's position from that of a net oil importer to that of an oil exporter. As noted previously, the major CARICOM countries are large importers of vegetable oils and are likely to remain so for some time.

Major efforts to expand coconut acreage can probably best be examined after the production potential for soybeans and oil palm, as competing crops, can more adequately be evaluated, and after serious efforts have been made to raise the level of yields from present stands. Although Guyana is not without additional lands which might be planted to coconuts,[1/] it seems reasonable to expect that oil palm, soybeans, or both can become more promising sources of additional oil within a few years, particularly if considerable progress does not materialize in raising present coconut oil yields.

A neglected issue to date has been the possibility that soybeans might be grown in some sort of rotation with rice on the coastal lands where water control is adequate. Such a rotation would offer important benefits to the rice crop -- partly because of improved weed control and partly because of the supply of microbially fixed nitrogen which would become available. Adequate drainage appears to be a key prerequisite for such a rotation; hence, the scope for its application may be sharply limited for some time. Nevertheless, immediate intensification of research on this possibility seems appropriate.

1/ Caribbean Development Bank, The Coconut Industry of the West Indies, prepared by Dr. Carleen O'Loughlin, Tech. Report No. 6, Barbados, November 1972, vol. I, p. 45.

Competitive Relationships Among Foodcrops, Rice and Sugarcane

In a general way, any given foodcrop may be viewed as a competitor with all other crops in each region and locality of Guyana. Realistically, however, considerations such as soil adaptability, transport costs, and existing settlement patterns narrow the degree of competition considerably. Conclusions on this score must be largely intuitive; evidence for appraising the competitive position of individual crops in various regions is extremely scanty or completely unavailable. Moreover, near-term needs for additional foodcrop acreage to satisfy the prospective growth of domestic consumption can be measured in hundreds of acres, whereas Guyana's land resources are measured in the millions. Variations in micro-environmental conditions are therefore likely to be major determinants of input-output performance in expanding the acreage of the various foodcrops.

Against this background, one of the more significant questions to be examined in considering the competitive position of foodcrops is the prospective competition between foodcrops and the established export crops (rice and sugar) in the coastal region. In the past, coconuts and certain foodcrops have been the dominant crops on the sand ridges intermingled with the coastal clay soils, whereas sugarcane and rice have been the successful claimants for most of the fertile soils with adequate or moderately adequate facilities for water control. As already noted, this pattern is at least partly a reflection of the fact that foodcrops can be grown on land not well suited for rice or sugarcane, and that Guyana's demand for foodcrops is less elastic than the combined demand for the established export crops.

If one applies product prices from the normalized 1972 data of the RRNA sector model to plausible yield expectations, and subtracts the cost of specified inputs as derived from various (not wholly comparable) published studies, the resulting relative margins are more favorable to foodcrops than might be expected (appendix table I-1). Surprisingly, one would have to achieve only the rather modest yields reported in 1960 for a labor-intensive system of producing interplanted plantains, eddoes, and vine crops at East Bank Essequibo to realize a margin over specified costs about 3 times as large as the margin for sugarcane and 10 times as large as the margin for double-cropped rice, calculated from reasonably comparable assumptions. Even cassava, planted alone, would produce a margin slightly above that for sugarcane, on the basis of assumptions based on similar premises.

As might be expected, the returns margin would be even higher if a reasonable yield could be realized from a single crop of tomatoes. But it is also worth noting that a combination of corn (for the long rainy season) and black-eyed peas (for the short rainy season) could produce a higher margin per acre than provisions, sugarcane, or rice if the input-output performance proposed in a study of alternatives for the Intermediate Savannahs could be realized on the more fertile coastal soils. Gross receipts, specified expenses, and the relative importance of purchased materials and machine services for the aforementioned alternatives can be summarized as shown in table 57.

Table 57. Returns Per Acre Over Specified Expenses for Selected Cropping Alternatives

Crop	Yield/ Ac.	Gross re- ceipts ($)	Speci- fied expenses ($)	Mar- gin ($)	Cash inputs as percentage of specified ex- penses
Sugar- cane....	25 T.	420	266	154	29
Rice (2x).	23 bags	166	121	45	72
Plantains.	5,000 lbs.	420			
Eddoes....	6,000 "	480	518	462	15
Vines.....	2,000 "	80			
Cassava...	6,000 "	480	289	191	7
Tomatoes (1x)....	6,000 "	1,590	795	795	39
Corn.....	3,000 "	240	284	476	95
Black-eyed peas....	1,300 "	520			

Such comparisons obviously cannot be taken at face value, partly because of the difficulty of establishing reasonable comparisons in input-output data and partly because the assumed prices would not hold if many producers accepted these relationships as an economic basis for adjusting their cropping patterns. To some degree, they also are incompatible with evidence on the direction of farming adjustments and land use changes in the area. In certain areas, sugarcane and rice have clearly tended to displace foodcrops in recent years. It is widely believed that the risks of predial larceny have been an important consideration to many farmers who now rely on crops not easily harvested by thieves.

In a 1970 report on the Canals Polder area, Dr. Leslie Cummings of the University of Guyana's Geography Department noted a dramatic expansion of peasant cane farming, described as follows:

> Land which in 1969 was lying fallow, or abandoned, or under fruit trees was being bulldozed, ploughed, drained and fertilized for cane in 1970. There is a new impetus and interest in farming both on the part of the farmers and the new activities which cane farming has created -- for examples, the fabrication of cane trailers and the servicing of tractors. The change to cane farming is also changing the price of fruit and ground provisions in Georgetown, since these commodities have to come from as far away as Bonasika and the Pomeroon.

Professor Cummings went on to point out that whereas officials viewed the change as an element in economic diversification, many farmers already foresaw an end to the boom and considered their change to cane as a temporary measure for "...improving their land for some future food-crop -- more often than not, the same crops from which they switched."[1/]

For the time being, the two large sugar firms are adjusting and consolidating the use of land on their present holdings in line with Government policy that unutilized estate lands be converted to residential or other productive use. Any expansion on nonestate lands must be carefully situated to avoid excessive transport costs for cane, on the one hand, and to assure adequate supplies of irrigation

1/ Leslie P. Cummings, "The Canals Polder," Department of Geography, University of Guyana, 1970.

water, on the other. West Bank Demerara, from the Canals Polder area upstream to the vicinity of Dunoon, is one of the areas where expansion of sugarcane is likely to compete with the possible expansion of foodcrops. (See appendix G.)

Cassava for Processing

In Brazil, it has been demonstrated that acceptable bread can be produced with the substitution of 10 to 30 percent of cassava flour for wheat flour.[1/] In fact, substitution was for some time required of the baking industry of that country. If sizable quantities of cassava were to be grown in Guyana for processing, however, foodcrop farms in the established production areas would represent a less promising source than some interior locations, including much of the sizable land acreage which has already been cleared at Matthew's Ridge, as well as lands in the Mazaruni/Potaro area, where small-scale processing facilities are already under construction.

To replace 15 percent of the flour made from imported wheat in 1972 would have required the output of about 7,000 acres of cassava, at an average flour yield of 2,000 pounds per acre. At 2,500 pounds per acre, the 7,000 acres of cassava would replace 15 percent of the wheat flour to be consumed at the 1981 outlook projection. Specific techniques for producing and processing cassava flour on this scale remain to be tested under local conditions in Guyana.

1/ United Nations, Food and Agriculture Organization, Agricultural Services Division, Cassava Processing, Agricultural Services Bulletin No. 8 (AgS/ASB/71/2), p. 78.

Continuous cropping to cassava would scarcely be a promising approach in view of potential soil depletion; at Matthew's Ridge it might be feasible to follow cassava with legume mixtures suitable for the expanding livestock enterprise planned for that area. Inasmuch as large areas have already been cleared but not planted to any crop at Matthew's Ridge, the cash costs of expanding cassava plantings rapidly at that location would compare favorably with costs at almost any other location; moreover, traditional techniques suitable for processing moderate quantities are already well known. The high costs of transporting bulk items from Matthew's Ridge would not be a major obstacle to shipping out cassava after it is processed into flour.

A Multipurpose Processing Plant in the Northwest

The situation in the Northwest suggests the feasibility of a multipurpose processing complex for ginger, citrus, cassava, and probably other products. This complex could evolve from the small-scale plant already under construction. The equipment for a combination or multipurpose processing plant would probably cost less than three separate plants with the same total processing capacity, because some of the basic equipment could be used for more than one type of processing operation. The building to house the equipment would cost less per unit, and the management skills that are so scarce in Guyana could be utilized more fully. The minimum rated capacity for a multipurpose processing facility would seem to be about 5 tons per day for ginger, 25 tons per day for cassava and 20 tons for citrus juice or canning of other fruits.

The production of fresh ginger in the Northwest seems to far exceed the domestic demand, judging from the large quantities that lie rotting at the Georgetown wharfs. It is estimated that in the first 3 months of 1974, the GMC lost 30,000 to 50,000 pounds of ginger. At 15 cents per pound plus transportation and handling costs, the total loss would be about $10,000 for the 3-month period.

Part of the machinery needed for drying ginger can also be used for producing cassava and plantain starch or flour, for which there is a considerable market in Guyana. The heat and power generators could be used alternately; the power source could also be used seasonally to operate a plant for juicing and canning citrus and other fruits.

Engineers in the Special Projects Unit of the Ministry of National Development and Agriculture estimate that such equipment would cost approximately $250,000. However, with foodcrop losses from spoilage, damage, and lack of a market averaging more than $125,000 per year in the Northwest, the savings would pay the initial investment within 4 to 5 years. At the same time it would create substantial employment. A preliminary review suggests that all three products from such a plant would find markets. The demand for dry ginger within and outside the CARICOM area is said to be strong. The domestic market for cassava flour could be increased from the current level of less than 1.5 million pounds to possibly 20 million pounds if the Government rules that wheat flour be mixed with 15 or 20 percent of cassava flour for bread-making. The production of citrus juice could displace imports that in 1972 amounted to nearly 90,000 gallons, equivalent to some 2.5 million oranges, or about 4 percent of Guyana's total citrus output.

A multipurpose plant in the Northwest would entail an initial total investment of some $600,000, of which about $400,000 would be for the building and basic equipment. This cost could be reduced somewhat if some existing buildings could be utilized and if some of the processing equipment that is not yet set up could be integrated.

The full annual operating costs for the kind of plant envisioned would be about $200,000. Of this amount, about $25,000 would be for containers and $160,000 for labor.

The approximate output of this plant would include:

- About 15,000 gallons of citrus juice, if only the estimated peak surplus of oranges were processed. This is equivalent to about one sixth of the total 1972 imports at a value of $60,000.

- Dried ginger with an export value of $50,000, produced by salvaging up to 30 tons of raw material.

- Nearly 3 million pounds of cassava flour and starch with a wholesale value of $300,000 (providing the plant operates 150 days at 75-percent capacity). In addition, there would be other by-products of cassava.

In sum, a plant of the above type has a potential for an annual output exceeding $400,000 at an annual cost, including interest and depreciation, of less than $300,000. There might be some additional saving in transportation

costs, and the plant would provide employment for about 60 man-years of labor.

Other Processing Facilities

The GMC already has plans for a major fruit and vegetable processing facility at Plantation Farm on the East Bank of the Demerara. A moderate-sized facility would appear to be feasible in conjunction with the smaller plants that are already in the planning and implementation stage throughout the country.

On the basis of the expected domestic demand for 1981, a plant could be built with a capacity to produce annually a total of about 2.8 million pounds, composed of the following products:

- 400,000 pounds of dried fruit and peel
- 500,000 pounds of canned fruit, jams and jellies
- 1,500,000 pounds of citrus and other fruit juice
- 400,000 pounds of canned vegetables, soups, and juices.

A larger plant would probably encounter problems of finding raw materials and/or markets. The output capacity suggested above would require about 10 to 15 million pounds of the various raw materials, 25 percent of which would come from skimming excess seasonal production.

The foregoing plant capacities are related to domestic market potentials, only because competing industries already have been developed to a considerable extent in Trinidad and Jamaica, and their products are gaining a strong position in the Caribbean area. A possible exception is the case of pineapple: some export market opportunities exist and raw materials are likely to be available. If Guyana takes steps early to develop this market, a larger-than-minimum capacity for fruit and fruit juice processing could be feasible.

There is little likelihood that a larger capacity for vegetable processing could be justified, even though the suggested minimum is not as large as projected consumption. This is because some of the projected demand is for products such as peas, beans, and carrots and other temperate-zone products which Guyana is unlikely to produce competitively in sufficient quantities.

The minimum capacity estimates for the plant at Plantation Farm make no allowance for processing tomato products, even though more than 1.0 million pounds could be marketed. The small plant at Black Bush Polder is likely to be able to absorb most of the additional production of tomatoes that can be generated in that area. It is highly unlikely that, in the absence of a major Government effort, a sufficient supply can be developed in areas near Georgetown to justify processing capacity there.

GMC's proposed processing plant for Plantation Farm would have a capacity to utilize roughly 50 million pounds of fruit in 1981. This is far in excess of any market that is likely to exist, except for the possibility of some additional vegetable processing. In any event, a thorough

feasibility study for the project would seem to be the logical next step, taking into account realistic estimates of domestic and export market demand for the various products; available and potential domestic supplies at peak seasons; and costs in relation to alternative sources of supplies.

Reducing Marketing Margins

Marketing per se currently offers no significant constraint to the flow of production to the consumer. The marketing systems, both local and distant, have grown sufficiently to deliver the output of the foodcrop production sector to consumers at home and abroad. They are likely to continue to grow in capacity to handle the growth in volume in prospect by 1976 or even 1981. In effect, entry into the current marketing system is comparatively easy, and the growth in volume of marketings is likely to be only slightly more than the 15- to 25-percent projected increase in production.

Clearly the focus in marketing improvement is on reducing waste and inefficiency. This applies particularly to the more institutionalized marketing system through which some 25 to 30 percent of Guyana's foodcrop production flows. The local marketing system probably does not generate much loss.

Reduction of waste is an alternative to increasing production. While waste is unproductive, the cost of reducing it must clearly be weighed by policy officials against the cost of obtaining increases in output. Also to be weighed are the employment and income distribution consequences.

Eliminating waste will tend to reduce consumer prices and enhance farm prices and incomes, without any significant change in production.

Crating

A switch to the use of wooden crates instead of bags would apparently be a feasible way to reduce losses of foodcrops shipped by boat. This applies particularly to shipments from the Northwest and Matthew's Ridge, and to a lesser extent to those from the Pomeroon.

In the Northwest, the manufacture of crates would afford an opportunity to utilize some of the region's timber. Millions of board feet of wood are presently being burned in the process of clearing land for foodcrops. Crate manufacture would create employment opportunities and prevent waste of a valuable resource. A portable sawmill for cutting logs into crating material costs about $15,000; such sawmills are already used in the area. The crates could be made by hand labor at an estimated cost of no more than $1 each for crates measuring about 15" x 15" x 24". This size would hold about 60 pounds of oranges or other produce and would thus cost slightly more per trip (assuming the same number of trips each) than used sacks, which currently sell for about 40 cents each. If the losses on a crate of oranges were reduced from 15 percent to 5 percent, the gain in salable product at wholesale would be about 60 cents, or enough to cover the cost difference. There would be a net gain from using crates if the loss reduction is greater and if the added losses from wholesale to retail are considered. Crates would be especially suitable for all ripe fruits and for vegetables that tend to be easily crushed; crates sent to Georgetown could be reused in that vicinity.

The estimate of about $1 per crate is based on an annual volume of about 35,000 crates, or enough for about half the produce currently shipped from the Northwest. Major cost items are as follows:

	Dollars
Interest and depreciation on a sawmill @ 30 percent.....	4,500
1,300 man-days cutting timber, sawing, re-sawing, and nailing @ $6.50 per day.....	8,450
Other costs.....	5,000
Total for 35,000 crates.....	17,950

A crate-building operation would create full-time employment in the Northwest for 6 to 7 men. They could be expected to produce an average of about 150 to 175 crates per day once the operation was underway. The saving of produce from spoilage in the Northwest alone could be about 0.5 to 1 million pounds of produce, with a value of some $40,000. There would be additional savings as the crates were reused in other parts of the marketing system.

If crate-making in excess of local needs could be developed in the Northwest, unassembled crates could be shipped for use in the Pomeroon, where losses are also high. Ultimately, crates could replace imported bags, with a substantial saving in foreign exchange.

While these cost-effectiveness estimates are crude and would need to be verified, they do suggest that such a project could be feasible as a direct Government undertaking, especially at Matthew's Ridge where workers are already

being paid by the Government and where available equipment could readily be employed for making crates.

Standards, Grades, and Market Information

The absence of a well-defined system of grades and standards impedes the effective dissemination of marketing information, and forces purchase by onsite inspection -- a comparatively expensive process. A well-regulated national system of grades and standards in which market agencies, farmers, and consumers have confidence would facilitate trade without incurring the cost of such inspection.

In the markets, prices of graded products tend to reflect differentials which purchasers are willing to pay for quality, size, and condition of the product. Unless the market rewards such differentiation, there is no point in grading. Observations in the main wholesale and retail markets suggest that there is comparatively little reward for better than run-of-the-mill quality. But consumers are not unaware of quality differences; in the market, they tend to select first the higher quality "parcels," the remainder being mostly sold by the end of a day without much price differentiation. The condition of the product with respect to ripeness, bruising, and other damage does seem to be significant in merchandizing; some dealers will attempt to sell commodities in poor condition before displaying supplies in better condition. In sum, before a grading system is superimposed, market demand for grading services would need to be determined, and alternative standards for each grade would need to be considered.

Grades and standards are also part of the language of trade and so provide a basis for communicating price quotations and other market information. It is possible to have price reporting without grades and standards; however, such information is ambiguous and would be less useful to farmers and middlemen than if the price were related to some known and accepted standard. Foodcrop price reporting has had an erratic history in Guyana -- sometimes in the press, sometimes on radio, and sometimes not at all. When prices were reported, it was typically an unweighted average for the three wholesale markets in Georgetown. The GMC posts minimum prices at buying stations. Nevertheless, farmers sometimes lack adequate information, partly because of variations in the way the GMC interprets its grading standards.

In sum, foodcrop farmers in Guyana lack good market information from either the private sector or from the GMC. This puts them at a direct disadvantage in selling their products, since buyers are usually better informed than they are. Also, the lack of appropriate price differentials by grades keeps farmers in ignorance about the importance of grade differences and any adjustments they could make to respond to the market demand.

The development and implementation of a basic system of market news reporting does seem to have merit. Consideration might be given to reporting to farmers the prices of major foodcrops in the Georgetown wholesale markets. Initially, it may be adequate to have prices collected on the main marketing day -- possibly Friday -- to be broadcast on the following Monday morning. In addition, these prices could be posted at some of the major assembly points

throughout the country by the agricultural field staff. It would be preferable to have the reporting done by an agency that does not have a vested interested in marketing. The GMC, for example, would not be an appropriate agency as it has direct interests in the pricing and procurement of agricultural produce, which could generate a conflict of interest.

GMC Price Policies

To minimize the conflict of interest that exists between the GMC's incentive price operation and its fund limitations, consideration might be given to transferring the price support function to a separate agency that could draw on treasury funds as needed to implement an incentive price policy. It would not be necessary to duplicate the handling facilities -- the GMC could continue to perform this role at some set fee or other remuneration to cover marketing costs. This would permit the GMC a freer hand in pursuing a more rational pricing policy with respect to its other operations. These could then be operated on a break-even basis and possibly at higher volume, because the demand for processed products is generally quite elastic.

Transportation

Changes in Guyana's transportation system are likely to have an important bearing on the foodcrop sector. Some of these changes will involve major investment and policy decisions, and extensive use of budget resources. Some transport investment decisions, such as major penetration roads to the interior, cannot be justified in terms of foodcrop production alone, but once built, could enable new foodcrop production to take place. Other transport decisions

are more directly related to foodcrop production and marketing. These include improvements in the quality of water transport, new air transport technology, new methods for reducing damage and spoilage during shipment, and policies for pricing transport services. Transport planning decisions along these lines may eventually have much to do with the location of production activities, processing facilities, and foodcrop markets.

Transportation from Established Areas

The development of a processing complex in the Northwest area would require improvement in the area's road and water transportation systems. Once the road from Wauna to Kaituma is completed, the processing plant could draw raw materials from the portion of the Northwest between Matthew's Ridge and Morawhanna, as well as from the surrounding territory. This would assure an adequate supply of raw materials.

In many cases, transport by water is likely to remain the principal means of moving foodcrops from the established production areas, as well as from areas along the rivers where new settlement activity is proposed. Improvements should therefore be considered in availability and frequency of service, flexible scheduling to serve the shipping requirements of foodcrops, and more rapid point-to-point service. Small vessels could probably satisfy these criteria, with little sacrifice in unit costs (see table 39, chapter V).

To complement a shift from bags to crates for handling fresh produce, moderate changes are needed in the handling

and shipping of produce by boat, especially from the Northwest area. While it would be ideal to install cooling equipment on the boats that carry produce, it is questionable if it would be economic to convert the holds of existing ships, especially as they now carry a wide variety of goods that do not require cooling. It would be feasible, however, to store perishable foodcrops on open decks or install fans to ventilate the holds. While the use of bags continues, losses by crushing could be reduced with the temporary use of shelves to relieve the total weight load at the bottom of high stacks.

The Transport and Harbours Department is already using pallets to handle much of the loading and unloading of their ships. Crating of fruits and vegetables would facilitate this operation, possibly with a modest saving.

Despite the higher unit costs, transportation by truck is in some ways a more desirable method for moving perishable commodities. Trucks are cooler and require less handling of the produce. This alternative could prove feasible for shipping from the Pomeroon area. Truck transportation from Charity would have an advantage in that the same trucks could service many of the village markets en route to Georgetown.

Trucks moving expeditiously from the Pomeroon probably do not need to be refrigerated, as they can be air-cooled with fans. The price of a closed 5-ton truck is around $15,000 -- a refrigerated truck of similar capacity would cost twice as much.

Transportation from the Interior

Transportation and interior development are very much a hen-and-egg proposition. It is clear that without reasonably low cost transportation for potential output, the interior cannot be developed. On the other hand, it is not clear that transportation alone is sufficient to develop the interior quickly.

The three major road systems which the Government is planning should eventually have considerable impact on the development of the interior. The Intermediate Savannahs are already partially accessible, and a road to the Rupununi has been laid out. If, in addition, the road to the Upper Mazaruni were completed, Guyana would have the core of an interior transport network that would facilitate considerable agricultural development. With present limited markets for most foodcrops, the cost of such a road network could scarcely be justified by foodcrop benefits alone. Given the magnitude of investment requirements for these roads and the normal lead time for complementary activities to develop, we do not anticipate that the proposed system will have an appreciable impact on foodcrop production before 1981.

In the interim, development of areas such as portions of the Rupununi may warrant continued subsidies for air transport to move the inputs which farmers need as well as the limited amounts of foodcrop production not consumed locally. Sizable subsidies, such as those which have prevailed in the past, could entail substantial resource costs for Guyana, and might become progressively more burdensome if alternative and cheaper means of transport failed to develop. At some point, then, a staged reduction

of the subsidy may become advisable. Another approach would be to look to larger planes for use on routes such as Lethem to Georgetown and Matthew's Ridge to Georgetown. Ton-mile costs of a DC-6, for example, are approximately 40 percent lower than for the C-47 or DC-3. In any event, attention will need to focus mainly on crops of relatively high specific value, and also on products that are not too perishable, for transport over distances of several hundred miles, whether by plane or truck.

The rate at which production is growing in the interior regions suggests that steps may soon have to be taken to manufacture lightweight crates to replace the second-hand cartons that are now being used. These could probably be produced on much the same basis as suggested for the Northwest.

Developing an Export System

Several potential foodcrop exports were identified in chapter III. Realization of this potential may well require the development of an export system, a task of some complexity since Guyana has no experience with regular foodcrop exporting.

For any given crop, the full development of an export system will require sufficient lead time, perhaps 2 years or more. Preparatory steps might include market testing with introductory shipments, negotiations of contracts, arrangements for regular shipping, securing CARICOM agreements, and in general developing acceptance of the Guyanese products. Clearly another necessary element of the export system is an effective grading and quality control program. These are prerequisites to developing

a market once there is the assurance that exportable surpluses will materialize on a dependable basis. However, such assurances can be given only with improvements in transportation, handling and storage in Guyana prior to shipment, and scheduling of vessels capable of handling perishable commodities. The feasibility of taking the foregoing step for developing an export system will depend in large part on the expected scale of exports; steps to expedite modest shipments by private traders may be less demanding.

Market Development: The Case of Pineapple

The projections of chapter III show that Guyana will be producing pineapple by 1976 well in excess of domestic requirements. Immediate export markets for pineapple are not apparent -- CARICOM pineapple imports are less than 15 percent of Guyana's surplus, and the larger world markets, with their established traditional suppliers, are not easily entered.

If Guyana is to enter the American and European markets, it will need to develop a theme that identifies Guyanese processed pineapple products as something superior to supplies from traditional sources. One such theme might capitalize on the spreading demand for "natural" foods, a theme which Guyana may be able to exploit with extensive market development. Bilateral trade agreements, such as those with East European countries, might provide a more immediate opportunity for Guyanese pineapple exports.

Probably the most critical element in establishing a market either for fresh or processed pineapple is to provide

importers with assurance of a regular supply. So far Guyanese exports of fresh pineapple have occurred largely during the seasons of peak production. Consideration might be given initially to having the GMC (or some other export agent) obtain an agreement or contract from some CARICOM importer for regular monthly shipments of pineapple -- small at the start and growing with market acceptance -- at some agreed price that would ensure the importer a reasonable profit. This would require the GMC to purchase for export on a regular basis at whatever price is needed to obtain the supplies. In the immediate future this could mean that exports may have to be subsidized during periods of relative scarcity. In the long run Guyana could benefit from a modest but thriving pineapple industry and sustained foreign exchange earnings.

Seasonal Markets: A Possibility

The coincidence of rainfall and weather create simultaneous seasonal surpluses of many of the same foodcrops that are commonly consumed fresh throughout the Caribbean area. Guyana, however, has an advantage in that its seasonal rainfall patterns are not as sharply defined as they are in most of the islands. This asset, along with improvement in water control, offers some opportunity for producing fruits and vegetables for off-season markets when supplies elsewhere in the Caribbean are low and prices are generally quite favorable.

To take full advantage of the seasonal market, Guyana would need to modify its own seasonal pattern of production for selected crops and develop an off-season marketing system and price structure to ensure supplies. Initially, off-season prices would probably have to be subsidized, since

relatively large price incentives would be necessary to get farmers to respond. Off-season purchases for export, if pursued systematically and continuously, could ultimately generate a production response, so that over time farmers would change their production patterns in areas where this is possible.

Hand-in-hand with any attempt to develop an off-season export market is the need to develop transportation that is timely and gets the product to its destination without excess deterioration of quality. For Guyana this is difficult since there are virtually no regular cargo runs to the various Caribbean islands, nor are there vessels equipped with refrigerated space. Air transport of foodcrops, which has not been attempted on any sustained basis, should be considered.

Programs for Research and Extension

The main thrusts of research and extension programs in the next decade must be conditioned by the major alternatives available for achieving Guyana's foodcrop goals, if resources are to be used effectively. This implies placing added emphasis on solving problems associated with expanding crop acreages on new and existing farms, together with a high degree of selectivity in efforts to raise yields.

In planning such programs, some 50 species now grown in Guyana must be considered, as well as an indeterminate number of exotic crops which might be introduced. In addition to their work on these crops the Crops Research Division and the Field and Extension Division have responsibility for work on a number of other crops such as rice, coffee, cocoa, tobacco, cotton, and spices. The limited

staffs of these divisions, moreover, have major responsibilities other than research and extension -- plant propagation, for example, in the first case, and general administrative responsibilities in the second.

When the list of important problem areas to be considered in research and extension is set off against the number of crop species, a large multidimensional matrix of possible topics is generated. Some of the more specific areas in which research is currently being conducted or planned are as follows:

- Varietal screening
- Optimum planting dates
- Optimum plant populations
- Use of liming materials
- Fertilization with:
  - Nitrogen
  - Phosphorus
  - Potash
  - Various minor nutrients
- Soil classification
- Crop rotations
- Weed control
- Control of plant pests
- Control of plant diseases

The last three items alone comprise aggregations of scores of problems, given the large number of different weeds, pests, and diseases which must be considered. One authority has been quoted to the effect that the number of known plant diseases in the tropical and subtropical zones is often at least 3 to 4 times as large as in the temperate zones -- for example, 248 known diseases of citrus in the subtropics vs. 50 in the temperate zones; 278 vs. 32 for tomatoes, 500 vs.

54 for rice; 175 vs. 91 for potatoes; and 125 vs. 85 for corn.[1/]

In Guyana, the matrix must also account for variations reflecting major differences among the environments of a dozen or more regions. If tomatoes are to be grown in the Rupununi, for example, the appropriate and economical varieties, fertilization rates, and other cultural practices may be quite different than if tomatoes are to be grown at Black Bush Polder.

Beyond the choices implied by the species/problem/region matrix, the planning of research programs will involve choices concerning the relative weight to be given to "adaptive," "applied," and "fundamental" research. This topic has been the subject of extensive debate which need not be reviewed here; some appropriate rate of discount must obviously be applied to prospective research benefits likely to materialize only in the distant future. The productivity of scarce professionals must also be kept high. Present research emphasis suggests that this point has already been recognized in much of Guyana's research planning.

Allocation of public resources for foodcrop research must also take account of the important topics being studied outside the Crops Research Division. Research activity, for example, is intermingled with the food processing development efforts of the Special Projects Unit of the Ministry, with the planning work of the Resource and Development Planning Division, and with the instructional programs of the Geography Department of the University of Guyana.

1/ Robert R. Nathan Associates, Inc., Agricultural Sector Analysis for El Salvador, vol. III, Washington, D.C., 1969, citing information from Dr. S. L. Wellman, Visiting Professor (1968-69) at the North Carolina University Experiment Station.

It goes without saying that the scope for an effective extension education program is extremely limited until research efforts have been continued long enough to produce a considerable body of information to be disseminated. The size of the present staff of the Field and Extension Division is probably close to a minimum for effective geographic accessibility to the main areas of agricultural production. One may conclude, however, that a larger staff would be severely constrained in educational effectiveness by the scantiness of the research findings and other information available for dissemination.

Extension workers without an adequate backlog of information to disseminate are not only unable to work effectively, but they may also easily damage their credibility by providing advice or information which proves to be unsound under applied conditions. In this connection, one may note that only in 1913 did the Smith/Lever Act establish the Cooperative Extension Service in the United States -- a quarter of a century after the Hatch Act provided basic funding for the state agricultural experiment stations and half a century after the land-grant colleges were established under the Morrill Act of 1862.

From the foregoing comments, certain guidelines for establishing program priorities in research and extension can be derived:

> Effective use of research funds in Guyana demands a concentration of most efforts on a limited number of key problems susceptible to early solution for a few of the major crops, including selected foodcrops.

. Although research activities cannot be given priority according to any precise sort of cost-benefit analysis, sizable research outlays will be difficult to defend for crop species unlikely to be of substantial importance in Guyana's agriculture of the next decade or two. This would suggest that attention should focus mainly on oilcrops, cassava, plantains, citrus, and tomatoes, for example, rather than on foodcrops of lesser production and market potential.

. In allocating research resources to various topics pertaining to individual crops or groups of crops, relationships between prospective benefits and costs are also relevant. Efforts for the screening of available crop varieties, for example, are more likely to be economic than efforts devoted to plant breeding programs, which must almost necessarily be very expensive relative to the scale of production for any one crop in Guyana.

. At present, expanded efforts in adaptive or applied research are likely to contribute more to the attainment of intermediate-term goals than will expanded extension efforts. In fact, there may be good reason to consider seconding a few extension workers to research activities for short periods of time -- both to augment the total professional input for research and to encourage interaction between workers who have been exposed to problems in the field and researchers who may

have clues to solutions which should be explored. Presently, extension recommendations are frequently developed by researchers whose judgments may be based almost entirely on test-plot results. Recommendations based on the high-risk conditions which characterize farm production might be considerably different.

. Although agricultural economists and farmers have good reason to be concerned with questions about quantitative responses to varying levels of such inputs as fertilizing materials, the complex experimental work needed to produce relevant answers is likely to be very costly, relative to potential benefits, under current circumstances in Guyana. Many interactions among environmental and cultural conditions must be considered in determining responses to each separate input for each individual crop; probably the most effective approach at present would consist of careful design and observation of farm test-demonstration activities pertaining to some of the major practice alternatives for principal crops.

. It has already been suggested that foodcrop production goals between now and 1981 can, in general, be more easily attained by emphasis on acreage expansion than by emphasis on yield increases, given the specific resource and technological situation which now prevails in Guyana. Correspondingly, there is reason to emphasize adaptive and applied research activities which can produce support for acreage expansion rather than technology for attaining higher yields on existing acreage. The

approaches, of course, are not wholly separable -- whereas improved control of diseases and insects can raise yields on the existing acreage, some such control is also a prerequisite to economical production in new areas.

. Knowledge pertaining to effective on-farm water control and utilization needs to be expanded by four specific kinds of activity:

-- Determining drainage sensitivities of potentially high value foodcrops, such as soybeans and bananas, with emphasis on identification of flood-resistant varieties.

-- Determining the response of high-value foodcrops (as well as for other cashcrops which might complement or compete with foodcrops) to irrigation as a basis for ascertaining the economic attractiveness, of irrigation.

-- Examining the use of residual soil moisture supplemented with small amounts of irrigation water for a foodcrop to follow rice especially for a crop of pulses or oilseeds as in India.

-- Examining alternative power sources for irrigation pumps, especially in the interior, with emphasis on wind.

One of Guyana's major advantages in assuring effective use of resources allocated to research and extension is the

ease of communication and control which arises from the modest scale and simple organizational structure for these efforts. Even the Deputy Prime Minister is able and willing to keep in close touch with many detailed aspects of agricultural development in various parts of the country. This situation will permit the continuation of a relatively flexible approach to determining and adjusting priorities in research and extension, which might be unwise and ineffective in a larger country such as Brazil.

Improved Water Management

Observations on the problems and potentials of water-resource development in Guyana, already set forth in chapter VI, may be summarized as follows:

. Flood control (of waters coming from river or sea) is currently receiving priority attention from the Government through its sea defense program. Upon completion of the current phase of capital works, sea defenses should be satisfactory along much of the coast.

. Riverine flood control, however, is not sufficient to reduce the risks of cultivation along most rivers. The larger rivers -- the Essequibo, Demerara, Berbice and Corentyne -- can be diked and adjacent lands drained by gravity. The smaller rivers -- the Canje, Mahaica, Abary and Mahaicony -- have small tidal ranges and will probably require upstream storage of flood waters or expensive diking and pumped drainage of adjacent lands. The Supenaam and Pomeroon Rivers are of intermediate behavior,

but diking and gravity drainage of adjacent lands appear feasible.

. Riverine flood behavior, river defense, and drainage of adjacent lands require study with emphasis upon identification of areas amenable to relatively low-cost flood control (of river waters) and gravity drainage (of rain waters).

. Gravity drainage to the sea (and in some cases to a river) is hampered by high tidal stages, excessive siltation of outfall channels, foreshore accretion in front of outfall channels, and land elevations below 50 G.D. For these reasons, pump drainage will be introduced during the next few years (after having been used on sugar estates for many decades). This program should markedly improve drainage reliabilities in declared drainage and irrigation areas of Guyana.

. Although irrigation is extensively practiced on sugar estates, it is not common on nonestate lands, notwithstanding the high degree of variability in rainfall at critical times during the growing seasons of most crops.

. Supplemental irrigation in various localities of Guyana would help to maintain plant growth during the spring and autumn dry seasons. Without irrigation, planting times must be conditioned by the arrival of rainy seasons, and ripening periods in both spring and autumn are subject

to the considerable variations in rainfall experienced at those times. There is, however, some flood irrigation of rice lands to obtain a spring crop, and some irrigation of garden vegetables with portable pumps, mostly of less than 1-cusec capacity.

. Expansion of irrigated acreage is limited by water supply during dry years. In the East Demerara and Boerasirie Water Conservancies there can be insufficient water to supply head for gravity irrigation to declared drainage and irrigation districts. Furthermore, water withdrawals in the Canje and Abary Rivers result in salinity intrusion during low flow periods. In each of these cases, sugar estates make significant water withdrawals, and there are conflicts (existing or potential) between these withdrawals and the needs of other crops.

. Water use efficiencies appear to be low throughout Guyana for a multitude of reasons. Sugar estates, for example, have high requirements because of the practice of flood fallow and the needs of navigation. Water-use efficiencies on rice lands, both on large projects such as Tapakuma and Black Bush Polder and in smaller drainage and irrigation areas, are low because of poor land leveling, lackadaisical maintenance of water courses, flood irrigation from field to field, water stealing and vandalism of control structures (made worse by difficult access to backdam areas), and preference for dark swamp water over clear rain water. There is scant

economic incentive for the farmer to conserve water, and there is little or no extension advice available on proper irrigation techniques.

. Research in Guyana on crop water requirements, tolerances to flooding and poor drainage, and varietal improvements to enhance productivity under deficient water control is totally lacking.

. In most areas, subsidiary drainage and irrigation works are the responsibility of local authorities or private proprietors. These subsidiary works are often absent or improperly maintained because of financial difficulties, conflicts or uncertainty over land titles, or inconvenient plot shapes. A few instances exist of successful cooperative construction of subsidiary works.

. Flood damages are not confined to the coast but have also hindered foodcrop expansion at Matthew's Ridge, in the Rupununi, and in the Intermediate Savannahs.

. The Intermediate and Rupununi Savannahs hold promise of substantial supplies of good quality ground water and year-round streams for surface water irrigation (especially streams from the Kanuku Mountains in the Central Rupununi). The steady winds may be sufficient to power windmills. Few hard data exist, however, regarding quality and availability of ground water. Water samples collected by the study team showed virtually no toxic salts.

Given the foregoing circumstances, Government initiatives in ground water development, minor irrigation schemes, and charges for water may, after further study, usefully complement existing programs to improve water control.

Ground-water Development

The ground-water resources of Guyana may be of significance to foodcrop development if low-cost energy sources can be tapped. Initiation of a reconnaissance ground-water survey is already being considered for the Inter-[illegible] Similar efforts might also be considered [illegible] Rupununi. Both should be viewed, in part, [illegible] ces.

[illegible] Irrigation Schemes

[illegible] pumps of 1- to 2-cusec capacity may be the most [illegible] and effective way to bring additional land under irrigation. These pumps would lift water for up to 10 feet from:

- Year-round rivers or creeks
- Adjacent swamps
- Drainage ditches operated to take in water at high tide during dry periods
- Drainage ditches filled from swamps in back
- Shallow, hand-dug wells, where water quality permits and where the water table lies sufficiently near the surface.

A single 1-cusec pump would be required for each 25 acres (assuming 50-percent water use efficiency, 20 inches of evapotranspiration requirement over a 4-month growing season, and an 8-hour operating day). Each pump with a diesel engine would cost approximately $5,000, or $200 per acre. In areas with main drainage available, little modification would be necessary to use trenches for pumped irrigation. Internal irrigation channels would need to be constructed to convey water from pump site to fields; land leveling would also be necessary. These costs would not exceed an additional $200 per acre.

Thus, for $400 per acre (excluding management costs) suitable areas could be provided with irrigation. This would be economically attractive, however, only for a high-value crop responsive to supplemental irrigation. Operating costs of the pump/engines would be approximately $20 per acre per year, assuming a 6-foot lift and a diesel fuel cost of $2.50 per gallon.

Costs could be reduced in areas where electricity is available. Pumps, if the demand were sufficient, could be locally manufactured (this can be a small-scale operation) and diesel engines and electric motors can also eventually be made in Guyana provided that from the project's inception some thought is given to desired specifications.

For example, an "old-fashioned" low-speed diesel engine is much easier to repair and eventually to manufacture than a "modern" high-speed engine. If further analysis indicated such a scheme were economically attractive (and this would depend to a large extent on selection of crops), then a pilot project could be started by some cooperative in a foodcrop area. For example, Essequibo north of the Supenaam

apparently has water from a few creeks, from the swamp in the back, and from the river itself. Although much of this area is in rice, a more intensive cropping scheme of rice followed by irrigated fruits and vegetables seems a possibility, given credit to farmers for land preparation (modest drainage system improvements would be needed over most of the area) and pump purchase, and given technical assistance to a serious, disciplined cooperative. As a pilot project, installations on a few hundred acres could be started in 1975. The pumps should not be gifts but should be owned (and maintained) by the cooperative.

Foodcrop areas in Vergenoegen/ Bonasika, Canals Polder, and Kamuni/Potosi might also be candidates. With irrigation, flood and drainage difficulties would be less of a constraint because irrigation permits manipulation of planting and harvesting times to avoid periods of maximum hazard. In any event, all of these areas currently have the rudiments of a drainage system that could be improved and used in conjunction with pumped irrigation. (More analysis is required of the flood hazard in the November-March period. Heavy storms can occur at that time, so drainage must be provided, but criteria for that period have not been developed for different crops.)

Charges for Irrigation Water and Drainage

As noted earlier in the report, charges for irrigation water and drainage services are nominal and are frequently not collected from farmers. Not only does the Government forego mobilizing resources for development, but the low (or zero) cost of water results in inefficient use. To encourage efficiency in the use of water on foodcrop (as well as

other) farms in a D&I district, consideration should be given to a new pricing system with higher water charges. The most desirable system would be on a volumetric basis, but this could probably be implemented only on the best-designed and best-managed projects. Alternative water pricing systems will need to be examined.

The Pomeroon

Improved drainage of lands along the Pomeroon River hinges on Hydraulics Department decisions about continuing improvement and management of the new main drainage system (including river defenses and backdams) and on private or cooperative responsibility for construction of internal works. Since most of this land is in active farm units, problems due to idle land as in Vergenoegen/Bonasika and Potosi/Kamuni should not arise. Farmers will benefit from provision of main drains even with faulty internal drains. Collection of rates should encourage more effective land utilization.

Agricultural Credit

At present, foodcrop farmers place few demands on the formal credit system. With occasional exceptions, such as mentioned in chapters IV and VI, the limited access of small farmers to agricultural credit is not currently a constraint to foodcrop production. Neither can it be considered a constraint for operators of the coconut estates and state farms.

Should several of the programs outlined earlier be implemented, the agricultural credit system would have to adjust correspondingly, or become a constraint. The

combination of four programs --riverine settlement, acreage expansion in the Parika area, minor irrigation schemes, and palm oil development -- could employ as much as $8 million of credit, in the aggregate, during 1974-81. The capital requirements for the Agricultural Co-operative Development Bank implied in this figure would exceed present disbursements by only $1 to $2 million per year, or by about 25 percent. Hence, mobilization of capital to satisfy foodcrop requirements should not present a problem.

The management of such a credit program, on the other hand, could present a serious constraint. Continuation of supervised credit on a farm-by-farm basis would not be feasible if extended to, say, 1,500 foodcrop farmers. Not only would the Agricultural Co-operative Development Bank need to augment its professional field staff, but at the same time new mechanisms would have to be designed for the disbursement and management of credit.

Alternative Regional Sources of Additional Output

All regions of Guyana have some potential for contributing to the production increases needed by 1976 and 1981. On the other hand, regional contributions to the expanded production of individual crops will vary widely.

Any geographic pattern of foodcrop production and marketing activities which can evolve by 1981 must be anchored to the present pattern of concentration of production in the coastal plain and nearby riverine areas. This is particularly true for tree crops, such as coconuts and citrus, which do not produce substantial quantities of output in much less than 5 to 7 years after initiation of

the first steps toward establishing new stands. Roughly similar lead times are involved for any geographic redistribution of production which requires completion of majcr drainage and irrigation projects, relocation of farm entrepreneurs and their families, or pilot-project testing of new combinations of production and marketing techniques.

Variations in the natural resource base also represent major constraints to any geographic redistribution of production. If Guyana is to achieve expansion targets for potato production, for example, sites at higher elevations of the interior are clearly favored climatically, whereas there has been equally good reason to choose the humid lowlands of the Northwest region for tests with oil palm. Relative to Guyana's needs for additional foodcrop output between now and 1981, the potentials of the various regions tend to be strongly commodity-specific, if both the agronomic and economic aspects of resource use are considered.

Transport resources and costs comprise one of the dominant economic determinants of this commodity-specific pattern of regional potentials, after taking as given the predetermined natural resource base, together with the existing distribution of the consuming public and of workers engaged or prepared for work in agriculture. For certain commodities and certain areas, transport constraints can readily be overcome; in other cases, the costs would be exorbitant. The prevailing strong orientation of market flows toward Greater Georgetown could well be modified by the emergence of lesser regional marketing centers in the interior over time, but such a change cannot be expected to materialize rapidly, or without encouragement in support of current goals for interior development.

Foodcrops can play a modest but strategic role in the achievement of national objectives for broader and more balanced development of the various regions. In part, this is because some part of foodcrop expansion can take place in each of the principal regions, whereas further expansion of sugarcane or rice production, for example, would be much less feasible except along the coast. Moreover, foodcrops for local consumption can be expanded along with population growth in each region, thus helping to support local and regional economies. Extractive forestry and mining can also be expected to contribute to attainment of goals for interior development, but any such contribution will be facilitated by the availability of inexpensive local supplies of food. Hence, the role of the foodcrop sector in interior development is doubly strategic.

Consequent to heretofore discussed constraints imposed by the natural resource base, the existing structure of the sector, the time frame of the analysis, and other determinants including transport, some emerging prospects for emphasis by regions will be suggested here.

The Intermediate Savannahs

Prospects have been strengthening during the last 5 or 10 years for development of the Intermediate Savannahs as an area of diversified crop and livestock production, with emphasis on the mechanized production of grains such as corn, grain sorghum, and soybeans. Experience at Kibilibiri during the last 4 years, however, has warned of the agronomic and administrative difficulties of economic production under a system which requires judicious employment of costly material inputs and skilled management in a location remote from sources of supply. To these difficulties must now be

added the prospect that imported fertilizers will be more costly and perhaps scarcer than in the recent past.

If this region is to become an economical producer of grains (and livestock), emphasis must be placed on developing cropping systems which require modest imports of fertilizer -- presumably by providing for the incorporation in the soil of locally produced organic materials (including crop residues and green manure crops), and by assigning to leguminous plants (such as soybeans and forage legumes) an important role in the cropping sequence. Until successful results have been realized from tests along these lines, caution in further expansion seems warranted.

In the meantime, however, the use of costly fertilizer on corn and/or grain sorghum on the brown sands of the Savannahs can be made to serve double duty if this sort of crop production can be integrated with the poultry and pineapple production on the white sands of the Soesdyke/Linden area. Pineapple and other fruits and vegetables can benefit substantially from applications of poultry litter, whereas the poultry enterprise -- already well established in the Soesdyke vicinity -- needs large inputs of feed grains. It is suggested, then, that some of the new settlers on the hazardous white sands should consider the possibility of arranging for cooperative or contract production of feed grains on the brown sands of the Intermediate Savannahs to the east. In this way, fertilizer used to grow corn would be recycled to nourish the pineapple crop.

The Northwest Region

Although the Northwest provides a more suitable soil and climatic environment for foodcrop production than many other parts of Guyana, it is relatively remote in terms of access and transport costs. These disadvantages can be minimized by emphasizing the production of crops whose weight and bulk can be reduced by local processing, and by utilizing cheap water transport insofar as feasible. This mode of transport has occasioned sizable handling losses for fresh citrus and other perishables, but such losses can be reduced by simple measures which have already been suggested in this chapter. The Northwest, it should also be noted, is conveniently located for sea shipment of foodcrops to other CARICOM countries.

With these factors in mind, it has been suggested that citrus for processing as well as for fresh market, cassava for processing, and other fruits and provision crops for processing or fresh market offer considerable promise as production alternatives for the Northwest. If sizable acreages of cassava are to be grown, crop sequences including forage legumes and grasses would be appropriate, particularly as present plans call for considerable expansion of livestock production in the area. In the Wauna area, present pilot stands of oil palm will soon be indicating the adaptability of this locality for expanded plantings and early establishment of a sizable processing plant (see previous sections of this chapter).

The Rupununi

To date, moderate attention has been given to the Rupununi as a source of foodcrops for shipment to Georgetown,

notwithstanding the current high costs of shipment by air. For the immediate future, it seems plausible to develop and demonstrate the use of appropriate techniques for growing various crops to satisfy the local market, which is not always well supplied with fresh fruits, vegetables, and provision crops. With this in mind, outshipments by air could be viewed mainly in terms of their contribution to supporting local market prices in the Rupununi, so as to encourage full development of the production potential for the kinds of crops which can mainly be marketed locally. Once such a capability is fully developed, transport costs may not present insurmountable obstacles to outshipments of selected foodcrops, including some which could be processed locally (see section on "Transportion" earlier in this chapter).

Looking ahead to 1981 and thereafter, it is conceivable that the Rupununi could become an economical seasonal or year-around supplier of fresh and processed tomatoes, other vegetables, and certain fruits, particularly if larger planes can be employed to reduce transport costs. Production and processing of cashew nuts is also a possibility which fits the physical and economic environment of the Rupununi.

At some future date, the Government of Guyana will no doubt want to undertake a comprehensive study of development alternatives for the Rupununi's extensive resources for crop and livestock production. Such a study, in our judgment, can be most productive after the accumulation of a much stronger information base for evaluating competitive relationships among crops and among regions, and in conjunction with a systematic examination of costs associated with the development of alternative modes of transport. For the time being, initiation of such a complex study would inevitably

distract attention and divert efforts of Guyana's few top program managers from topics where their inputs could be expected to produce higher benefits.

The Intermediate Riverine Areas

For many plausible reasons, Guyana has chosen to look toward the interior for expanded agricultural production, including production of foodcrops. The intermediate riverine localities offer opportunities for pursuing this objective without requiring excessive transport costs for provisions and other perishables, and without necessitating the relocation of producers and their employees to places which they may tend to shun. In the intermediate riverine locations, it may also be possible to find lands which can be cultivated without the major investments in water control which are indispensible to many of the otherwise promising underutilized lands of the coast and the interior.

Along the Demerara River, upstream from the vicinity of Timehri, land-use capability mapping based on reconnaissance soil surveys suggests that it should be possible to find sizable areas of land readily convertible to growing provisions, fruits, vegetables, and pulses. Water transport along the Georgetown/Linden axis can be provided at minimum cost, and the area should be attractive if resettlement opportunities could be provided to some of the excess entrepreneurial talent now underutilized on existing food-crop farms. Steps taken recently have already paved the way for untangling tenure problems of this area.

Somewhat similar opportunities, oriented to local markets as well as to Georgetown, are to be found in other

intermediate riverine areas, among which are the Corentyne and the East Bank of the Essequibo, including the Bonasika Creek area. As already noted, the total additional acreage needed for various fresh-market crops is modest compared to the areas of unutilized land in such locations.

The Established Coastal Areas

Foodcrops can continue to compete successfully in selected locations along the coast, particularly if progress is made in improving water control in such areas as the Pomeroon, along lines discussed earlier in this chapter, and if the problem posed by widespread predial larceny can be controlled near the more populated areas. This region will also continue to be the main source of coconuts until 1981 and beyond, and steps are urgently needed to raise yield levels for this crop.

Personnel for Staffing Technical and Economic Programs

Throughout previous sections, the scarcity of personnel with sufficient training and experience to provide technical, economic, and managerial expertise for public sector programs has repeatedly been suggested. In one sense, Guyana is not especially shorthanded in this respect; on the contrary, the number of qualified individuals as a percentage of the total population may be relatively high, partly because of the relatively high literacy rate for the country as a whole. Rather, the problem is that Guyana's goals for national and regional development -- particularly insofar as they contemplate general progress and regional diversification as to foodcrops -- call for large inputs of expertise from individuals with many different technical and economic

specialties, and with work assignments spread geographically over the country. It seems fair to conclude that the professional and technical input for achieving sector goals must be relatively large, not only in relation to total production and marketing activity in the sector, but also in relation to existing resources of qualified manpower. This constraint is not easily overcome.

The problem may become more evident if the foodcrop sector is compared with the rice enterprise or the sugar industry. Both rice and sugarcane occupy much more land than foodcrops, and the farm value of cane output is double the farm value of foodcrop output. However:

- The sugar and rice industries are concentrated on relatively uniform clay soils of a restricted coastal area.

- Sugar and rice are produced from a mere handful of different varieties of planting material, and they are subject to only a few serious kinds of pests and diseases, whereas workers in the foodcrop sector must spread their attention over more than 50 plant species and perhaps as many as 500 or more varieties in active use, most of which can be grown on various soils and under diverse environmental conditions throughout the country, subject to infestations of almost innumerable pests and diseases.

- The assembly stage for sugarcane and paddy ends at some mill close to the area of production; the assembly stage for foodcrops

involves a diversity of flows of many individual products of varying perishability.

. The processing of sugarcane and rice extends to the entire crop, whereas only a portion of foodcrop output would be processed, but such processing as is contemplated for foodcrops requires technical knowledge pertaining to various oil extraction processes; the preparation and canning of a variety of juices, jams and jellies, tomato products; and such other activities as making cassava flour and starch by processes ranging from traditional to modern.

The difference in the implied magnitude of needed expertise, per unit of product, is obvious.

There are two distinct approaches to coping with this constraint. One is to reduce the demand for such expertise, either through a reduction of program goals or through the selection of those programs which minimize needs for such expertise. The latter most probably implies relying more heavily upon the private sector and pricing policies to achieve some foodcrop goals. For example, freer commodity prices for some crops may be an adequate substitute for direct Government programs to bring about an increase in production. As another illustration, consideration might be given to encouraging private sector participation in such management-intensive activities as food processing, palm oil development, and soybean production in the Intermediate Savannahs. These illustrations do not suggest any inherent preference for the private sector; rather, they are meant to demonstrate that management and technical expertise have a high

opportunity cost and therefore should be allocated as carefully as any other scarce resource.

The other approach to coping with this constraint is to add to the stock of public sector managerial and technical expertise through a diversified program of formal and informal training. Some of this training could be provided in existing Guyanese educational institutions; some might be acquired through on-the-job training; much of it is likely to require some assistance from external sources.

To make such statements about the need for training is to do no more than state the obvious about what is in reality a very complex problem. Its complexity is derived from several considerations. First, designing an appropriate training program which meets specific manpower needs for a sector such as foodcrops is a demanding task, and a task which is yet to be done. Second, emigration constantly threatens to neutralize the results of training programs. This problem would be less intractible if, third, the personnel management system of the public sector could respond to some of the causes of emigration, an action that would require rather substantial changes which cannot be introduced quickly.

One area of manpower development which we judge worthy of early attention concerns manpower for economic planning in the agricultural sector. The many policy and program choices described earlier, for example, by themselves imply a demand on the Ministry of National Development and Agriculture which exceeds its present planning capacity. This planning capacity could be augmented in several ways. One would be to enlarge the capability of the Ministry's staff for economic and statistical analysis. Another way would

be to develop further the economics, geography and related social science capabilities at the University of Guyana. Though a longer term path, this has two potential benefits: involvement of faculty in research and planning problems, and production of university graduates with more depth in social science skills.

A Data Base for Program Management and Accountability

It has been amply demonstrated throughout this report that the data base for foodcrop sector analysis is weak, and in some aspects unreliable. One might conclude that Guyana ought to generate more and better information on all aspects of the foodcrop sector to permit effective planning, monitoring of program results, and accountability of program managers.

However, high-quality data can be costly to collect and in some respects represents a luxury for countries with scant financial resources and with few analytically trained personnel. Careful consideration is required to assess even subjectively the cost and need for data for decision-making. Cost effectiveness criteria should be applied to quality improvement -- that is, to improving the reliability of data -- as well as to expanding the data base. To do this, one needs to determine the relevant kinds of data for decision-making and the probable frequency of their use. If additional information would change no decisions, its value must be considered minimal. If decisions would be affected, then one needs to know the probable benefits which the added information would generate by reducing the risk of an unfavorable outcome or improving the chances of a favorable one.

Depending on these factors, choices can be made with respect to what data should be collected on a regular basis, what should be collected on an ad hoc basis, and what degree of reliability should be sought in either case.

Where there is considerable government intervention and participation in the agricultural economy, as in Guyana, it would intuitively seem that at least a small core of reliable basic information would have utility for reducing failures of costly projects. The agricultural production goals of the 1972-76 plan, for example, were developed with access to such limited information that they were almost doomed to failure of one sort or another: had the specified production been realized, the effect on slowly growing local markets would probably have led to drastic price declines and serious dissatisfactions.

Census Data

An agricultural census is used in many countries as a major benchmark for developing periodic estimates of farm production and marketing activities. Such undertakings are relatively expensive and require elaborate preparation and careful execution to be of maximum utility. Commonly, findings become available only after considerable delay -- comprehensive results of Guyana's 1968 agricultural census, for example, were still not available at the close of the present study. For many purposes, then, alternative approaches deserve careful examination.

Sample Surveys

Sample surveys -- which are sometimes called "sample censuses" when broadly comprehensive as to geographic area

and substantive topics -- can usually provide the same kinds of information as a census at lower cost, more rapidly, and sometimes with about equal reliability. Errors arising from sampling can be kept within reasonable limits by appropriate sample design, while fewer errors of other sorts may result because of the greater ease of managing a sample survey as compared to a complete census.

Sample agricultural surveys can be conducted in Guyana's coastal plain at moderate cost and with a relatively high degree of success, as was demonstrated by the 1952 sample census. In that case, a 20-percent sample of farms of less than 100 acres, and a complete census of larger farms, provided considerable information about crop acreages and production, tree numbers, livestock numbers and production, and other kinds of farm business data, with acceptable levels of sampling error at national and county or census district levels. (The design aimed for national estimates within a limit of a 2-percent error for major items.) Results show a high degree of consistency with such preliminary information as is available from hand tabulations of the 1968 census (see appendix H), and also with findings of the farm survey conducted as a part of the present study, insofar as comparisons are permitted by the respective coverages.

In the established coastal and riverine areas, a sample survey covering about 5 percent of farm units of 1 to 50 acres and a higher proportion of larger farms could provide objective and acceptable reliable estimates for a number of key items pertaining to the production and marketing of farm products, if interest centered mainly on regional totals. A larger sampling fraction would be necessary if the survey were to be extended to other regions, because of presumably greater variability in large areas with only scattered farms.

In view of the unfortunate delays and shortfalls in processing the 1968 census, and because of the modest size of the proposed tasks and the advantages of maintaining a pool of qualified statistical assistants, it is suggested that all processing of such sample survey data be done with conventional office equipment. Both office and field personnel could be used more effectively if both repetitive and special surveys were performed on a more or less continuous basis by a team permanently assigned to such tasks. This suggests the possibility that a sample survey might be conducted in one of the three counties each year, so that it would be repeated in each county every 3 years. Between the sample survey years, more specialized surveys and other kinds of data collection activities could be realized.

Although such an objective and continuous approach to collecting basic agricultural data is urgently needed, the present system could be materially strengthened, and the transition bridged, by scheduling quarterly or semiannual visits by an experienced statistical reporter to each of the principal production districts, such as the Pomeroon. The procedure would have much in common with that already used for producing statistics on rice acreage and production. The reporter's task would be to collect timely observations and judgments from key local informants, such as the agricultural field assistant, a local representative of the GMC, a few private buyers, selected tradespeople, and a few farm operators. Some of the kinds of data which can be collected by such a procedure with varying degrees of success are discussed, for the specific case of foodcrops in the Pomeroon District, in appendix E.

Price Data

Economic analysis commonly requires some basic price data. These data are generally needed at both retail and farm levels. If these two kinds are available in fairly reliable form, they automatically provide useful information about the marketing margins. Such data can usually be collected at low cost in conjunction with a market information program.

Implementation

The objectivity of final crop and livestock statistical estimates must be carefully guarded if they are to prove useful in program planning and evaluation. Objectivity can easily be compromised if the agency responsible for achieving program and policy objectives is also responsible for collecting the statistics needed to measure performance. The agency responsible for the latter function, whether within or outside the Ministry of National Development and Agriculture, needs to be insulated from any responsibility for achieving program and policy objectives.

Moreover, the collection of basic agricultural data can proceed much more effectively if field surveys, office processing, and other activities can be performed, insofar as possible, by a full-time, specialized staff. Past experience can thus be applied in the planning of each current activity, training and supervisory inputs can be reduced drastically, and career opportunities can be created, thus providing motivation and incentives for improved performance.

Emphasis on data processing efficiency must be subordinated to emphasis on accurate interpretation and full utilization of information obtained in the field if the overall efficiency and effectiveness of statistical activities are to be maximized. In fact, opportunities for effective use of systems designed for mass processing of data will become less important as interest focuses more and more on statistics for a wide range of foodcrops rather than on those for rice and sugar alone. New concepts must be precisely formulated and reliably quantified for a large number of separate parameters pertaining to small statistical universes -- a task which requires craftsmanship rather than mass production.

A permanent, full-time team comprising a senior statistician, three statisticians, three assistants and several clerks could do much to satisfy the Government's needs for basic crop and livestock statistics if team members are adequately trained and supported with funds for field travel and office expenses. The total input, except for training, would not be much in excess of outlays presently being made through various channels. However, the present staff lacks much in theoretical training even in such simple concepts as weighted averages, and even more in the ability to adapt theoretical concepts to practical needs. Training and early guidance in implementing new approaches could be provided by one statistical adviser, who would probably need to be made available through an agency for development assistance. Benefits would result from more realistic planning and more effective evaluation of agricultural programs in general, but there would also be direct savings of time now wasted by those who must constantly ponder the implications of doubtful statistics.

The relatively modest cost of obtaining useful statistics, even by special surveys, was illustrated in the course of the present study. The 1974 acreage of pineapple plantings in the rapidly growing Soesdyke/Linden area had been estimated by "informed" observers over a range extending from a few thousand acres down to a few hundred. The dilemma posed by these widely varying estimates was easily resolved: one Ministry employee with car and driver was able to enumerate total pineapple acreage on farms and institutions in the area in only 2 days. The key advantage of such special surveys is that the collection of information can be pointed directly toward satisfying a particular decision-making need. This tends to assure a high benefit relative to the cost.

A special survey of existing corn producers might have benefited the design for the recently initiated Berbice River Corn Project. Moreover, it would have provided a benchmark for project evaluation, so that costs of the project could have been related to the acreage expansion realized, after taking account of any displacement of existing acreage. Such information would represent a valuable basis for planning subsequent projects of a similar nature.

Program and Project Monitoring

Projects are often initiated without a mechanism to monitor their effectiveness -- sometimes costs are not even forecast. The Berbice River Corn Project is an example. This neglect usually occurs for three reasons: (1) project managers feel that their performance as managers is being monitored and therefore they resist such actions; (2) projects are hurriedly implemented, so that time for an

initial survey is not available; and (3) funds are not allotted for monitoring purposes.

In the case of the first objection, it is necessary to draw a careful distinction between the monitoring of management performance and the monitoring of project performance. While the two have some interrelationships, they are nevertheless separate activities. It is quite conceivable that a well-managed project could have a low cost effectiveness if it was poorly designed. Alternatively, even a poorly managed project could be cost-effective if the basic project was well designed. On the other two points the solutions are obvious; the time needed to gather benchmark data is often negligible, while decisions to allot funds depend, as in other cases, on whether the added information justifies the added cost.

Improving Capability in Agricultural Planning

There are many program possibilities for improving economic planning capability in the agricultural sector. One alternative could take the following dimensions. A fund of both foreign exchange and local currency would be established and managed by the Government, to be allocated over a period of 3 to 5 years. The resources would be directed to a mixture of (1) graduate university and shorter term training in resource and agricultural economics for staff in the Ministry of National Development and Agriculture; (2) graduate education for new faculty additions to the university in geography, economics, and related social sciences; (3) exchange of faculty with appropriate universities overseas; (4) economic research and planning assistance to the Ministry of National Development and

Agriculture; and (5) funding of special research studies, including the continuation of the present program directed by the Department of Geography at the University. The magnitude of such a program could vary substantially; a 5-year allocation of US$400,000 to US$600,000 could probably yield significant improvements in Guyana's agricultural planning.

APPENDIXES

APPENDIX A. THE DEMAND ANALYSIS: METHODS, PROCEDURES AND INTERPRETATION

The foodcrop demand projections presented in this report are a composite of theory, analytical technique, data and judgment. This appendix attempts to make explicit the role of each in the derivation of the estimates of demand used for Guyana. Basically, it explains all of the major assumptions used for the analysis and shows their interrelationships.

Another purpose of this appendix is to inform those who may wish to extend or improve upon the analysis about the procedures followed, so that they may have full knowledge of the strengths and weaknesses inherent in the present analysis.

Of the various factors that may influence domestic consumption, this analysis was limited to the consideration of changes in population, per capita real private consumption expenditures (current expenditures deflated by a consumer price index), and relative prices.

It should be understood that the projections presented here are not firmly anchored in reliable data on the Guyanese economy. Mainly there is an absence of data

on (1) the variables that are thought to determine demand, and (2) the quantities of the various foods presently being consumed and consumed in the recent past. Available statistics were used, but where relevant statistics were unavailable or appeared to be in error, judgment was substituted, with the realization that the reliability of the projections depends upon the quality of those judgments. Persons more familiar with Guyana, especially those more familiar with Guyanese food habits, will be able to improve upon these judgments and the resulting demand projections.

Demand: Population and Income Effects

The basic growth factors related to demand are population and income. As each of these grows, it has a positive impact on the level of consumption: population tends to have a one-to-one impact on consumption; income tends to have an impact that is substantially less and different for each item in the consumer range of purchases. This section therefore deals only with these two determinants of demand. A subsequent section discusses price changes that modify consumption, quite apart from the influences of basic growth.

Population Growth

According to census counts, Guyana's population was around 560,330 persons in April 1960 and 699,000 persons

in April 1970.[1/] This growth estimate (560,330 to 699,000) is surprisingly close to the growth estimate one obtains from the official statistics on births, deaths, arrivals and departures (see table A-1).

The trends in births, deaths and migration suggest a rather constant annual increment in population between 1960 and 1970. For reasons outlined in chapter III, Guyana's population is expected to grow by about the same number of persons per year. A straight-line projection based on the 1960 and 1970 population counts suggests that the population is presently growing at an annual rate of about 1.87 percent and may approach the level of 855,000 by 1981.

Private Consumption Expenditures

Following procedures used by the Food and Agriculture Organization (FAO) of the United Nations, this analysis relates changes in per capita food consumption rates to changes in per capita private consumption expenditures.[2/] Estimates of private consumption expenditures are available from both the Bank of Guyana and the Statistical Bureau of the Ministry of Economic Development (see table A-2).

1/ A count of 714 000 for April 1970 has been reported. We are informed, however, that the correct count is 699,000.

2/ Private consumption expenditures equal private income minus private savings.

Table A-1. Population Growth in Guyana, 1960-70, and Projection to 1981

(In number of inhabitants)

Year	Births[a]	Deaths[a]	Arrivals[a]	Departures[a]	Total population		
					April[b]	End of year[c]	Mid-year[d]
1960..	23,252	5,167	23,304	26,502	560,330	571,495	563,634
1961..	23,321	5,175	25,605	29,090	--	586,156	577,534
1962..	24,269	4,649	34,822	35,673	--	604,925	591,434
1963..	24,233	4,840	30,015	33,087	--	621,246	605,334
1964..	23,836	5,069	40,595	44,622	--	635,986	619,234
1965..	23,176	5,046	34,787	37,754	--	651,149	633,134
1966..	25,376	5,277	40,178	40,838	--	670,588	647,034
1967..	23,743	4,895	43,718	46,107	--	687,047	660,934
1968..	24,464	5,000	44,230	49,028	--	701,713	674,834
1969..	22,636	4,541	51,500[e]	57,559[e]	--	713,749	688,734
1970..	23,786[e]	4,600[e]	58,356[e]	66,657[e]	699,000	724,634	702,634
1971..	--	--	--	--	--	--	716,534
1972..	--	--	--	--	--	--	730,434
1973..	--	--	--	--	--	--	744,334
1974..	--	--	--	--	--	--	758,234
1975..	--	--	--	--	--	--	772,134
1976..	--	--	--	--	--	--	782,034
1977..	--	--	--	--	--	--	799,934
1978..	--	--	--	--	--	--	813,834
1979..	--	--	--	--	--	--	827,734
1980..	--	--	--	--	--	--	841,634
1981..	--	--	--	--	--	--	855,534

a/ Source: Guyana Statistical Abstract 1971, Ministry of Economic Development.
b/ 1960 and 1970 census counts.
c/ April 1960 census count plus subsequent births, minus subsequent deaths, plus subsequent arrivals, minus subsequent departures.
d/ Straight-line values based on 1960 and 1970 census counts.
e/ Projected values.

Table A-2. Private Consumption Expenditures in Guyana, 1960-72, and Projected 1981

Year	Expenditure estimates				Projected expenditure[b/] (1956 prices)
	Bank of Guyana		Statistical Bureau		
	Current prices	1956 prices[a/]	Current prices	1956 prices[a/]	
1960.....	--	--	201.9	195.3	--
1961.....	--	--	209.5	200.5	--
1962.....	198.6	182.5	202.1	185.8	--
1963.....	161.1	146.2	161.9	146.9	--
1964.....	220.2	198.2	223.8	201.4	--
1965.....	236.5	208.4	240.5	211.9	--
1966.....	256.3	220.4	258.8	222.5	--
1967.....	261.0	218.9	270.1	226.4	--
1968.....	279.2	227.0	282.9	230.0	--
1969.....	298.2	239.1	302.7	242.7	--
1970.....	325.5	255.3	322.0	252.5	--
1971.....	337.1	258.9	336.0	258.1	--
1972.....	360.0	263.0	--	--	265.0
1973.....	--	--	--	--	272.8
1974.....	--	--	--	--	280.6
1975.....	--	--	--	--	288.3
1976.....	--	--	--	--	296.1
1977.....	--	--	--	--	303.9
1978.....	--	--	--	--	311.7
1979.....	--	--	--	--	319.4
1980.....	--	--	--	--	327.2
1981.....	--	--	--	--	335.0

a/ Deflated by the Guyana Consumer Price Index (all items) (1956 = 100).
b/ Straight-line projection of 1960-72 trend.
Source: Bank of Guyana Annual Report, 1972 and Guyana Statistical Abstract, 1971.

In current dollars, total private consumption expenditures increased from G$201.9 to G$360.0 million, or by about 78 percent, between 1960 and 1972, but a major share of this increase resulted from higher prices. In real terms (deflating by the Guyana Consumer Price Index), the increase appears to have equaled only about 35 percent.

With minor exceptions, private consumption expenditures increased fairly steadily between 1964 and 1972. This provided the basis for a straight-line projection extended from those years and suggests that real expenditures by 1981 may be 27 percent above the 1972 level. The reasons for assuming a continuation of past growth rates in expenditure are outlined in chapter III.

Per Capita Private Consumption Expenditure

Combining estimates and projections presented in tables A-1 and A-2, one concludes that in real terms per capita private consumption expenditures (1) increased by less than 4 percent between 1960 and 1972, and (2) may be about 10 percent above the 1972 level by 1981. Assuming continued growth at 1 percent annually, per capita expenditures (measured in 1956 prices) are projected to approach G$400 in 1981 (see the last column of table A-3).

Projected Percentage Changes in Purchases of Food Commodities: First Approximations

Considering only the projected changes in population and real (deflated) private consumption expenditures,

Table A-3. Per Capita Private Consumption Expenditures in Constant 1956 Prices, 1960-72, and Projections to 1981

Year	Private consumption expenditure (G$ million)	Population at mid-year[a] (thousands)	Per capita private consumption expenditure (G$)	
			Consumption expenditure divided by population	1 percent annual growth rate from 1971
1960.....	195.3[b]	563.6	346.5	
1961.....	200.5[b]	577.5	347.2	
1962.....	185.8[b]	591.4	314.2	
1963.....	146.9[b]	605.3	242.7	
1964.....	201.4[b]	619.2	325.3	
1965.....	211.9[b]	633.1	334.7	
1966.....	222.5[b]	647.0	343.9	
1967.....	226.4[b]	660.9	342.6	
1968.....	230.0[b]	674.8	340.8	
1969.....	242.7[b]	688.7	352.4	
1970.....	252.5[b]	702.6	359.4	
1971.....	258.1[b]	716.5	360.2	
1972.....	263.0[c]	730.4	360.1	365
1973.....	272.8[d]	744.3	366.5	369
1974.....	280.6[d]	758.2	370.1	372
1975.....	288.3[d]	772.1	373.4	376
1976.....	296.1[d]	782.0	378.6	380
1977.....	303.9[d]	799.9	379.9	384

continued --

Table A-3 (continued)

Year	Private consumption expenditure (G$ million)	Population at mid-year[a] (thousands)	Per capita private consumption expenditure (G$)	
			Consumption expenditure divided by population	1 percent annual growth rate from 1971
1978.....	311.7[d]	813.8	383.0	387
1979.....	319.4[d]	827.7	385.9	391
1980.....	327.2[d]	841.6	388.8	395
1981.....	335.0[d]	855.5	391.6	399

a/ Straight-line projection of 1960 and 1970 census counts.
b/ Estimate of Statistical Bureau, deflated by Guyana Consumer Price Index.
c/ Estimate of Bank of Guyana, deflated by Guyana Consumer Price Index.
d/ Straight-line projection 1960-72 trend.

purchases for any given food commodity may be projected as follows:

$$DT = DB(1 + E \cdot \frac{YT - YB}{YB}) \frac{PT}{PB}$$

Where:

DT = quantity in target year

DB = quantity in base year

PT = population projected in target year

PB = population in base year

YT = per capita real (deflated) private consumption expenditures projected in target year

YB = per capita real (deflated) private consumption expenditures in the base year

E = a coefficient expressing the influence of a percentage change in per capita real private consumption expenditures upon the quantity demanded per capita (the elasticity of demand with respect to income).

Expenditure Elasticities

The FAO has estimated the causal relationships between changes in the per capita real private consumption expenditures in Guyana and the quantities purchased per capita of various food commodities and commodity groups. The estimates are in the form of mathematical demand functions.[1/] Points on the FAO functions for selected food commodities are shown in table A-4. This table

1/ United Nations, Food and Agriculture Organization, Agricultural Commodity Projections, 1970-1980, (Rome: FAO, 1971), vol. II, p. 229.

Table A-4. Selected Food Commodities in Guyana: Indexes of Demand Changes with Respect to Per Capita Private Consumption Expenditures

Commodity	Indexes of quantities demanded per capita at various levels of private consumption expenditures[a] (G$)					
	322.8[b]	357.0	397.0	411.2	450.6	489.0
Wheat flour[c]	100.0	101.0	102.1	102.4	103.4	104.2
Rice[c]	100.0	103.0	106.3	107.4	110.4	113.1
Ground provisions	100.0	102.9	106.0	106.9	109.6	112.0
Plantains	100.0	102.9	106.0	106.9	109.6	112.0
Sugar and sugar products	--	100.0	103.8	105.0	108.1	110.6
Pulses and nuts	100.0	104.0	108.3	109.6	113.3	116.6
Vegetables	100.0	105.1	110.4	112.1	116.8	120.9
Fruits	100.0	108.2	116.7	119.7	127.0	133.7
Citrus fruits	100.0	108.2	116.9	119.7	127.1	133.8
Lemons and limes	100.0	109.1	118.6	121.8	130.0	137.4
Other citrus	100.0	108.1	116.5	119.3	126.7	133.3
Other fruits	100.0	108.1	116.5	119.3	126.7	133.3
Butter	100.0	112.9	128.1	133.7	149.3	164.6
Vegetable oils	100.0	104.1	108.6	110.1	114.2	118.0
Animal fats	100.0	103.1	106.4	107.5	110.5	113.3

a/ In 1956 prices.
b/ Assumed 1965 private consumption expenditure of G$240 million divided by 655,000 persons and deflated by the 1965 Consumer Price Index.
c/ FAO estimates of demand functions for rice and wheat are rejected, because they are not consistent with recent history in Guyana. Constant expenditure elasticity of 0.3 assumed for rice and 0.1 for wheat.

Source: Except for wheat flour and rice, the demand relationship are taken from United Nations, Food and Agriculture Organization, Agricultural Commodity Projections, 1970-1980 (Rome: FAO, 1971), vol. II, pp. 6, 12, and 229.

shows, in index numbers, the estimated changes in per capita consumption rates that would occur, ceteris paribus, if per capita expenditure increased from G$322.8 to G$357.1, G$397.0, G$411.2, G$450.6 and G$489.0.[1/] The FAO demand functions for wheat, flour and rice have been rejected, principally because they are not consistent with recent history. Respectively, the elasticities are assumed to be constant at about 0.10 and 0.30 within the relevant expenditure range. Assuming other determinants of demand remain constant, the relationships shown in the table provide order-of-magnitude estimates of the demand changes that will accompany rising incomes and consumption expenditures in Guyana.

Changes in Demand Considering Only Population and Private Consumption Expenditure

In table A-1, Guyana's population is projected to increase 7.06 percent between 1972 and 1976 and 17.13 percent between 1972 and 1981. If one thought that per capita demands for the various food commodities would not change, one could project the total demands for the individual commodities to increase at the same percentage rates as population. But the per capita demands will not remain unchanged.

1/ G$322.8 and G$357.1 are the FAO estimates for 1965 and 1970; G$397.0 and G$411.2 are the FAO "trend" and "high" projections for 1975; G$450.6 and G$489.0 are the FAO "trend" and "high" projections for 1980.

Per capita private consumption expenditure (measured in constant 1956 prices) is projected to increase by 9.3 percent (from G$360.1 to G$399.0) between 1972 and 1981. Along with other changes, e.g., changes in relative prices, these expenditure changes will increase (or decrease) per capita purchases for the various food commodities.

In terms of index numbers, the estimated impacts of the projected expenditure changes upon the per capita consumption of selected food commodities are shown in table A-5. When combined with the impact of projected changes in population, the changes in total demand for these commodities, expressed as index numbers, are shown in table A-6.

Impacts of Price Changes

The consumer prices of the various food commodities will change relative to each other and relative to other prices, and these changes will influence the "commodity mix" consumers will purchase. Consumers tend to substitute commodities that become relatively less expensive for those that become relatively more expensive. These influences, depending on whether they are positive or negative, represent movements along the relevant demand functions and affect the indicated purchases correspondingly.

Table A-5. Estimated Impacts of Projected Increases in Per Capita Private Consumption Expenditures Upon Per Capita Demands for Selected Food Commodities, 1976 and 1981

(Index: 1972 = 100)

Commodity or commodity group	Indexes of per capita demand	
	1976	1981
Ground provisions[a/]	101.5	102.9
Plantains	101.5	102.9
Vegetables	102.5	104.9
Split peas	102.1	104.0
Other pulses and nuts	102.1	104.0
Fruits	103.9	107.6
Vegetable oils	102.2	104.2
Wheat flour	100.5	101.0
Rice	101.6	103.1
Sugar	101.9	103.6

a/ Same projection applies to white potatoes.

Source: Derived from estimates presented in table A-4, assuming the per capita private consumption expenditure (measured in constant 1956 prices) will increase from G$360 in 1972 to G$380 in 1976 and to G$399 in 1981.

Table A-6. Projected Demand Growth for Selected Food Commodities, Considering the Impacts of Projected Growth in Population and Private Consumption Expenditures, 1972 to 1976, and 1981

(Index: 1972 = 100)

Commodity or commodity groups	Indexes of quantity demanded	
	1976	1981
Ground provisions[a/]	108.7	120.5
Plantains	108.7	120.5
Vegetables	109.7	122.9
Split peas	109.3	121.8
Other pulses and nuts	109.3	121.8
Fruits	111.2	126.0
Vegetable oils	109.4	122.0
Wheat flour	107.6	118.3
Rice	108.8	120.8
Sugar	109.1	121.3

a/ Same projection applies to white potatoes.
Source: Derived from tables A-1 and A-5.

Price Trends

The price projections used to estimate purchases adjusted for price changes are presented in table A-7. Deflated by the projected all-items consumer price index, the same projections are presented again in table A-8. The projections in table A-6 must thus be adjusted for the net impact of these price trends.

Price Elasticity Coefficients

The impacts of changes in relative prices upon consumer purchases of a single product (product group) may be expressed in terms of a price elasticity coefficient and one or more cross-elasticity coefficients. The price elasticity coefficient expresses the percentage change in purchases associated with a percent change in the relative price of the product. Each of the cross-elasticity coefficients expresses the percentage change in purchases of a commodity (say, wheat flour) that will be associated with a 1 percent change in the price of a substitute commodity (say, rice).

Unfortunately, price and cross-elasticity coefficients derived from Guyanese market data are not available, and the existing market data are inadequate for deriving reliable coefficients. For the present, analyses of effects of price trends on purchases must rely upon assumed coefficients. Although not derived from Guyanese market data, these coefficients need not be the product of mere speculation. Guidance can be obtained from demand theory, empirical demand studies from other countries, and the fragmentary data now available on Guyana.

Table A-7. Foodcrops and Related Items: Trend Levels of Current Retail Price Indexes, 1972, 1976 and 1981
(Indexes: 1972 actual = 100)

Commodity or commodity groups	1972		1976	1981
	Actual	Trend		
All items[a/].....	100.0	97.1	106.2	116.5
All foods[a/].....	100.0	95.4	106.2	119.0
Wheat flour[a/]....	100.0	102.2	102.2	102.2
Rice[b/].....	100.0	100.0	100.0	100.0
Ground provisions and plantains..	100.0	87.6	108.2	131.2
Plantains[b/].....	100.0	87.1	109.7	135.5
Cassava[b/].....	100.0	78.8	109.1	136.4
Eddoes[b/].....	100.0	100.0	112.0	124.0
Sweet potatoes[b/].	100.0	88.6	102.3	118.2
Yams[b/].....	100.0	81.0	92.9	102.4
Potatoes[b/].....	100.0	100.0	200.0	200.0
Tannias[b/].....	100.0	85.7	102.0	122.4
Sugar[a/].....	100.0	100.0	100.0	100.0
Black-eyed peas[b/].	100.0	84.0	109.6	136.0
Split peas.....	100.0	95.6	108.0	122.0
Peanuts and other pulses[c/].....	100.0	84.0	109.6	136.0
Vegetables.....	100.0	94.6	104.5	116.3
Cabbage[b/].....	100.0	110.5	113.2	118.6
Carrots[b/].....	100.0	100.0	100.0	100.0
Tomatoes[b/].....	100.0	96.2	105.8	115.4
Onions[d/].....	100.0	100.0	133.3	133.3
Pumpkin[b/].....	100.0	76.7	93.3	120.0
Fruits.....	100.0	95.9	109.9	120.5
Oranges[b/].....	100.0	94.9	107.7	112.8

continued --

Table A-7 (continued)

Commodity or commodity groups	1972		1976	1981
	Actual	Trend		
Grapefruit[b/]	100.0	100.0	125.0	155.5
Limes[b/]	100.0	73.5	77.9	83.8
Pineapple[b/]	100.0	100.0	107.5	107.5
Avocado[b/]	100.0	66.7	72.5	81.2
Bananas[b/]	100.0	96.3	114.8	140.7
Vegetable oils[b/].	100.0	100.0	113.5	113.5

a/ Based on trends observed in data presented in Guyana Statistical Abstract, 1971, Ministry of Economic Development, tables 156 and 157.
b/ Based on trends observed in data obtained from the Ministry of Agriculture.
c/ Assumed same as for black-eyed peas.
d/ Based on import prices.

Table A-8. Foodcrops and Related Items: Trend Levels of Deflated Retail Price Indexes, 1972, 1976 and 1981

(Index: 1972 actual = 100)

Commodity or commodity group	1972		1976	1981
	Actual	Trend		
All foods.....	100.0	98.2	100.0	102.1
Wheat flour.....	100.0	105.3	96.2	87.7
Rice.....	100.0	103.0	94.2	85.8
Ground provisions and plantains.....	100.0	90.2	101.9	112.6
Plantains.....	100.0	89.7	103.3	116.3
Cassava.....	100.0	81.2	102.7	117.1
Eddoes.....	100.0	103.0	105.5	106.4
Sweet potatoes.....	100.0	91.2	96.3	101.5
Yams.....	100.0	83.4	87.5	87.9
Potatoes.....	100.0	103.0	188.3	171.7
Tannias.....	100.0	88.3	96.0	105.1
Sugar and sugar products.....	100.0	103.0	94.2	85.8
Black-eyed peas.....	100.0	86.5	103.2	116.7
Split peas.....	100.0	98.5	101.7	104.7
Peanuts and other pulses.....	100.0	86.5	103.2	116.7
Vegetables.....	100.0	97.4	98.4	99.9
Cabbages.....	100.0	113.8	106.6	101.8
Tomatoes.....	100.0	99.1	99.6	99.1
Onions.....	100.0	103.0	125.5	114.4
Pumpkins.....	100.0	79.0	87.9	103.4
Fruits.....	100.0	98.8	103.5	103.4
Oranges.....	100.0	97.7	101.4	96.8
Grapefruit.....	100.0	103.0	117.7	133.5

continued --

Table A-8 (continued)

Commodity or commodity group	1972		1976	1981
	Actual	Trend		
Limes.....	100.0	75.7	73.4	71.9
Pineapple.....	100.0	103.0	101.2	92.3
Avocado.....	110.0	68.7	68.3	69.7
Bananas.....	100.0	99.1	108.1	120.8
Vegetable oils.....	100.0	103.0	106.9	97.4

Source: Computed from projections presented in table A-7.

As to empirical studies, it is well established that the price elasticity coefficients for most food commodity groups, e.g., food grains as a group, are well below unity (-1.0). Price elasticity coefficients for individual commodities may approach or exceed unity when their income elasticity coefficients approach or exceed unity (1.0) or when there are readily accepted substitute commodities. As to theoretical relationships, it is generally agreed that income, price and cross-elasticities and the distribution of consumer expenditures among the various consumer goods must be related to each other in particular ways. For example, the sum of a product's income, price and cross-elasticity coefficients must equal zero.[1/] The elasticity coefficients used in this analysis are presented in table A-9. They seem plausible when compared with price and cross-elasticities computed with market data in other countries and recent trends in prices and consumption rates in Guyana. In terms of accepted theoretical relationships, they seem consistent with what is known of income elasticities in Guyana and the apportionment of Guyanese private consumption expenditures between foods and non-foods.

Projected Net Changes in Consumption

When the projections involving only population and private consumption expenditures are subjected to the

1/ For a comprehensive discussion of such relationships and a demonstration of their use in estimating elasticity coefficients, see G.E. Brandow, Interrelations Among Demands for Farm Products and Implications for Control of Market Supply, Bulletin 680, The Pennsylvania State

Table A-9. Price and Income Elasticities for Selected Foodcrops in Guyana

Commodity whose demand is affected	Income elasticity[a]	Price elasticity[b]	Cross-elasticities	
			Substitute commodity	With regard to price of substitute[c]
Ground provisions..	.27	-.55	Plantains	.10
			White potatoes	.04
			Rice	.04
			Wheat	.01
Plantains.....	.27	-.55	Ground provisions	.10
			White potatoes	.04
			Rice	.04
Vegetables.....	.45	-.80	Ground provisions	.03
			Plantains	.03
			Split peas	.07
			Other pulses	.07
			Fruit	.05
			White potatoes	.03
Split peas.....	.37	-.75	Vegetables	.15
			Other pulses	.07
Other pulses.....	.37	-.75	Vegetables	.12
			Split peas	.12
Fruit.....	.70	-.90	Vegetables	.05
			Sugar	.05
White potatoes....	.27	-.40	Ground provisions	.03
			Plantains	.03
			Rice	.02
			Wheat	.01
Wheat flour.....	.10	-.15	Ground provisions	.01
			Rice	.02
Vegetable oils....	.42	-.62	None in foodcrops	--
Rice.....	.30	-.50	Ground provisions	.05
			Plantains	.05
			Wheat flour	.02
			White potatoes	.05
Sugar.....	.33	-.50	Fruit	.07

continued --

Table A-9 (continued)

a/ Assumed income elasticity; approximately equal to the expenditure elasticity coefficients used in table A-6 for estimating the influence upon demand of projected changes in private consumption expenditures.
b/ Any coefficient in this column expresses the influence of a change in the price of the commodity upon consumer demand for that commodity. A negative coefficient expresses the percentage decrease in demand that will result, all else the same, from a 1.0 percent increase in price.
c/ Any coefficient in this column expresses the influence of a change in the price of the substitute commodity upon consumer demand for the original commodity.

Table A-10. Projected Impacts of Demand Growth and Changes in Relative Prices on Purchases of Selected Food Commodities, 1972 to 1976 and 1981

(Index: 1972 actual = 100)

Commodity or commodity groups	Indexes of quantity demanded	
	1976	1981
Ground provisions	107.4	115.6
Plantains	104.4	108.8
White potatoes	83.9	97.3
Vegetables	114.6	122.9
Split peas	106.9	119.2
Other pulses and nuts	100.1	110.2
Fruits	106.1	119.8
Vegetable oils	106.9	126.2
Wheat flour	108.9	118.3
Rice	119.9	139.3
Sugar	114.3	132.7

Source: Projections of table A-6 adjusted for price changes projected in tables A-7 and A-8, using the elasticity coefficients of table A-9.

2. The impact of changes in per capita private consumption expenditures upon per capita purchases of plantains is defined by the numbers in columns 1 and 5 of table A-4.

Calculations

1. By interpolation, find the approximate values of the quantity index (column 5, table A-4) that are consistent with per capita private consumption expenditures (measured in 1956 prices) of G$360.1, G$380 and G$399.

a. Where X_1 = the value of the quantity index that is consistent with a per capita expenditure of G$360.1:

$$\frac{360.1 - 357.0}{397.0 - 357.0} = \frac{X_1 - 102.9}{106.0 - 102.9}$$

$$\frac{3.1}{40.0} = \frac{X_1 - 102.9}{3.1}$$

$$(40.0)X_1 - 4,116 = 9.61$$

$$(40.0)X_1 = 4,126.61$$

$$X_1 = 103.14$$

b. Where X_2 = the value of the quantity index that is consistent with a per capita expenditure of G$380:

$$\frac{380.0 - 357.0}{397.0 - 357.0} = \frac{X_2 - 102.9}{106.0 - 102.9}$$

$$\frac{23.0}{40.0} = \frac{X_2 - 102.9}{3.1}$$

$$(40.0)X_2 - 4,116.0 = 71.3$$

$$(40.0)X_2 = 4,187.3$$

$$X_2 = 104.68$$

c. Where X_3 = the value of the quantity index that is consistent with a per capita expenditure of G$399:

$$\frac{399 - 397}{411.2 - 297.0} = \frac{X_3 - 106.0}{106.9 - 106.0}$$

$$\frac{2}{14.2} = \frac{X_3 - 106}{0.9}$$

$$(14.2)X_3 - 1,505.2 = 1.8$$

$$(14.2)X_3 = 1,507$$

$$X_3 = 106.13$$

2. Change base of the quantity index so that $X_1 = 100$.

a. $\frac{103.14}{103.14} = 100.0$

b. $\frac{104.68}{103.14} = 101.5$

c. $\frac{106.13}{103.14} = 102.9$

Interpretation

All else the same, the projected change in per capita expenditure will cause per capita purchases of plantains to increase by 1.5 percent between 1972 and 1976 and by 2.9 percent between 1972 and 1981.

Sample Calculation #2

In table A-6, projected changes in quantities demanded considering impacts of projected changes in population and private consumption expenditures, 1972 to 1976 and 1981.

Assumptions

1. The per capita consumption expenditure will change as projected in the last column of table A-3, and all else the same, these expenditure changes will cause changes in quantities demanded per capita as projected in table A-5.

2. Population will increase as projected in the last column of table A-1.

Calculations

1. Projected 1976 and 1981 populations as a percentage of the 1972 population (last column of table A-1).

a. 1976 population as percentage of 1972 population:

$$\frac{782,034}{730,434} = 107.06\%$$

b. 1981 population as percentage of 1972 population:

$$\frac{855,534}{730,434} = 117.13\%$$

2. Calculation of column 3 and 4, table A-6.

a. Column 3 of table A-6. Multiply each number in column 3 of table A-5 by 1.0706:

1.0706 x 101.5 = 108.7

1.0706 x 101.5 = 108.7

1.0706 x 102.5 = 109.7

- -
- -
- -

1.0706 x 101.6 = 108.8

1.0706 x 101.9 = 109.1

b. Column 4 of table A-6. Multiply each number in column 4 of table A-5 by 1.1713:

1.1713 x 102.9 = 120.5

1.1713 x 102.9 = 120.5

1.1713 x 104.9 = 122.9

.. -

- -

1.1713 x 101.0 = 118.3

1.1713 x 103.1 = 120.8

1.1713 x 103.6 = 121.3

Sample Calculation #3

Projected changes in the Guyana All-Items Consumer Price Index, 1972-1976 and 1981, table A-7.

Assumptions

The Guyana All-Items Consumer Price (1956 = 100) will fluctuate about a trend line. The 1972 value of the trend line is 132.9; the 1976 value is 145.4 and the 1981 value is 159.5. The actual value of the CPI in 1972 was 136.9

Calculations

Adjust the base of the All-Items Consumer Price Index so that the 1972 actual value equals 100:

$$\frac{136.9}{136.9} = 100$$

$$\frac{132.9}{136.9} = 97.1$$

$$\frac{145.4}{136.9} = 106.2$$

$$\frac{159.5}{136.9} = 116.5$$

Interpretation

The index is temporarily about 3.0 percent above its trend line (100 ÷ 97.1 = 103.0). It will increase 6.2 percent between 1972 and 1976 and 16.5 percent between 1972 and 1981.

Sample Calculation #4

Projected changes in the consumer price of plantains, 1972 to 1976 and 1981, table A-7.

Assumptions

The retail price of plantains will fluctuate about a trend line. The 1972 value of the trend line is 13.5 cents; the 1976 value is 17.0 cents; and the 1981 value is 21.0 cents. The actual price in 1972 was 15.5 cents.

Calculations

Convert prices to index numbers with the 1972 price (15.5 cents per pound) = 100:

$$\frac{15.5}{15.5} = 100$$

$$\frac{13.5}{15.5} = 87.1$$

$$\frac{17.0}{15.5} = 109.7$$

$$\frac{21.0}{15.5} = 135.5$$

Interpretation

The price in 1972 was temporarily about 14.8 percent above its trend line (100 ÷ 87.1 = 1.148). It will increase by 9.7 percent between 1972 and 1976 and 35.5 percent between 1972 and 1981.

Sample Calculation #5

Deflated Price Indexes, table A-8. The purpose of this table is to obtain index numbers that reflect changes in the prices of the individual items relative to the All-Items Consumer Price Index.

Calculations

1. Column 2, table A-8.

   a. 1972 actuals. It was arbitrarily decided that the index numbers in table A-8 would be constructed with the 1972 actuals = 100.

b. 1972 trend values. Using the numbers in column 1 of table A-7, deflate the 1972 trend value of the price index of all foods, and the price indexes of wheat flour, etc., by the 1972 trend value of the All-Items Consumer Price Index (97.1):

$$\frac{95.4}{0.971} = 98.2$$

$$\frac{102.2}{0.971} = 105.3$$

$$\frac{100.0}{0.971} = 103.0$$

$$\begin{matrix} - & - \\ - & - \\ - & - \end{matrix}$$

$$\frac{66.7}{0.971} = 68.7$$

$$\frac{96.3}{0.971} = 99.1$$

$$\frac{100.0}{0.971} = 103.0$$

2. Column 3, table A-8, 1976 trend values. Using the numbers in table A-7, deflate the 1976 trend value of the price index of all foods and the 1976 price indexes of wheat flour, etc., by the 1976 trend value of the All-Items Consumer Price Index (106.2):

$$\frac{106.2}{106.2} = 100.0$$

$$\frac{102.2}{106.2} = 96.2$$

$$\frac{100.0}{106.2} = 94.2$$

$$\frac{108.2}{106.2} = 101.9$$

$$\begin{array}{cc} - & - \\ - & - \\ - & - \end{array}$$

$$\frac{72.5}{106.2} = 68.3$$

$$\frac{114.8}{106.2} = 108.1$$

$$\frac{113.5}{106.2} = 106.9$$

3. Column 4, table A-8, 1981 trend values. Using the numbers in table A-7, deflate the 1981 trend value of the price index of all foods and the 1981 price indexes of wheat flour, etc., by the 1981 trend value of the All-Items Consumer Price Index (116.5):

$$\frac{119.0}{1.165} = 102.1$$

$$\frac{102.2}{1.165} = 87.7$$

$$\frac{100.0}{1.165} = 85.8$$

$$\begin{array}{cc} - & - \\ - & - \\ - & - \end{array}$$

$$\frac{81.2}{1.165} = 69.7$$

$$\frac{140.7}{1.165} = 120.8$$

$$\frac{113.5}{1.165} = 97.4$$

Sample Calculation #6

Indexes of the quantity of plantain purchases, 1972, 1976 and 1981, table A-10.

Assumptions

1. If there were no changes in relative prices, the projected changes in population (table A-1) and private consumption expenditures (table A-3, last column) would cause the demand for plantains to change as is indicated in table A-6, i.e., the index of quantity demanded would increase from 100 percent in 1972 to 108.7 percent in 1976 and 120.5 percent in 1981.

2. Relative prices will change as indicated in table A-7 and A-8.

3. The impacts of the changes in relative prices upon the demands for plantains can be estimated with the price and cross-elasticity coefficients of table A-9.

Calculations

A-1. Influence of the projected 1972-76 change in the price of plantains upon plantain purchases:

$$\left(\frac{103.3 - 89.7}{\frac{103.3 + 89.7}{2}}\right) (-0.55) = (-)0.0775 \text{ or } (-)7.75\%$$

A-2. Influence of the projected 1972-76 change in the price of ground provisions upon the demand for plantains:

$$\left(\frac{110.3^{\dagger} - 100^{\dagger}}{\frac{110.3^{\dagger} + 100^{\dagger}}{2}}\right)(0.1) = +0.0098 \text{ or } +0.98\%$$

† Index of weighted average price of ground provisions, deflated by the projected All-Items Consumer Price Index (1972 = 100).

A-3. Influence of the projected 1972-76 change in the price of rice upon the demand for plantains:

$$\left(\frac{94.2 - 103.0}{\frac{94.2 + 103.0}{2}}\right)(0.04) = (-)0.00357 \text{ or } (1)0.357\%$$

A-4. Influence of the projected 1972-76 change in the price of white potatoes upon the demand for plantains:

$$\left(\frac{188.3 - 103.0}{\frac{188.3 + 103.0}{2}}\right)(0.04) = +0.02343 \text{ or } 2.343\%$$

A-5. Combined influence of the projected 1972-76 changes in the prices of plantains, ground provisions, rice and white potatoes upon the demand for plantains:

$$-0.0775 + 0.0098 - 0.00357 + 0.02343$$
$$= (-)\ 0.04784 \text{ or } (-)\ 4.784\%$$

A-6. Adjustment of the projected 1976 demand for plantains (table A-6) for the influence of projected 1972-81 changes in relative prices:

$$108.7\ [1.0 + (-0.04784)] = 108.7\ (0.9522)$$
$$= 103.5$$

B-1. Influence of projected 1972-81 change in the price of plantains upon the demand for plantains:

$$\left(\frac{116.3 - 89.7}{\frac{116.3 + 89.7}{2}}\right)(-0.55) = (-)\ 0.1419 \text{ or } 14.19\%$$

B-2. Influence of projected 1972-81 change in the price of ground provisions upon the demand for plantains:

$$\left(\frac{118.8^{\dagger} - 100^{\dagger}}{\frac{118.8^{\dagger} + 100^{\dagger}}{2}}\right)(0.1) = 0.01718 \text{ or } +1.718\%$$

† Index of weighted average price of ground provisions, deflated by the projected Consumer Price Index (1972 = 100).

B-3. Influence of projected 1972-81 change in the price of ground provisions upon the demand for plantains:

$$\left(\frac{85.8 - 103.0}{\frac{85.8 + 103.0}{2}}\right)(0.04) = (-)0.00729 \text{ or } 0.729\%$$

B-4. Influence of projected 1972-81 change in the price of white potatoes upon the demand for plantains:

$$\left(\frac{171.7 - 103.0}{\frac{171.7 + 103.0}{2}}\right)(0.04) = 0.0200 \text{ or } 200\%$$

B-5. Combined influence of the projected 1972-81 changes in the prices of plantains, ground provisions, rice and white potatoes upon the demand for plantains:

$$(-)0.1419 + 0.01718 - 0.00729 + 0.0200 = (-)\ 0.11201$$

B-6. Adjustment of the projected 1976 demand for plantains (table A-6) for the influence of projected 1976-81 changes in relative prices.

$$[1.0 + (-0.11201)]\ 120.5 = 0.88799\ (120.5) = 107.0$$

Interpretation

Given the projected changes in population, private consumption expenditure and relative prices, the demand for plantains is projected to increase by 3.5 percent between 1972 and 1976 and by 7.0 percent between 1972 and 1981.

APPENDIX B. AN EXAMINATION OF AVAILABLE SUPPLY-UTILIZATION DATA FOR FOODCROPS

The analysis of the foodcrop sector required basic data on the utilization of foodcrop supplies. The data available proved in many respects to be either internally inconsistent or departed substantially from the consumption estimates that were tabulated from the 1970 consumer expenditure survey. As a result it was decided to use the data from the 1970 survey as a basis for estimates of production by: estimating 1972 consumption levels, adding or subtracting as appropriate available data on external trade, with moderate allowances for farm-to-retail waste and other uses. The results of this exercise are discussed in this appendix.

Ground Provisions and Plantains

The pattern of variation in the Ministry of National Development and Agriculture price and supply data on these commodities is to a considerable degree incongruous. The price data suggest that consumer supplies of plantains have lagged more relative to demand than have consumer supplies of ground provisions, but as is shown in table B-1, the supply data suggest the reverse. Even the year-to-year variations in the price and consumption data are not well correlated.

Table B-1. Ground Provisions and Plantains: Trends in Domestic Utilization, Including Amounts Wasted, 1964-72

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972
Ground provisions									
Production (000 lbs.).....	83,120	73,500	49,980	41,000	43,725	52,941	56,632	58,425	60,500
Imports (000 lbs.).....	21	7	29	262	41	3	--	b/	--
Exports (000 lbs.).....	357	403	172	36	54	21	84	38	84
Domestic use:									
Total (000 lbs.)....	82,784	73,104	49,837	40,964	43,712	52,923	56,548	58,387	60,416
Per capita (lbs.)a/.....	133.7	115.5	77.0	61.9	64.8	76.8	80.5	81.5	82.7
Plantains									
Production (000 lbs.).....	45,645	51,900	62,280	52,413	47,320	48,861	51,304	54,650	52,000
Imports (000 lbs.).....	--	--	--	--	--	--	--	--	--
Exports (000 lbs.).....	2,721	1,218	642	380	90	145	176	268	201
Domestic use:									
Total (000 lbs.)....	42,924	50,682	61,638	52,033	47,230	48,716	51,128	54,382	51,799
Per capita (lbs.)a/.....	69.4	80.0	95.3	78.7	70.0	70.7	72.8	75.9	70.9
All provisions									
Domestic use:									
Total (000 lbs.)....	125,708	123,786	111,475	92,997	90,942	101,639	107,676	112,769	112,215
Per capita (lbs.)a/.....	203.0	195.5	172.3	140.7	134.8	147.5	153.2	157.4	153.6

a/ Assumed population levels: 1964--619,234; 1965--633,134; 1966--647,034; 1967--660,934; 1968--674,834; 1969--688,734; 1970--702,634; 1971--716,534; 1972--730,434.
b/ Less than 500 pounds.
Source: Ministry of Agriculture.

Overall, however, the directions of the 1964-72 trends seem reasonable. The sharp upward trend in consumer prices has been associated with a downward trend in the per capita utilization of ground provisions and plantains combined. As shown in figure B-1, per capita supplies have shown a downward trend from around 200 pounds in 1964 to only about 150 pounds in 1972. Total supplies declined from around 126 million pounds in 1964 to around 91 million pounds in 1968. Total supplies were about 112 million pounds in 1972. However, GMC purchases plus receipts of the three Georgetown markets for 1972 indicate that total plantain supplies could be considerably less than 112 million pounds.

Data from the 1970 Household Consumer Survey of the Ministry of Economic Development indicate that the volume of ground provisions and plantains consumed in 1970, excluding losses from harvest to purchase by consumers, equaled only about 45 percent of the supplies indicated to have been available by the data on production, imports and exports. The reasons for the discrepancy are not clear. It is not likely, however, that a major portion of it can be explained as spoilage and handling losses.

White Potatoes

The per capita consumption of white potatoes fluctuated from year to year and trended downward very modestly between 1964 and 1972 (see table B-2 and figure B-2). Per capita consumption in 1972, including spoilage and handling losses, was about 25.6 pounds. The price of potatoes also fluctuated from year to year during the period, but moved upward more rapidly than the consumer price index. It should be noted that the years of

FIGURE B-1. DOMESTIC UTILIZATION OF GROUND PROVISIONS AND PLANTAINS, 1964-72

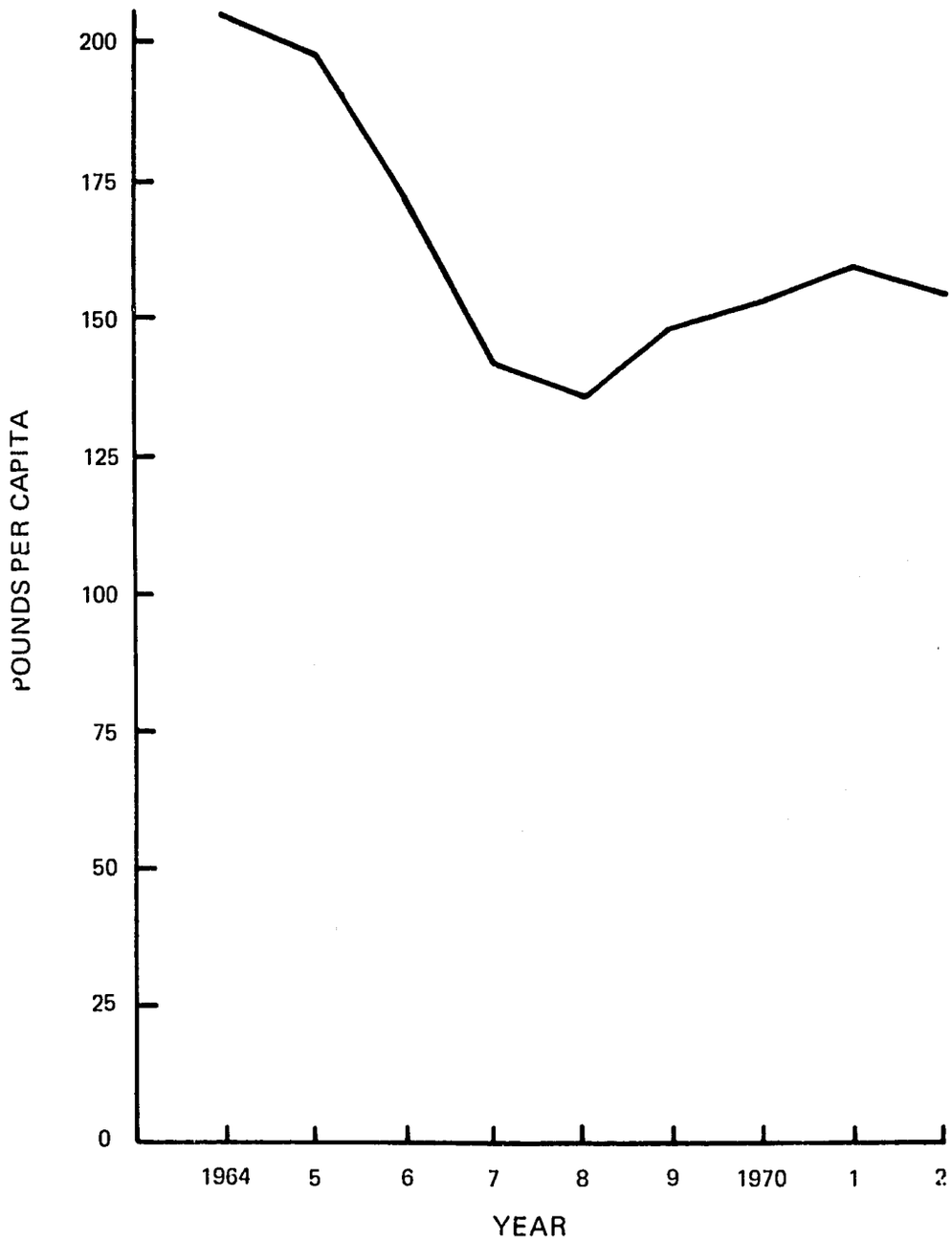
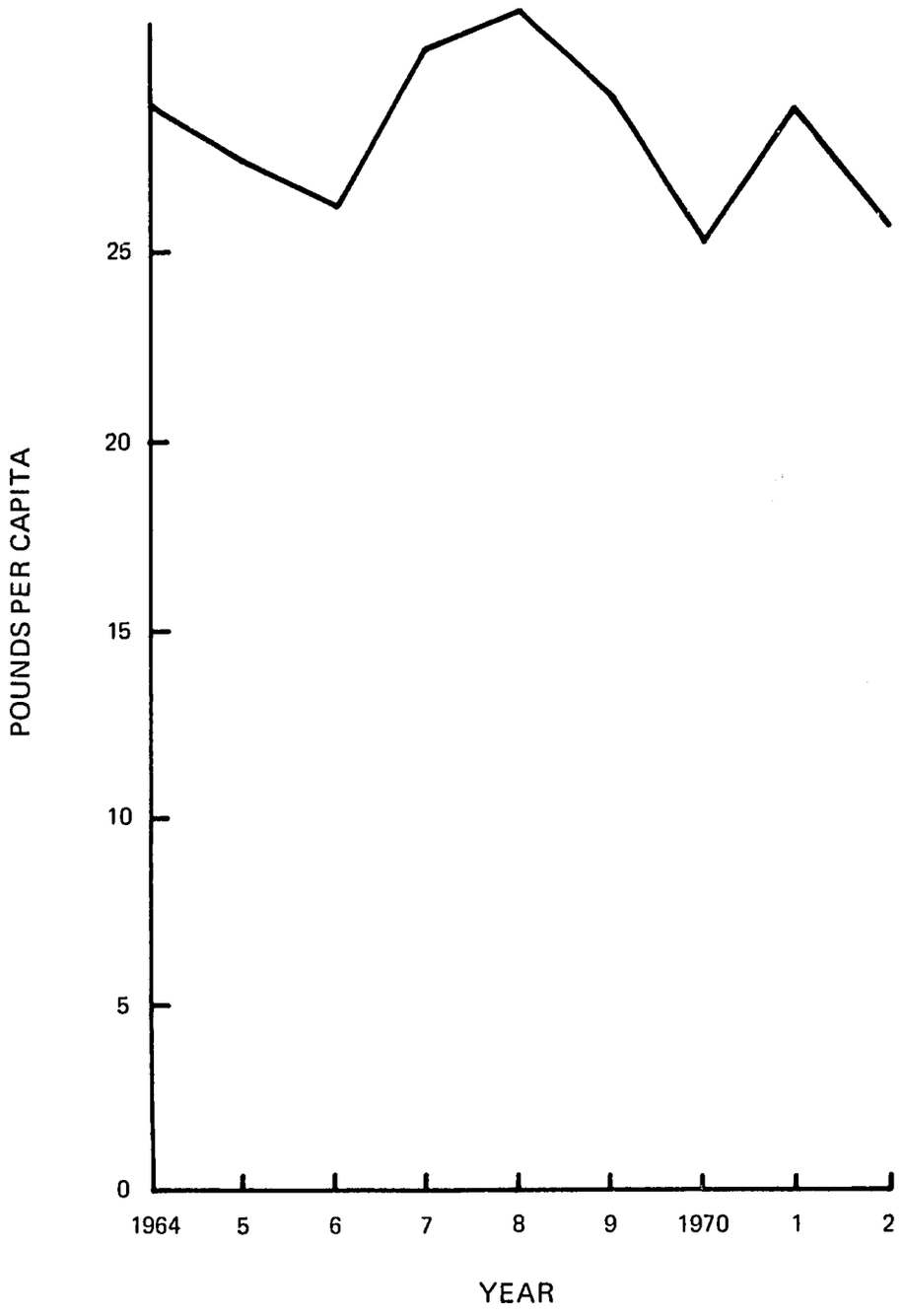


Table B-2. White Potatoes: Trends in Consumption, 1964-72

Item	1964	1965	1966	1967	1968	1969	1970	1971	1972
Production (000 lbs.).....	0	0	0	0	0	0	0	0	0
Imports (000 lbs.).....	17,852	17,323	16,904	20,020	21,182	19,997	17,769	20,640	18,684
Consumption:									
Total (000 lbs.)....	17,852	17,323	16,904	20,020	21,182	19,997	17,769	20,640	18,684
Per capita (lbs.).....	28.8	27.4	26.1	30.3	31.4	29.0	25.3	28.8	25.6

Source: Ministry of Agriculture.

FIGURE B-2. PER CAPITA CONSUMPTION OF WHITE POTATOES, 1964-72



highest per capita potato consumption (1967 and 1968) were the 2 years of lowest per capita consumption of ground provisions.

Vegetables

The available data on the consumption of vegetables are fragmentary. When Ministry data are used to estimate the consumption of tomatoes, onions, carrots and cabbage as fresh vegetables during each year from 1964 to 1972, they show a fairly sharp upward trend in the per capita consumption from 11.13 pounds per capita in 1964 to 16.83 pounds in 1972 (table B-3). This increase is accounted for in full by one vegetable, tomatoes. Other fresh vegetables are also consumed, but there is no evidence to indicate whether these quantities have increased, remained constant or declined.

Including the fresh product equivalent of processed vegetables (canned or otherwise), FAO has estimated the per capita consumption (excluding waste) at 19.6 kg. (43.12 pounds) in 1965 and 20.6 kg. (45.32 pounds) in 1970.[1/]

Food balance sheets prepared by the Ministry place the per capita consumption of fresh vegetables at around 30 pounds in 1967 and 20 pounds in 1970, the latter adjusted for more realistic assumptions regarding population levels. By commodity, the estimates contained in the food balance sheets are given below.

1/ United Nations, Food and Agriculture Organization, Agricultural Commodity Projections, 1970-1980 (Rome: FAO, 1971), Volume II, page 229.

Table B-3. Selected Fresh Vegetables: Trends in Domestic Utilization, Including Amounts Wasted, 1964-72

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972
Tomatoes									
Produced (000 lbs.)	1,211	1,523	1,800	3,102	3,048	3,143	3,500	4,892	5,610
Imported (000 lbs.)	30	21	20	14	3	1	8	a/	--
Exported (000 lbs.)	23	5	2	1	1	1	2	16	3
Domestic use:									
Total (000 lbs.)	1,218	1,539	1,818	3,114	3,049	3,142	3,506	4,876	5,607
Per capita (lbs.) b/	1.97	2.43	2.81	4.71	4.52	4.56	4.99	6.80	7.68
Onions									
Produced (000 lbs.)	--	--	--	--	--	--	12	20	35
Imported (000 lbs.)	4,837	4,723	4,941	5,249	5,277	5,489	5,081	5,243	4,911
Exported (000 lbs.)	1	10	a/	--	a/	--	--	a/	a/
Domestic use:									
Total (000 lbs.)	4,836	4,713	4,941	5,249	5,277	5,489	5,093	5,262	4,945
Per capita (lbs.)	7.81	7.44	7.64	7.94	7.82	7.97	7.25	7.34	6.77
Carrots									
Produced (000 lbs.)	--	--	--	--	--	--	36	72	84
Imported (000 lbs.)	124	218	147	138	23	81	184	8	n.a.
Exported (000 lbs.)	--	--	--	--	--	--	--	--	--
Domestic use:									
Total (000 lbs.)	124	218	147	138	23	81	220	80	84 c/
Per capita (lbs.)	0.20	0.34	0.23	0.21	0.03	0.12	0.31	0.11	0.12

continued--

Table B-3 (continued)

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972
Cabbages									
Produced (000 lbs.).....	321	385	484	464	585	699	650	1,239	1,650
Imported (000 lbs.).....	392	558	406	155	--	293	282	--	--
Exported (000 lbs.).....	--	--	--	--	--	--	--	--	--
Domestic use:									
Total (000 lbs.).....	713	943	880	619	585	991	932	1,239	1,650
Per capita (lbs.).....	1.15	1.49	1.36	0.94	0.87	1.44	1.33	1.73	2.26
Combined total									
Domestic use:									
Total (000 lbs.).....	6,891	7,413	7,786	9,120	8,934	9,703	9,751	11,457	12,202 c/
Per capita (lbs.).....	11.13	11.71	12.03	13.80	13.24	14.09	13.88	15.99	16.83 c/

a/ Less than 500 pounds.
b/ Assumed population levels: 1964--619,234; 1965--633,134; 1966--647,034; 1967--660,934; 1968--674,834; 1969--688,734; 1970--702,634; 1971--716,534 and 1972--730,434.
c/ Excludes possible imports.
Source: Ministry of Agriculture.

Commodity	1967	1970
Tomatoes.....	4.75	5.02
Pumpkins.....	6.49	1.96
Boulangers (eggplant).	3.94	1.90
Onions & garlic.....	8.26	8.23
Cabbage & such.....	1.14	1.00
Other.....	5.21	2.22
Total.....	29.79	20.33

Consumption of a greater variety of fresh vegetables was recorded in the 1970 consumer expenditure survey conducted by the Ministry of Economic Development. Based on the survey, per capita consumption of fresh vegetables in 1970 is estimated at 64 pounds. Most of the individual commodity estimates -- other than onions and garlic, which are imported -- differ substantially from the food balances derived from Ministry data.

Commodity	Per Capita Consumption of Fresh Product in 1970 (pounds)
Onions.....	7.44
Garlic.....	1.36
Red peppers.....	0.73
Ginger.....	0.11
Cabbage.....	1.18
Carrots.....	0.20
Boulangers.....	11.42
Callalu.....	15.46
Cucumbers.....	2.40
Lettuce.....	0.37
Eshallots.....	0.49
Okra.....	4.84
Pumpkins.....	6.74
Tomatoes.....	3.35
Fresh peas and beans...	4.04
Other fresh.....	4.19
Total.....	64.32

Pulses and Nuts

As shown in table B-4 and figure B-3, the data on production, imports and exports indicate that split peas now account for three-fourths of the dried pulses and nuts in the Guyanese diet. Data from the 1970 consumer expenditure survey suggest that the consumption of dried pulses and peanuts in 1970 may have been 25 percent higher than is indicated by the data on production, imports and exports. The reliability of the estimate derived from the consumer survey data seems questionable in that its split pea component substantially exceeds the volume of split pea imports.

Fresh Fruit

Data on production, imports and exports indicate an upward trend, since 1966, in per capita consumption of citrus, bananas and pineapple (see table B-5 and figure B-4). The total for these commodities, including spoilage and handling losses, has increased from about 52 pounds per capita in 1966 to nearly 58 pounds in 1972.

Many other fresh fruits are consumed in Guyana, but data are not available with which to estimate consumption trends. As shown below, data from the 1970 consumer survey indicate that, net of spoilage and handling losses, citrus, bananas and pineapple accounted for about 80 percent of the total consumption of fresh fruits. Assuming that the data on production, imports and exports of citrus, pineapple and bananas are approximately correct, it is likely that the consumption of all fresh fruits, including spoilage and handling losses, approached 70 pounds per capita in 1972

Table B-4. Dried Pulses and Peanuts: Trends in Domestic Utilization as Food, Including Amounts Wasted, 1964-72

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972
Split peas									
Imports (000 lbs.)	a/	a/	4,673	6,696	6,938	7,302	6,552	7,447	7,944
Domestic use:									
Total (000 lbs.)	a/	a/	4,673	6,696	6,938	7,302	6,552	7,447	7,944
Per capita (lbs.)	a/	a/	7.22	10.13	10.28	10.60	9.32	10.39	10.88
Other peas and beans									
Production (000 lbs.) b/	246	198	178	165	175	271	346	394	420
Imports (000 lbs.)	a/	a/	2,327	160	424	270	1,839	1,441	494
Domestic use:									
Total (000 lbs)	a/	a/	2,505	325	599	541	2,185	1,835	914
Per capita (lbs.)	a/	a/	3.87	0.49	0.89	0.79	3.11	2.56	1.25
Peanuts									
Production (000 lbs.)	--	--	--	13	61	64	75	138	151
Imports (000 lbs.)	1,136	1,224	888	1,192	1,052	703	974	803	724
Domestic use;									
Total (000 lbs.)	1,136	1,224	888	1,205	1,113	767	1,049	941	875
Per capita (lbs.)	1.83	1.93	1.37	1.82	1.64	1.11	1.49	1.31	1.20
All pulses and nuts b/									
Domestic use:									
Total (000 lbs.)	9,114	9,268	8,066	8,226	8,650	8,610	9,786	10,223	9,733
Per capita (lbs.) c/	14.72	14.64	12.47	12.44	12.82	12.50	13.93	14.26	13.32

a/ Imports not separately reported.
b/ Excludes small quantities of pigeon peas.
c/ Population assumptions: 1964--619,234; 1965--633,134; 1966--647,034; 1967--660,934; 1968--674,834; 1969--688,734; 1970--702,634; 1971--716,534 and 1972--730,434.
Source: Ministry of Agriculture.

FIGURE B-3. DRIED PULSES AND PEANUTS: TRENDS IN PER CAPITA CONSUMPTION AS FOOD, INCLUDES AMOUNTS WASTED, 1964-72

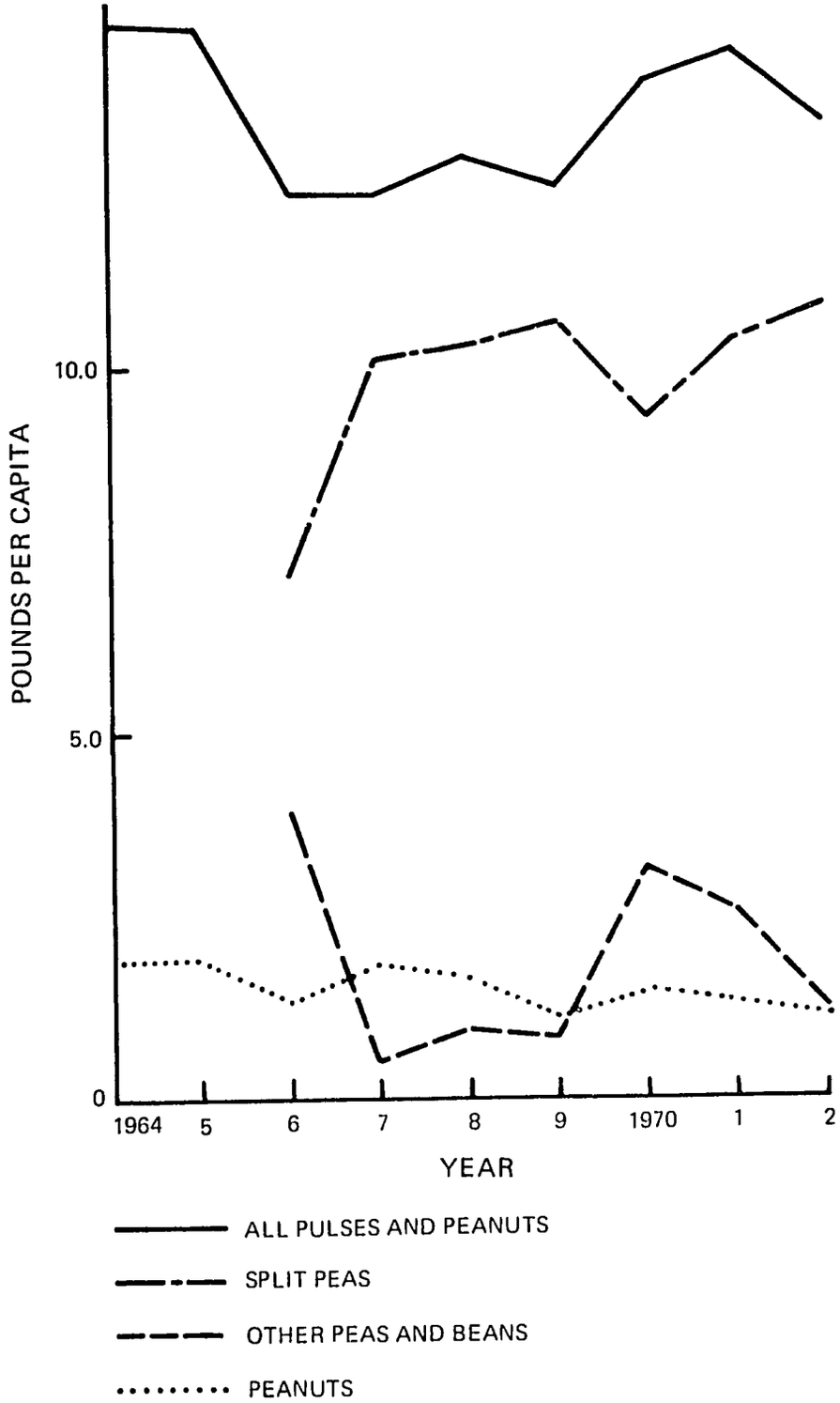
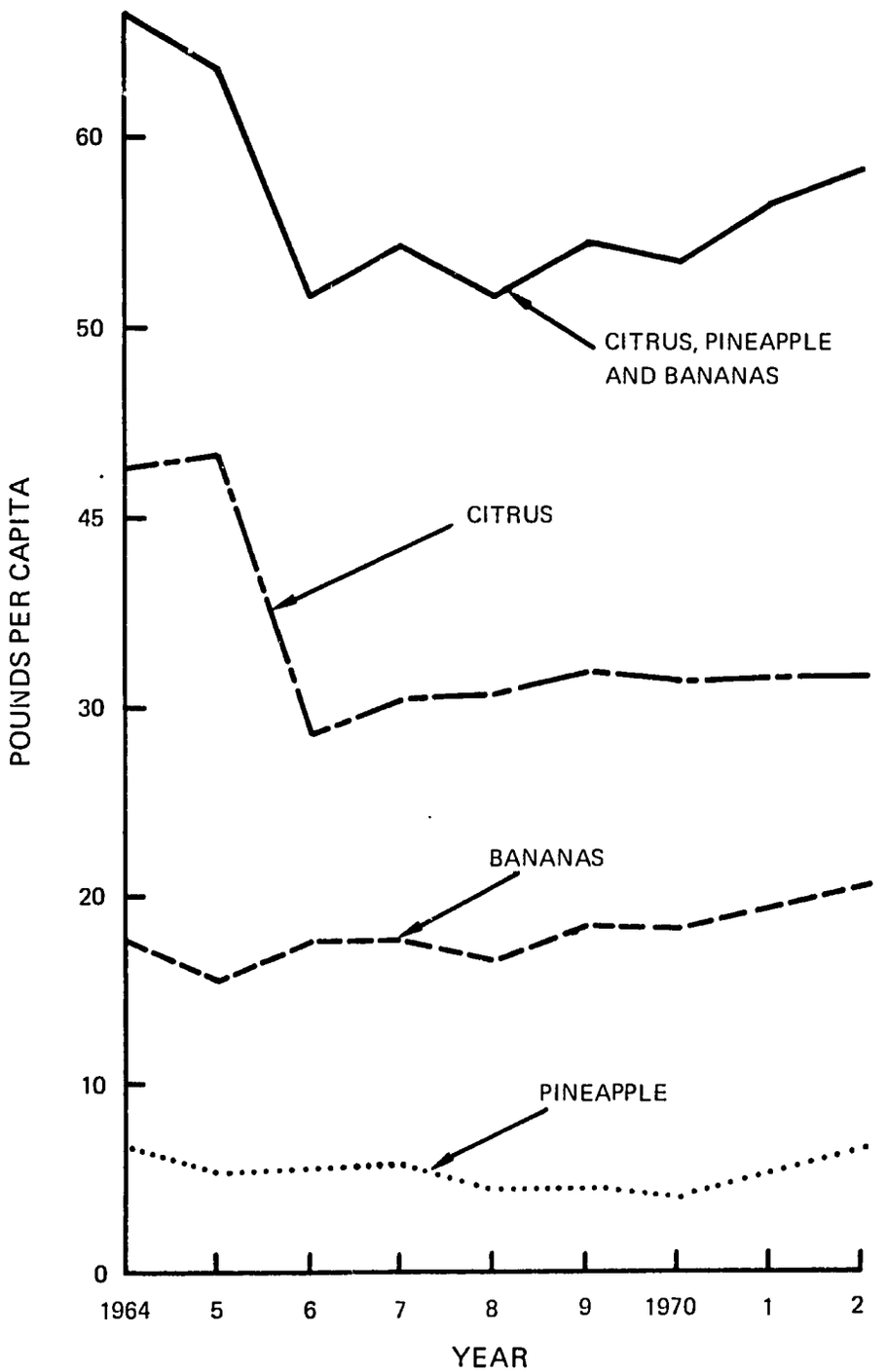


Table B-5. Citrus, Pineapple and Bananas: Trends in Consumption, Including Amounts Wasted, 1964-72

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972
Citrus									
Produced (000 lbs.).....	25,323	27,000	18,630	20,000	20,759	21,840	22,000	22,626	23,000
Imported (000 lbs.).....	1,054	421	5	22	8	84	47	3	9
Exported (000 lbs.).....	59	18	10	4	13	19	288	63	26
Consumed:									
Total (000 lbs.).....	26,318	27,402	18,625	20,018	20,754	21,905	21,759	22,565	22,983
Per capita (lbs.)....	42.5	43.3	28.8	30.3	30.8	31.8	31.0	31.5	31.5
Pineapple									
Produced (000 lbs.).....	4,105	3,220	3,636	3,844	2,803	2,981	2,800	3,697	4,500
Imported (000 lbs.).....	--	--	--	--	--	--	--	--	--
Exported (000 lbs.).....	65	10	1	5	a/	1	3	35	17
Consumed:									
Total (000 lbs.).....	4,040	3,210	3,635	3,840	2,803	2,979	2,797	3,661	4,483
Per capita (lbs.)....	6.5	5.1	5.6	5.8	4.2	4.3	4.0	5.1	6.1
Bananas									
Produced (000 lbs.).....	10,947	9,788	11,245	11,770	11,275	12,685	12,700	13,805	14,803
Imported (000 lbs.).....	--	--	--	--	--	--	--	--	--
Exported (000 lbs.).....	152	3	2	1	1	2	1	3	3
Consumed:									
Total (000 lbs.).....	10,795	9,785	11,243	11,769	11,274	12,683	12,699	13,802	14,800
Per capita (lbs.)....	17.4	15.5	17.4	17.8	16.7	18.4	18.1	19.3	20.3
Citrus, pineapple and bananas									
Consumed:									
Total (000 lbs.).....	41,153	40,397	33,503	35,627	34,831	37,567	37,255	40,028	42,266
Per capita (lbs.)....	66.5	63.8	51.8	53.9	51.6	54.5	53.0	55.9	57.9

a/ Less than 500 pounds.
Source: Ministry of Agriculture.

FIGURE B-4. PER CAPITA CONSUMPTION OF CITRUS, PINEAPPLE AND BANANAS, INCLUDING AMOUNTS WASTED, 1964-72



Commodity	Per capita consumption in 1970	
	Pounds	Percent
Oranges.....	17.67	42.14
Lemons.....	0.27	.65
Grapefruit.....	1.54	3.68
Limes.....	1.30	3.11
Pineapple.....	1.33	3.18
Bananas.....	11.15	26.67
Mangoes.....	3.89	9.30
Pawpaw.....	2.99	7.15
Avocado pears.....	0.30	.72
Sapodilla	0.31	.74
Guava.....	0.38	.91
Other.....	0.73	1.75
Total.....	41.81	100.00

Vegetable Oils

Based on production, import and export data, per capita consumption of imported and factory-produced vegetable oils moved upward between 1964 and 1972 (see table B-6 and figure B-5). The increase was from an average of around 18 pounds in 1964-66 to an average of nearly 20 pounds in 1970-72. Small quantities of oil are produced by households for their own use; the consumer survey suggests an average of 1.32 pounds of coconut oil was produced for home consumption in 1970.

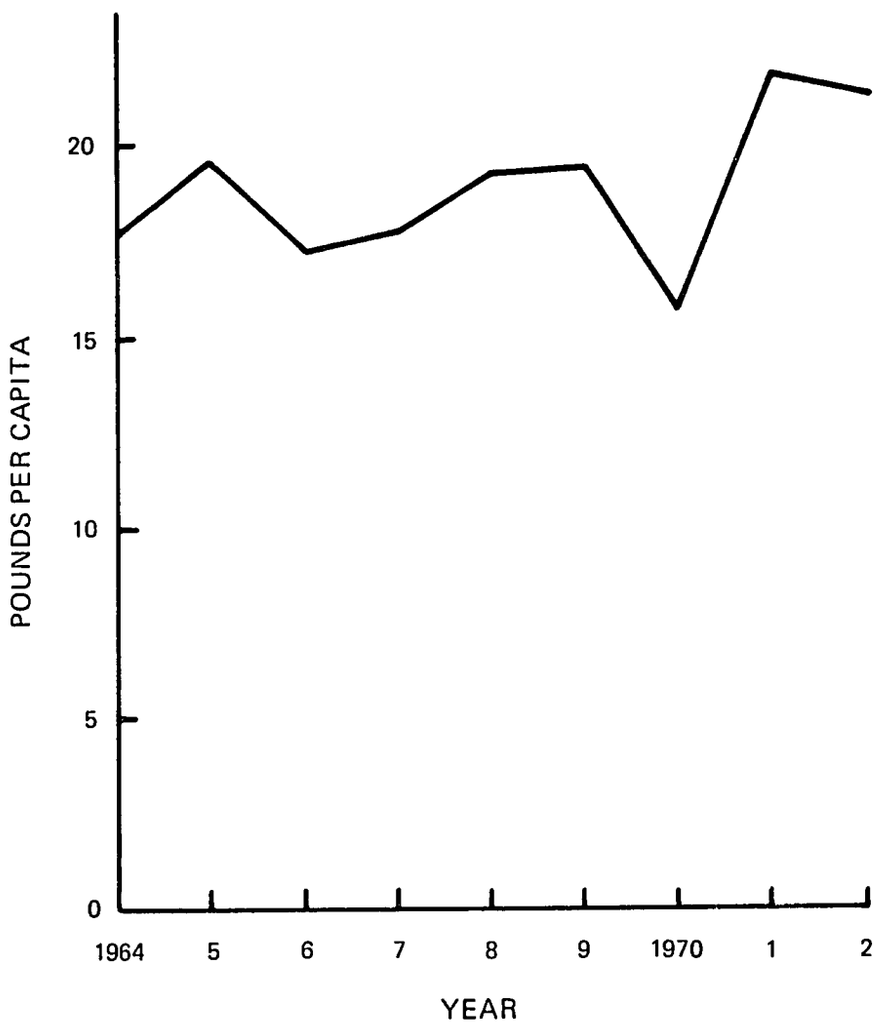
Data from the Consumer Survey also indicate that nearly 7 million coconuts were consumed as dried coconuts in 1970, in addition to the coconuts used for home-produced coconut oil. At 5.3 ounces per nut, this is equivalent to around 2.3 million pounds of copra.

Table B-6. Vegetable Oils: Consumption as Food, 1964-72[a/]

Item	1964	1965	1966	1967	1968	1969	1970	1971	1972
Production (000 lbs.)[a/]	8,485	6,365	8,094	8,443	8,773	7,331	7,841	8,188	9,835
Imported (000 lbs.)	2,866	6,345	3,280	3,546	4,511	6,410	3,518	7,850	6,616
Exported (000 lbs.)	--	--	--	--	--	--	--	--	--
Used for Soap (000 lbs.)	347	340	320	278	308	329	347	331	319
Used for Food:									
Total (000 lbs.)	11,004	12,370	11,054	11,711	12,976	13,412	11,012	15,707	15,637
Per capita (lbs.)	17.77	19.54	17.08	17.72	19.23	19.47	15.67	21.92	21.41

a/ Excludes the production of coconut oil by householders and cottage industries and soap stock. One ton of copra yields 150 gallons of oil, of which 93 percent is refined oil and 7 percent is soap stock.
b/ Includes small quantities of ghee.
Source: Ministry of Agriculture.

FIGURE B-5. PER CAPITA CONSUMPTION OF VEGETABLE OILS, 1964-72



Wheat Flour

Per capita consumption of wheat flour remained relatively constant during 1964-72, fluctuating between 104 and 117 pounds (table B-7). The one exception was 1969, in which per capita consumption dropped to 63 pounds, possibly explained by data deficiencies due to the starting of the flour mill at about this time.

Rice

Two sets of data are available for estimating domestic consumption of rice (see table B-8). Neither set yields estimates with believable patterns of year-to-year variation. Both sets fluctuate wildly from year to year, which, even if stock changes are considered, is inconsistent with year-to-year consumption patterns in most parts of the world. All rice in the domestic market is distributed to retailers by the Rice Marketing Board and is sold at fixed prices. There is no evidence that rice has not been available to consumers for any extended period of time.

On balance, as shown in figure B-6, the two sets of estimates suggest an upward trend in the per capita consumption of rice, a trend consistent with available data on prices. With the price of rice at retail held constant and other retail prices rising, consumer demand seems to have shifted from other commodites to rice.

The two sets of estimates are so different, however, that they provide little guidance in judging how much rice actually has been consumed in recent years. Data collected in the consumer survey suggest a per capita consumption as food of about 128 pounds in 1970. On this basis it seems

Table B-7. Wheat Flour: Trends in Consumption, 1964-72

Item	1964	1965	1966	1967	1968	1969	1970	1971	1972
Production (000 lbs.).....	--	--	--	--	--	--	66,540	74,557	76,946
Imports (000 lbs.).....	71,054	65,852	73,782	77,038	73,801	43,645	9,669	6,844	6,264
Exports (000 lbs.).....	--	--	--	--	--	a/	26	12	401
Consumption:									
Total (000 lbs.)..	71,054	65,852	73,782	77,038	73,801	43,645	76,183	81,389	82,809
Per capita (lbs.)	114.7	104.0	114.0	116.6	109.4	63.4	108.4	113.6	113.4

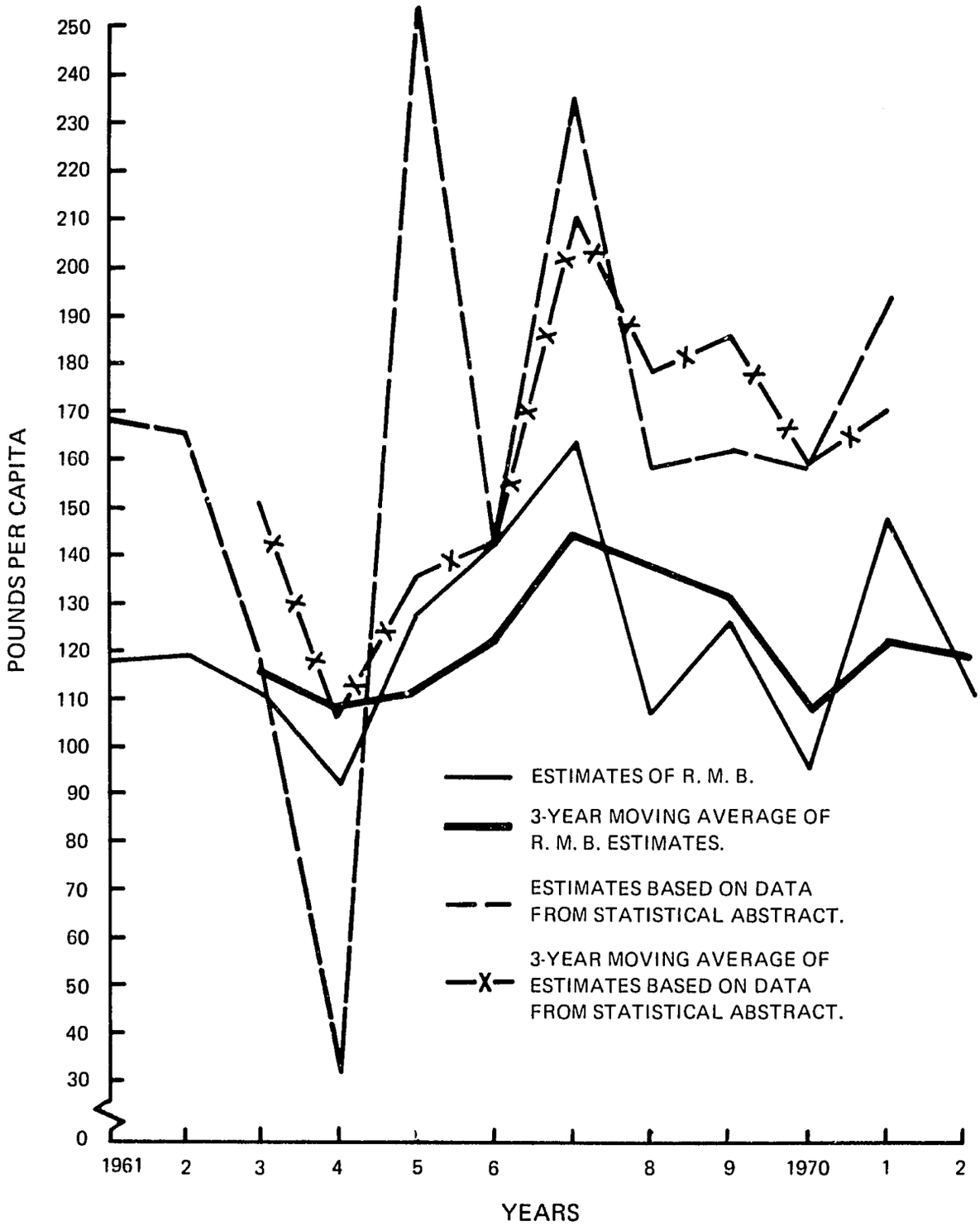
a/ Less than 500 pounds.
Source: Ministry of Agriculture.

Table B-8. Rice: Trend in Domestic Utilization for Food and Beer, 1961-72

Milled rice	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
	a. Estimates of Guyana Rice Marketing Board											
Retained by producers (long tons)	10,779	10,354	11,685	10,619	24,919	27,597	36,155	21,526	27,497	26,500	34,500	25,000
Sold locally by R.M.B. (long tons)	19,558	21,142	18,283	15,074	11,254	13,657	11,988	10,357	11,080	13,144	12,412	12,880
Total (long tons)	30,357	31,495	29,968	25,693	36,173	41,254	48,143	31,883	38,577	29,644	46,912	37,880
Per capita (lbs.)	117.7	119.2	110.8	92.9	128.0	142.8	163.2	105.8	125.5	94.5	146.7	116.2
	b. Estimates based on data presented in Guyana Statistical Abstract											
Production (000 LT)	121.6	127.0	130.5	96.6	176.9	146.0	179.1	142.4	113.8	122.1	134.2	n.a.
Deliveries to R.M.B. (000 LT)	93.1	99.6	112.0	102.0	108.8	113.3	113.7	100.0	69.8	80.3	78.5	n.a.
Local sales by R.M.B. (000 LT)	19.6	21.1	18.1	15.1	11.3	13.2	11.5	10.4	11.0	13.1	12.3	n.a.
Domestic use:												
Total (000 LT)[a]	48.1	48.5	36.6	9.7	79.4	45.9	76.9	52.8	55.0	54.9	68.0	n.a.
Food & beer (LT)[b]	43.3	43.6	32.9	8.7	71.5	41.3	69.2	47.5	49.5	49.4	61.2	n.a.
Food & beer per capita (lbs.)	167.9	165.1	121.7	31.5	253.0	143.0	234.5	157.7	161.0	157.5	191.3	n.a.

a/ Production minus deliveries to the R.M.B. plus local sales of R.M.B.
b/ Assumes that 10 percent of domestic utilization is for seed and animal feed.
Source: Guyana Rice Marketing Board, Annual Reports and Guyana Statistical Abstract, 1971, Ministry of Economic Development.

FIGURE B-6. PER CAPITA CONSUMPTION OF RICE, 1961-72



reasonable to believe that the per capita consumption as food was around 130 pounds in 1972. Allowing 1.4 pounds per capita for beer manufacturing, a per capita rate of 131.4 is assumed for 1972.

Sugar

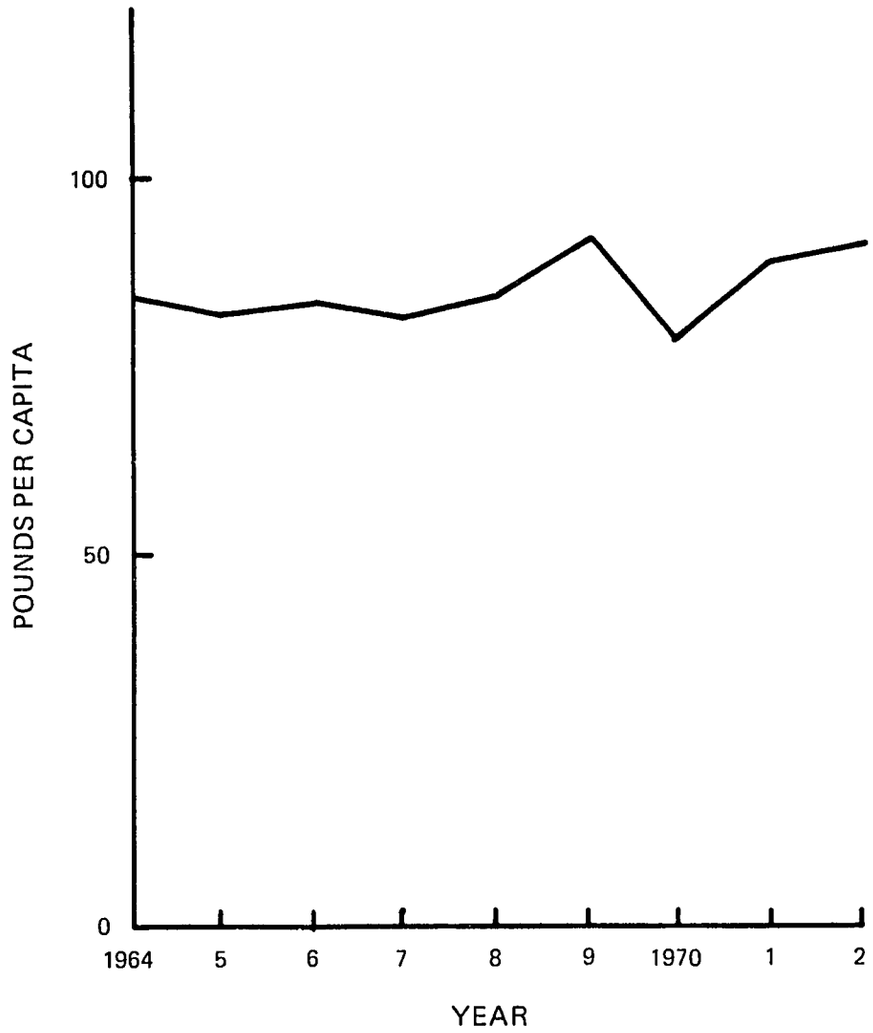
Recent trends in sugar consumption are shown in table B-9 and figure B-7, revealing an upward trend in per capita sugar consumption. Year-to-year variations in the per capita consumption are exaggerated (figure B-7) since variations in the amounts carried over from one year to the next have resulted in less year-to-year variation in the amounts actually consumed. Thus, the indicated increase in per capita consumption in 1969 and the decline in 1970 are more apparent than real. In both years the actual consumption was probably intermediate between the levels indicated for 1968 and 1971.

Table B-9. Sugar: Trends in Consumption, 1964-72

Item	1964	1965	1966	1967	1968	1969	1970	1971	1972
Produced and sold domestically (LT)....	22,676	22,977	23,811	24,083	24,983	28,201	24,238	28,103	29,569
Imported (LT).....	427	72	68	90	308	88	318	223	65
Consumed:									
Total (LT).....	23,103	23,049	23,879	24,173	25,291	28,289	24,619	28,326	29,634
Per capita (lbs.).	83.5	81.5	82.7	81.9	83.9	92.0	78.5	88.6	90.9

Source: Ministry of Agriculture.

FIGURE B-7. PER CAPITA CONSUMPTION OF SUGAR, 1964-72



APPENDIX C. TRADE IN FOODCROPS BY CARICOM COUNTRIES

This appendix contains detailed data on the imports and exports of foodcrops by CARICOM countries for 1972. These tables present both quantities and values, identifying intra-CARICOM and aggregate trade flows for each country, by commodity. This information not only specifies the magnitude of foodcrop import demand, but also indicates the source of imports.

The tables also include average unit import prices for each country and for each foodcrop. While these prices must be used with care, they do provide a rough guideline to determine whether Guyana prospectively could compete in the market.

If trade tables similar to these were prepared on a continuing basis, they would enable Guyanese planners to assess changes in CARICOM import demand, sources of imports, and import prices over time.

These tables have been constructed from the respective trade statistics of each CARICOM country.

Table C-1. Vegetable Oil: Trade by CARICOM Countries, 1972
(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	495.0	--	495.2
$	--	--	--	168.3	--	168.3
Trinidad:						
Lbs.	13.8	--	--	200.7	19.5	253.6
$	10.1	--	--	118.6	13.4	154.5
Jamaica:						
Lbs.	1.1	.09	--	--	1.2	169.7
$	2.2	.1	--	--	.5	32.0
Barbados:						
Lbs.	--	--	--	--	.008	4.0
$	--	--	--	--	.04	1.4
Other CARICOM:						
Lbs.	1,604.6	3,744.4	2,073.3	2,975.4	--	10,397.7
$	390.9	1,336.2	507.4	1,191.0	--	3,389.6
Total:[a/]						
Lbs.	1,899.7	9,097.6	12,507.0	4,374.0	20.7	--
$	505.7	3,628.4	1,738.4	1,843.3	14.0	--
Average import price ($/lb.) ...	.26	.43	.27	.46	.74	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-2. Bananas and Plantains:
Trade by CARICOM Countries, 1972

(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	199.9	--	204.0
$	--	--	--	20.0	--	20.7
Trinidad:						
Lbs.	--	--	--	24.5	--	44.1
$	--	--	--	1.7	--	5.0
Jamaica:						
Lbs.	--	--	--	--	--	4,415.8
$	--	--	--	--	--	11,859.5
Barbados:						
Lbs.	--	--	--	--	--	1.2
$	--	--	--	--	--	.2
Other CARICOM:						
Lbs.	--	42.3	--	317.0	--	359.3
$	--	7.1	--	37.8	--	44.9
Total:[a/]						
Lbs.	--	42.3	--	527.0	--	--
$	--	7.1	--	--	60.7	--
Average import price ($/lb.) ...	--	.18	--	.12	--	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-3. White Potatoes: Trade by CARICOM Countries, 1972
(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	--	--	.4
$	--	--	--	--	--	.09
Trinidad:						
Lbs.	--	--	--	--	--	.4
$	--	--	--	--	--	.08
Jamaica:						
Lbs.	3,300.0	9,600.0	--	10.0	95.0	13,012.1
$	310.0	288.5	--	.8	6.8	606.7
Barbados:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Other CARICOM:						
Lbs.	--	--	--	.8	--	.8
$	--	--	--	.02	--	.02
Total:[a/]						
Lbs.	18,684.4	32,978.0	6,341.7	13,129.9	95.0	--
$	2,240.0	3,883.3	605.9	1,140.8	6.8	--
Average import price ($/lb.) ...	.11	.11	.09	.08	.07	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-4. Tomatoes: Trade by CARICOM Countries, 1972
(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	--	--	2.9
$	--	--	--	--	--	2.1
Trinidad:						
Lbs.	--	--	--	32.5	--	37.4
$	--	--	--	21.8	--	25.5
Jamaica:						
Lbs.	--	--	--	.9	--	21.8
$	--	--	--	1.8	--	7.7
Barbados:						
Lbs.	--	--	--	--	--	1.8
$	--	--	--	--	--	.6
Other CARICOM:						
Lbs.	--	11.2	--	9.1	--	20.3
$	--	3.9	--	5.3	--	9.2
Total:[a/]						
Lbs.	--	11.8	--	209.2	--	--
$	--	4.4	--	184.6	--	--
Average import price ($/lb.) ...	--	.37	--	.88	--	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-5. Peanuts: Trade by CARICOM Countries, 1972
(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	--	--	.05
$	--	--	--	--	--	.01
Trinidad:						
Lbs.	--	--	--	--	--	16.0
$	--	--	--	--	--	15.1
Jamaica						
Lbs.	79.4	--	--	--	4.0	132.1
$	97.1	--	--	--	6.3	173.3
Barbados:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Other CARICOM:						
Lbs.	104.4	--	--	--	--	104.4
$	69.5	--	--	--	--	69.5
Total:[a/]						
Lbs.	723.7	198.0	102.3	10.7	4.0	
$	340.6	195.2	35.8	18.3	6.3	
Average import price ($/lb.) ...	.47	.98	.34	1.70	1.56	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-6. Pineapple (Fresh): Trade by CARICOM Countries, 1972

(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	16.0	--	16.5
$	--	--	--	1.7	--	1.9
Trinidad:						
Lbs.	.2	--	--	106.6	4.2	112.0
$	.03	--	--	22.5	.8	23.8
Jamaica:						
Lbs.	--	--	--	--	--	.3
$	--	--	--	--	--	.2
Barbados:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Other CARICOM:						
Lbs.	--	--	--	5.8	--	5.8
$	--	--	--	2.6	--	2.6
Total:[a/]						
Lbs.	.2	--	--	120.4	4.2	
$	.03	--	--	32.1	.8	
Average import price ($/lb.) ...	.18	--	--	.26	.19	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C [illegible] Year[a/]: Trade by [illegible] 1972

[illegible] ds)

Exporting country	[illegible] orts to					
	Guyana	[illegible]	[illegible]ca	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--			[illegible]	--	18.2
$	--			[illegible]	--	4.6
Trinidad:						
Lbs.	[illegible]			[illegible]	.4	997.1
$	[illegible]			[illegible]	.3	427.9
Jamaica:						
Lbs.				[illegible]	--	.09
$			--	--	--	.06
Barbados:						
Lbs.	--	--	--	--	--	.5
$	--	--	--	--	--	.4
Other CARICOM:						
Lbs.	.5	6.5	--	28.2	--	35.1
$	.3	.6	--	4.4	--	5.2
Total:[a/]						
Lbs.	120.7	2,796.1	2,171.2	492.2	.4	
$	52.2	820.6	812.3	280.8	.3	
Average import price ($/lb.) ...	.43	.29	.37	.57	.73	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-8. Red Kidney Beans: Trade by CARICOM Countries, 1972

(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a]
Guyana:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Trinidad:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Jamaica:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Barbados:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Other CARICOM:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Total:[a]						
Lbs.	--	1,471.2	3,220.1	--	--	--
$	--	532.7	954.6	--	--	--
Average import price ($/lb.) ...	--	.36	.29	--	--	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-9. Pineapple (Canned): Trade by CARICOM Countries, 1972

(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a/]
Guyana:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Trinidad:						
Lbs.	--	--	--	--	--	.2
$	--	--	--	--	--	.2
Jamaica:						
Lbs.	5.0	9.0	--	2.4	.4	30.8
$	2.6	4.3	--	1.3	.2	11.8
Barbados:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Other CARICOM:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Total:[a/]						
Lbs.	--	183.9	5.3	n.a.	.4	
$	--	95.7	2.4	n.a.	.2	
Average import price ($/lb.) ...	.52	.52	.46	n.a.	.44	

a/ Represents total for intra- and extra-CARICOM area trade.

Table C-10. Cabbage: Trade by CARICOM Countries, 1972

(In thousands)

Exporting country	Exports to					
	Guyana	Trinidad	Jamaica	Barbados	Other CARICOM	Total[a]
Guyana:						
Lbs.	--	--	--	--	--	--
$	--	--	--	--	--	--
Trinidad:						
Lbs.	--	--	--	.2	30.5	34.8
$	--	--	--	.1	15.4	18.2
Jamaica:						
Lbs.	--	--	--	--	--	1.2
$	--	--	--	--	--	.3
Barbados:						
Lbs.	--	--	--	--	2.3	5.3
$	--	--	--	--	.9	2.2
Other CARICOM:						
Lbs.	--	--	--	.9	--	.9
$	--	--	--	.3	--	.3
Total:[a]						
Lbs.	--	826.1	1,287.5	326.2	32.8	
$	--	244.7	371.8	90.4	16.4	
Average import price ($/lb.) ...	--	.29	.28	.27	.49	

a/ Represents total for intra- and extra-CARICOM area trade.

APPENDIX D. RESULTS OF FARM SURVEY

As an integral part of this study, a survey of nearly 350 farm operating units was completed in four sample areas where a considerable potential for increased foodcrop production is presumed to exist. The primary purpose of the survey was to provide a classification of farm operating units according to resource combinations, current production activities, and related circumstances, with a view to evaluating production potentials, identifying constraints to their realization, and proposing actions to overcome such constraints.

The Sample Areas and Farms

The farms included in the survey were intended to represent, insofar as feasible, random samples of active units of 1 acre or more in each of the following areas:

- The district served by the agricultural field assistant stationed in Parika, including farms along the road from Ruby to Present Hope plus some located along Bonasika Creek and others from the Backdam settlement project.

- The banks of the Upper and Lower Pomeroon River and its tributary creeks.

. The district served by the agricultural field assistant for Coverden/Timehri, including farms along the Demerara River upstream from Timehri. (A few farm units on the white sands near Timehri were also included in this group.)

. The Lesbeholden North and Mibikuri North units within Black Bush Polder.

All farms in the Pomeroon sample are predominantly devoted to foodcrop production, and the same is true for most of the units in the Parika and Timehri areas. Units in the Black Bush Polder project area, on the other hand, were originally structured to provide families with about 15 acres of riceland plus a 2.5-acre homestead to be used mainly for production of foodcrops other than rice.

A total of 321 "foodcrop" and 25 "other" farms were included in the combined sample. Distributions by farm size and by area of land in crops in 1973 appear in table D-1. The representativeness of the sample, relative to all farms used for foodcrop production throughout Guyana, can be evaluated more adequately when full results of the 1968 Agricultural Census become available. In the meantime, it seems reasonable to treat the combined sample as broadly representative, in various respects, of the bulk of the farms and farmland which contribute to the country's output of foodcrops for market.

It may be noted, for example, that the Pomeroon has much in common with the Northwest, which includes relatively specialized foodcrop production at some distance from market,

Table D-1. Foodcrop and Other Farms Included in the Farm Survey, By Size and District

Size class	Foodcrop farms					Other farms		All farms
	Pomeroon	Parika	Timehri	Black Bush	Subtotal	Parika	Timehri	
Acres of land in farms								
1 - 4.9.....	8	54	4	5	71	4	--	75
5 - 9.9.....	17	7	5	--	29	5	--	34
10 - 14.9.....	15	15	5	10	45	2	--	47
15 - 19.9.....	12	27	3	61	103	2	1	106
20 - 24.9.....	5	3	2	--	10	1	--	11
25 - 49.9.....	28	7	2	1	38	6	--	44
50 - 99.9.....	9	3	2	--	14	--	--	14
100 or more....	6	4	1	--	11	3	1	15
Total.....	100	120	24	77	321	23	2	346
Acres of land in crops								
1 - 4.9.....	30	90	9	6	135	6	1	142
5 - 9.9.....	23	19	8	1	51	6	--	57
10 - 24.9.....	28	9	5	69	111	6	--	117
25 - 49.9.....	11	2	1	1	15	2	--	17
50 - 99.9.....	5	--	1	--	6	3	--	9
100 or more....	3	--	--	--	3	--	1	4

accessible mainly by boat. Similarly, the Parika and Timehri Districts have much in common with other localities where relatively specialized foodcrop farms are to be found near the marketing and consuming center of Georgetown. Black Bush Polder, although differing in various respects from other localities where rice production is a major enterprise, does reflect some of the problems and possibilities common to farms and areas where limited foodcrop production is combined with rice cultivation.

Selection of Sample Areas

The sample areas were chosen to represent portions of the established coastal and riverine agricultural regions where considerable potential for foodcrop production could be presumed to exist. Although no area could be presumed completely lacking in such potential, in the absence of information to the contrary, it seemed reasonable to give emphasis to localities which are already important producers of foodcrops other than rice, rather than to concentrate on areas now mainly devoted to rice production. It also seemed important to include localities at varying distance from the Georgetown market, distributed so that other variations associated with geographic location would be represented. Furthermore, an attempt was made to include localities differing in their emphasis on groupings of such crops as rice, coconuts, citrus, bananas and plantains, ground provisions, and mixed vegetables. These criteria appear to have been relatively well satisfied by the combination of the four areas included in the survey.

A national random sample would have been impractical in terms of time and cost requirements, and in terms of the

need for developing conclusions on a regional basis; furthermore, only scanty data were available to construct a frame for stratified sampling, especially in relation to the foodcrop portion of Guyana's agriculture.

Selection of Sample Farms

Within the four sample areas, more objective procedures for sampling were applied. In the Pomeroon, where most farm units were accessible only by boat, a cluster sampling procedure was followed, for the most part. Each bank of the river, both upstream and downstream from Charity, was divided into several segments of roughly equal length, and additional segments were designated for several of the tributary creeks. Interviewers were instructed to start at a point identifying the beginning of each segment and to proceed in a specified direction along the designated bank, attempting to complete an interview at each farm unit. Each cluster corresponded to the farms which one interviewer could reach within a single working day in a given segment. A few additional interviews were completed with farmers encountered at the stelling in Charity during the first part of the training period, when adverse weather and lack of a boat made it impossible to interview along the river.

In Black Bush Polder, the homestead plots were numbered and identified by number on a map; in addition, a list of occupants, including a few nonresidents, was available. The lot numbers of the homestead plots were therefore used in drawing a random sample of farm units.

In Parika, most of the farm operators lived on small houselots along the road but worked plots at some distance

from the road. Hence, it was difficult to ascertain, without preliminary questioning, whether or not any given unit would meet the criteria of a farm operating unit, as defined for the study. At the beginning, interviewers were instructed to approach alternate houses on each side of the road; in view of the considerable number of nonfarm households encountered, they were subsequently instructed to check each unit. The number of days of interviewing was allocated so as to ensure coverage roughly proportionate to the anticipated number of farms along the road to the north and to the south of Parika, in the Backdam settlement area, and along the Bonasika River, where one interviewer accompanied the agricultural field assistant for 2 days of farm visits. Approximately similar procedures were followed in Timehri, where only a small number of interviews were taken, corresponding roughly to the limited number of all farms in the area.

Interviewer Performance

Five interviewers, recruited specifically for this study in the respective areas and trained by a supervisory team comprised of a representative of the Ministry and a member of the RRNA consultant group, completed most of the interviewing. Both interviewers for the Pomeroon area were farm operators of the locality; one of them later arranged to assist in the Timehri area as well. The interviewers in Parika were two young men recommended by the headmistress of the local school; one was still a student and one was regularly employed on a farm operated by a member of his family. The interviewer employed in Black Bush Polder was a local farmer. All were conversant with the agriculture of their

respective areas, but none had advanced education or intensive experience in farm economic survey work. Contrary to conventional local practice, they were remunerated on a per-day rather than per-schedule basis, which may have contributed to the quality of their work.

The first day of employment for each interviewer was devoted mainly to office-type training with the supervisory team; thereafter, he spent 2 days in supervised interviewing and 7 to 11 days in unsupervised interviewing. A total of 49 man-days were spent in interviewing, excluding the time spent by members of the supervisory team in accompanying interviewers, and also excluding about 10 man-days which the interviewers spent in training, travel and reporting results. (Three of the interviewers traveled to Georgetown to do so.) Thus, the interviewers completed slightly more than 7 schedules per day in the field, compared to a minimum target of 6 schedules per day.

Field observations by the supervisory team, together with a careful reading of each schedule and certain other checks based on information from the schedules themselves, led to the conclusion that the interviewers did a conscientious job during the unsupervised periods as well as during the supervised periods. The supervisory team concluded that respondents appeared to be giving frank and thoughtful answers in nearly all cases; refusals accounted for only about 1 percent of all households approached.

Entries on the schedules completed during the unsupervised period revealed that some instructions and concepts had not been fully understood. In most cases, it was

possible to make corresponding corrections in editing the schedules. Other errors of interpretation may remain undiscovered; in a study of this sort, one can scarcely expect that all concepts would have the same meaning for respondents, interviewers, and analysts. In Black Bush Polder, for example, it was tardily discovered that the term "farm" was being locally interpreted in certain contexts to mean the homestead plot but not the associated rice plot. Fortunately, it appears that such communication difficulties caused no serious problems with respect to the data and interpretations.

The Farm Operators and Their Families

Interviewers were asked to indentify the PRODUCER (or FARM OPERATOR) and fill out a schedule for his unit, defined as follows:

> The FARM OPERATING UNIT consists of all land held in whole or in part for crop and livestock production by the PRODUCER, working alone or with the assistance of others, without reference to title or size of holding. It may consist of one or more lots, parcels, or blocks, so long as they are operated as a single management unit.

The interviewers were instructed that under this definition, a tenant rather than his landlord would ordinarily be considered the PRODUCER, and they were cautioned to distinguish between the PRODUCER and another individual acting for him as manager or caretaker. They were also asked to distinguish between the PRODUCER and the HOUSEHOLD HEAD, in

cases where the two might not be the same individual. Such distinctions were to be made according to the following definitions:

> The PRODUCER is the person, partnership, or cooperative entity with principal responsibility for conducting the farm business, whether directly or through a hired manager or other employee.
>
> The members of a family living together in one dwelling are usually considered a HOUSEHOLD. Persons sharing the same dwelling, however, should be considered of a separate HOUSEHOLD if they live mainly from a separate income without contributing to, or sharing in, the income of others in the same dwelling.

The Decision-Makers

Careful distinctions along these lines were considered necessary to provide as much information as possible about the context in which decisions concerning farm organization and management are made, and any sharing of responsibility for the making of such decisions. In nearly all cases, the PRODUCER and the HOUSEHOLD HEAD proved to be the same individual. Decision-making responsibility was usually strongly concentrated in the hands of this individual and members of his household. The only share tenant encountered was involved in a temporary arrangement with his brother, and the existence of contract production was virtually limited to the few individuals producing sugarcane. A few properties used in separate shares or collectively by survivors of recently deceased owners were encountered, but such situations were neither numerous nor unexpected.

Security of Tenure

An attempt was made to distinguish land held by transport (ownership) or on a long-term lease (with secure tenure for the next 5 years or more) from land held under less secure tenure arrangements. Only a few producers reported small parcels of land held under short-term leases, and most of these individuals seemed to feel that they had considerable security of tenure. (Possibly some respondents had somewhat less secure tenure than they were willing to admit, but such cases were probably not numerous.) A number of individuals, however, complained they could not find land to rent. Also, there is evidence from other sources that security of tenure is a more serious problem in certain localities not included in the present sample survey.

Age and Sex of Operator

Data on age and sex of the 321 foodcrop farm operators appear in table D-2. In three of the four sample areas, the number of operators over 50 years of age was larger than the number aged 40 or under. Only in Parika was the number of operators under 41 greater than the number over 50. Most of the ones of 40 years or less, however, operated relatively small farms with fewer than 5 acres of land in crops; a number in this group had recently entered the Backdam settlement project or settled along the Bonasika Creek.

Within the group of 321 farms as a whole, the operator's age was directly associated with the acreage of land in crops, as may be noted by comparing the percentage of operators below 41 and above 50 in each size class:

Table D-2. Age and Sex of Foodcrop Producers in the Farm Survey, by District and by Acres of Land in Crops

Zone and acres of land in crops	Age of producer					All food-crop farms	Female pro-ducers
	30 or less	31-40	41-50	51-60	Over 60		
Pomeroon							
1-4.9	2	8	8	6	6	30	2
5-9.9	3	6	2	6	6	23	2
10-24.9	--	8	6	8	6	28	--
25 or more	1	3	3	6	6	19	3
Subtotal	6	25	19	26	24	100	7
Parika							
1-4.9	20	23	23	11	13	90	14
5-9.9	4	5	5	4	1	19	--
10-24.9	--	2	6	--	1	9	--
25 or more	1	--	1	--	--	2	1
Subtotal	25	30	35	15	15	120	15
Timehri							
1-4.9	--	3	2	2	2	9	2
5-9.9	--	1	2	3	2	8	--
10-24.9	--	1	2	1	1	5	2
25 or more	1	--	1	--	--	2	--
Subtotal	1	5	7	6	5	24	4
Black Bush							
1-4.9	2	1	2	--	1	6	2
5-9.9	--	1	--	--	--	1	--
10-24.9	3	10	26	21	9	69	5
25 or more	--	1	--	--	--	1	--
Subtotal	5	13	28	21	10	77	7
Four Districts							
1-4.9	24	35	35	19	22	135	20
5-9.9	7	13	9	13	9	51	2
10-24.9	3	21	40	30	17	111	7
25 or more	3	4	5	6	6	24	4
Total	37	73	89	68	54	321	33

Land in crops (acres)	Operators under 41	Operators over 50
	---- percent ----	
0.1 - 4.9.....	44	33
5 - 9.9.....	39	43
10 and over...	23	44

Ten percent of all farm operators were females, but more than half of these had fewer than 5 acres of land in crops.

Entrepreneurial Status of the Farm Operator

It should be obvious that the management decisions of a given producer are likely to be strongly influenced by his age, family circumstances, and degree of reliance on off-farm employment and income, as well as by the physical resources of his farm and the institutional parameters of his environment. Some producers, for example, are primarily dependent on off-farm sources of employment and income and can give the management of their farms only secondary attention.

Others, because of advancing age or various physical limitations, are likely to permit their farming efforts to decline or drift unless a younger member of the family is present to provide part of the management input and a reason for long-range planning. Data on age, family composition, and employment were used in an attempt to distinguish producers of these two groups from other included in the present survey. The three resulting entrepreneurial status classes were identified as follows:

Status I - Commercial producers with full entrepreneurial potential. Those commercial producers who depend primarily on farming for employment and income, and who have a physical potential for continuing intensive management effort, exercised either directly or through the participation of a son or another family member.

Status IIA - Commercial producers with limited planning horizons. Those commercial producers who lack a long-range planning horizon or a physical potential for intensive management effort.

Status IIB - Commercial producers primarily dependent on off-farm employment and/or income. Commercial producers whose potential for intensive management effort is limited by their reliance on off-farm sources of employment and/or income.

Subsistence producers also comprise a numerous group in Guyana, but most of them have less than an acre of farmland and hence were excluded from the present sample. Large numbers of families produce mainly for subsistence on lots of a quarter of an acre or less; the 1968 Agricultural Census enumerated more than 4,000 units with an acre or less, plus some 7,000 units with no farmland but with enough livestock (mainly kept for subsistence) to qualify as farm units.

Although it would obviously have been impossible to make a full assessment of the entrepreneurial potential of the producers included in the survey, it was possible to separate those in groups IIA and IIB from others free of the

same constraints on entrepreneurial input. For this purpose, farm operators were assigned to the IIA group if they were over 60 years of age and lacked a potential replacement (son, son-in-law, or other household member over 13 years of age) employed to a substantial degree on the producer's farm. Any younger producers with serious physical handicaps were added to this group, together with several female producers whose activities were mainly domestic and whose household included no one with the characteristics already specified for a potential replacement.

Producers were assigned to the IIB group if they indicated that their principal occupation was other than that of farm operator or if it appeared that their main source of employment and income was from an off-farm occupation. Exceptions were made when a household member with the qualifications of a potential replacement was active in the farm business, and also in a few cases when it appeared that individuals currently employed as farm laborers were seeking to substitute expanded farming activity for other employment. The number of producers who relied mainly on income from investments or other unearned income was virtually nil. The resulting classification according to entrepreneurial status (table D-3) is obviously inadequate for full measurement of management potential, but it is believed to be a useful first step in analyzing production possibilities and constraints in the sample localities.

Nearly half of the producers on units with less than 5 acres of farmland were in Status IIA or IIB, largely because of the sizable number of such producers in the Parika area. On farms of 10 to 25 acres, only about a tenth of the

Table D-3. Foodcrop Producers in The Farm Survey, by District, Acres of Farmland, and Entrepreneurial Status

District and farm-land size class	Status I	Status IIA	Status IIB	Total
Pomeroon				
1-4.9	6	-	2	8
5-9.9	10	5	2	17
10-24.9	21	4	7	32
25-49.9	22	2	4	28
50 or more	11	4	-	15
Subtotal	70	15	15	100
Parika				
1-4.9	26	19	9	54
5-9.9	5	-	2	7
10-24.9	44	-	1	45
25-49.9	7	-	-	7
50 or more	6	1	-	7
Subtotal	88	20	12	120
Timehri				
1-4.9	2	2	-	4
5-9.9	5	-	-	5
10-24.9	8	2	-	10
25-49.9	2	-	-	2
50 or more	2	1	-	3
Subtotal	19	5	-	24
Black Bush				
1-4.9	3	1	1	5
5-9.9	-	-	-	-
10-24.9	69	-	2	71
25-49.9	1	-	-	1
50 or more	-	-	-	-
Subtotal	73	1	3	77
Four districts				
1-4.9	37	22	12	71
5-9.9	20	5	4	29
10-24.9	142	6	10	158
25-49.9	32	2	4	38
50 or more	19	6	-	25
Total	250	41	30	321

operators were in Status IIA or IIB -- a logical consequence of the fact that around two-thirds of these units had been assigned within the last 10 years to new settlers at Black Bush Polder and the Backdam area in Parika. In terms of the acreage represented, it is important to note that a quarter of the farm units of 50 acres or more were operated by producers in Status IIA -- those with limited planning horizons, including entrepreneurs over 60 years of age with no potential replacement on the farm. It is not unusual to find that such units are managed less and less aggressively as the operator's age advances, until a hiatus in productive activity ensues before a new and more vigorous entrepreneur comes into control of the unit.

Entrepreneurial Replacements

The number of producers assigned to Status IIA would have been around 50 percent larger if allowance had not been made for the presence of potential replacements already employed on a number of farms. In addition, more family members, mostly in the 18-to-30 age bracket, appeared to be available as potential operators for other farm units. This was particularly marked in Black Bush Polder, where several respondents volunteered comments about the urgency of finding additional land or new farm units for their older sons, some of whom were married and had families of their own but were still members of the parent's household.

In view of the prevalence of this situation, a count was made of the number of households with one or more sons employed on the farm but not already viewed as a potential replacement for the existing operator (table D-4). Although

Table D-4. Foodcrop Farms with Sons Representing Excess Farm-Operator Potential by District and Acres of Farmland

District and farmland size class	Number of foodcrop farms	Farms with sons representing excess farm-operator potential					Total sons
		1 son	2 sons	3 sons	4 sons	Total farms	
Pomeroon							
1 - 4.9.....	8	1	-	-	-	1	1
5 - 9.9.....	17	-	-	-	1	1	4
10 - 24.9.....	32	5	1	-	-	6	7
25 or more.....	43	3	2	-	-	5	7
Subtotal....	100	9	3	-	1	13	19
Parika							
1 - 4.9.....	54	3	1	-	-	4	5
5 - 9.9.....	7	-	1	-	-	1	2
10 - 24.9.....	45	11	4	1	-	16	22
25 or more.....	14	3	-	-	-	3	3
Subtotal....	120	17	6	1	-	24	32
Timehri							
1 - 4.9.....	4	-	-	-	-	-	-
5 - 9.9.....	5	1	-	-	-	1	1
10 - 24.9.....	10	-	1	3	-	4	11
25 or more.....	5	-	-	-	-	-	-
Subtotal....	24	1	1	3	-	5	12
Black Bush							
1 - 4.9.....	5	1	-	-	-	1	1
5 - 9.9.....	-	-	-	-	-	-	-
10 - 24.9.....	71	26	13	4	-	43	64
25 or more.....	1	-	-	-	-	-	-
Subtotal....	77	27	13	4	-	44	65
Four Districts							
1 - 4.9.....	71	5	1	-	-	7	7
5 - 9.9.....	29	1	1	-	1	2	7
10 - 24.9.....	158	42	19	8	-	69	104
25 or more.....	63	6	2	-	-	8	10
Total.....	321	54	23	8	1	86	128

the sons included in this count were no doubt performing useful work on their parents' farms, they had scant opportunity to utilize entrepreneurial talents they may have possessed, particularly in view of the small size of the farms where they typically were found.

On the 321 foodcrop farms as a group, there were 40 sons representing excess operator potential for each 100 farms, and most of them were on Class I units with no more than 25 acres of total farmland. Half of them were on such units in Black Bush Polder alone -- a distribution probably related to the age and family characteristics of settlers chosen for the project about 10 years ago, and perhaps also related to the rural geographic location of the Polder. Although the count included only sons, there was evidence that many daughters were remaining with their families and engaging in farm work in the absence of other employment alternatives; a number of the daughters should probably also be considered potential operators of other farms.

Mobility of Farm Operators

A rather surprising degree of mobility was evident when operators were asked if they had ever lived elsewhere or if they had given thought to moving elsewhere.

More than 60 percent of the Pomeroon operators had lived elsewhere than in their current residence, and 23 percent had lived outside the Pomeroon River area. Thirteen percent said they had thought of moving elsewhere, and most of these were able to name specific possible destinations, including the Rupununi, Matthew's Ridge, the Bartica/Potaro

Road, Kuru Kuru, Georgetown, and Venezuela. Six had lived at interior locations previously, two had given thought to returning there, and two more were considering such a move.

As in the Pomeroon area, more than 60 percent of the Parika and Timehri respondents had lived elsewhere than in their current residence; almost half had lived outside the Parika sample area; and about 17 percent had lived in relatively remote portions of the coastal zone or in the interior. Only 4 percent had considered moving to another location, and none of these mentioned a specific destination outside the Parika area.

All the settlers in Black Bush Polder, of course, had lived elsewhere, but only 20 percent mentioned previous residence outside Berbice, and all but one of these had come from some portion of Demerara.

In Parika and Timehri, earlier residence in relatively remote coastal locations or the interior was more common for the larger farm operators than for those with farms of less than 5 acres. Conversely, two-thirds of the operators of farms of less than 5 acres had lived only in the Parika study area -- a fact probably not unrelated to the above-average proportion of young operators in this group (as already shown in table D-2).

Household Size and Composition

The 321 households of foodcrop producers include from one to more than 15 persons. The average size was 6.5 persons; 60 percent of the households were of 4 to 9 members (table D-5).

Table D-5. Comparison of Household Size for 1973 Survey Farms and 1968 Census Farms, by Acres of Farmland

Farmland size class (acres)	Total farms		Percentage distribution, by persons in household					
	Survey (no.)	Census (000)	1-3	4-6	7-9	10-12	13 or more	Total
1 - 4.9.....	71	--	31	29	31	7	2	100
	--	10.6	25	31	30	11	3	100
5 - 9.9.....	29	--	34	28	31	7	--	100
	--	5.4	17	29	33	17	4	100
10 - 24.9.....	158	--	14	29	34	19	4	100
	--	6.4	15	26	35	20	4	100
25 - 49.9.....	38	--	23	36	18	21	2	100
	--	1.0	20	23	32	20	5	100
Subtotal..	296	--	21	30	31	15	3	100
	--	23.4	20	29	32	16	3	100
50 or more....	25	--	36	36	20	8	--	100
	--	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	--
Total....	321	--	23	30	30	14	3	100
	--	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	--

n.a. = not available.

When all sample units with 1.0 to 49.9 acres of farmland are combined, the percentage distribution by size of household is remarkably similar to that calculated from preliminary national totals for corresponding units in the 1968 Agricultural Census. The data may be highlighted as follows:

Household size (persons)	Sample	Census
	-----percent----	
1 to 3.....	21	20
4 to 6.....	30	29
7 to 9.....	31	32
10 to 12.....	15	16
13 or more....	3	3
Total.....	100	100

In no household-size class is there more than 1 percentage point difference between the two distributions. This lends support to the belief that interviewers in both undertakings understood their task and were relatively conscientious and accurate in enumerating items of average difficulty. It must also be concluded that the households of the sample of foodcrop producers were representative, at least in respect to size, of all census households.

Within the four separate farmland size classes covering the range from 1.0 to 49.9 acres, distributions for the sample and census households also show considerable similarity. Differences in the separate classes are naturally somewhat larger than for the four classes taken together. Data are not yet available for census farms with 50 acres or more.

Almost exactly half of all household members were children under 14 years of age (table D-6). The ratio of children to adults was the highest on farms in Parika and in Entrepreneurial Status IIB -- both being groups with a strong representation of relatively young operators. Only 3.5 percent of all household members were over 60 years of age.

Among household members 14 or more years of age, 14 percent were still in school. Some of these students helped with farm work and a few had off-farm jobs, but their total employment was very limited. A few household members over 60 were fully retired, but most of the farm operators in this age group were still active on the farm.

Nine percent of all household members of 14 years or more were individuals under 60 employed for 3 days or more per week in off-farm work during 1973, and 5 percent had off-farm employment of less than 3 days per week. Such off-farm employment was much more common for males than for females; about 25 percent of all males of 14 or more engaged in off-farm work to some degree, whereas the corresponding proportion for females was only 5 percent.

Time spent in off-farm work by males of 14 years or more amounted to about 16 percent of the days available for work; among selected groups, this percentage varied approximately as follows:

	Percent
Males, 14 years or more:	
Class I units.....	12
Class IIA units.....	12
Class IIB units.....	77

Table D-6. Percentage Composition of Farm Survey Households, By Area and Entrepreneurial Status Class

(Percent of persons in area or class)

Area and entrepreneurial status	Children under 14	Students, 14 or more	Producers		Others		Total
			Male	Female	Male	Female	
Pomeroon.....	50	6	16	1	8	19	100
Parika.....	56	3	16	2	7	16	100
Timehri.....	44	8	15	3	9	21	100
Black Bush.....	44	12	10	2	14	18	100
All households....	50	6	14	2	10	18	100
Class I.....	49	8	13	1	10	19	100
Class IIA.....	41	3	20	8	7	21	100
Class IIB.....	64	3	14	-	4	15	100

	Percent
Males, 14 years or more, on Class I units:	
Pomeroon.....	14
Parika.....	10
Timehri.....	8
Black Bush.....	12
Male producers, 14 to 60 years:	
Class I units.....	8
Class IIB units.....	92

Among off-farm occupations mentioned by respondents, work on other farms predominated in the Pomeroon, while nonfarm work predominated in the other three areas. Household members with nonfarm occupations included teachers, carpenters, sawmill workers, watchmen, mechanics, tailors, seamstresses, shopkeepers, and a troolie cutter.

Current Land Use

On foodcrop farms, a large share of all cropland is characteristically occupied by rather complex mixtures of various species of annuals and perennials. Sometimes a crop like coconuts is planted on a regularly spaced basis and others like citrus and bananas or plantains are interplanted in part or all of the main stand; in other cases, annuals may be planted between rows of plantains or young fruit trees, or in small patches which would otherwise be vacant for one reason or another. In some cases, the second or third crop may be distributed rather uniformly over the entire plot; in other cases, crops like eddoes or tannias may be represented by only a few scattered plants. A wide

variety of tree fruits may also be represented by scattered trees in a complex planting mixture. Double- or triple-cropping of rapidly maturing vegetables is also sometimes practiced on an "end-to-end" basis.

If each planting of a double- or triple-cropped annual is counted, and if each species represented in mixed stands is considered to occupy the entire plot, then the total acreage of crops grown in a given year can be at least 5 or 10 times as large as the total acreage devoted to crops. On the other hand, the conventional practice of pro-rating the occupied land to the various crops in interplanted stands on a "sole-crop equivalent" basis is not feasible for the complex mixtures commonly encountered in Guyana.

For these reasons, land-use data for the survey farms have been summarized according to the principal single crops and crop mixtures occupying the land during the year. The sum of these items represents land in crops; if idle cropland is added, a figure for total cropland results. Much if not all of the cropland in the sample areas is empoldered and drained; the area of total cropland is probably not greatly different from the area so improved.

Major Use Categories

In addition to cropland, the farm units in the survey included a few small pasture plots, a limited area devoted to structures and miscellaneous uses, and a considerable area categorized as "bush, swamp, and forest", but consisting mainly of bush. Most of this land had not been cropped within the memory of the present occupants; a few plots now in bush but cropped since 1967 were classed as idle cropland.

Given the limited area identified as idle cropland, there was only a small difference between total cropland and land in crops on the survey farms as a group. The ratio of total cropland to land in crops varied widely, however, according to size of farm (table D-7).

On the foodcrop farms in Parika, for example, the percentage of farmland in crops declined from 70 for the farms of less than 5 acres to 15 for the farms of 50 acres or more. Conversely, the increase in acres of land in crops per farm was less rapid than the increase in total farm size, as shown by the following summary:

Size class	Farmland per farm	Land in crops per farm	Land in crops as percent of all farmland
	---acres---		---percent---
1-4.9 acres	1.9	1.3	70
5-9.9 acres	6.0	3.1	53
10-24.9 acres	14.3	4.6	32
25-49.9 acres	36.1	6.9	19
50 or more	100.7	15.6	15

In the Pomeroon and Timehri areas, the relatively large farms also had smaller percentages of farmland in crops than the smaller farms, but the differences were not as marked as in Parika, perhaps partly because the larger Pomeroon farms were mostly planted to coconuts. In Black Bush, nearly all units fell in a single size class.

The smaller percentages of farmland in crops on the larger farms, of course, are not to be taken as evidence

Table D-7. Farmland and Land in Crops on Foodcrop Farms in Sample Survey, by District and Size of Farm

District and farmland size class	Farms (no.)	Farm-land (acres)	Land in crops (acres)	Land in crops per farm (acres)	Land in crops as percent of all farmland
1 - 4.9 acres					
Pomeroon.....	8	17	14	1.8	86
Parika.....	54	103	72	1.3	70
Timehri.....	4	11	10	2.4	91
Black Bush.....	5	11	8	1.7	75
Subtotal.....	71	142	104	1.5	75
5 - 9.9 acres					
Pomeroon.....	17	118	74	4.4	63
Parika.....	7	42	22	3.1	53
Timehri.....	5	35	23	4.6	66
Black Bush.....	-	-	-	-	-
Subtotal.....	29	195	119	4.1	61
10 - 24.9 acres					
Pomeroon.....	32	484	307	9.6	63
Parika.....	45	645	207	4.6	32
Timehri.....	10	142	93	9.3	65
Black Bush.....	71	1,149	1,109	15.6	97
Subtotal.....	158	2,420	1,716	10.9	71
25 - 49.9 acres					
Pomeroon.....	28	876	440	15.7	50
Parika.....	7	253	48	6.9	19
Timehri.....	2	60	16	8.0	27
Black Bush.....	1	33	31	31.0	94
Subtotal.....	38	1,222	535	14.1	44
50 or more acres					
Pomeroon.....	15	2,212	1,209	80.6	55
Parika.....	7	705	109	15.6	15
Timehri.....	3	220	100	33.3	45
Black Bush.....	-	-	-	-	-
Subtotal.....	25	3,137	1,418	56.7	45
All size classes					
Pomeroon.....	100	3,707	2,044	20.4	57
Parika.....	120	1,748	458	3.8	26
Timehri.....	24	468	242	10.8	52
Black Bush.....	77	1,193	1,148	14.9	96
Total.....	321	7,116	3,892	12.1	55

that small farmers make better use of their land than large farmers. Land unsuited for cropping normally tends to remain in relatively large holdings, whereas there is more compelling reason for dividing land with cropping potential into small units. Most of the occupants of farmland not in crops indicated that their bushland would have some cropping potential, but said that external and/or internal drainage and certain other land improvements would first be needed.

Principal Crops and Crop Mixtures

Foodcrops other than rice, sugarcane, coffee and cocoa occupied a total of about 2,880 acres on the 321 foodcrop farms (table D-8). A third of this acreage was in complex mixtures. In the Pomeroon, these mixtures consisted mainly of coconuts, citrus, bananas, plantains, other fruits, and ground provisions; in Parika, they included plantains and ground provisions, with a few vegetables. In Black Bush Polder, a more diverse mixture of tree fruits with vegetables and some ground provisions prevailed. Roughly similar combinations were found in Timehri, but on a more limited acreage.

Simple mixtures of coconuts with bananas and plantains or citrus accounted for more than 500 acres of cropland in the Pomeroon -- mostly on the larger farms. About 1,200 acres in the four areas as a whole were recorded as individual tree crops (counting bananas and plantains as a single crop). Separately identifiable plots of cassava, other ground provisions, vegetables, corn, and black-eyed peas totaled less than 200 acres.

Table D-8. Major Uses of Farmland on Foodcrops Farms in Sample Survey, by Area and by Size of Farm

Area and crop	Size class in acres of farmland					
	1-4.9	5-9.9	10-24.9	25-49.9	50 or more	Total
Pomeroon						
Coconuts.....	1	2	44	113	465	625
Coffee.....	5	4	34	10	4	57
Citrus.....	1	19	70	32	43	165
Bananas/plantains...	-	-	39	43	56	138
Pineapple.....	1	-	-	-	-	1
Various annuals.....	1	2	29	34	34	100
Simple tree-crop mixtures.....	-	-	4	79	434	517
Complex mixtures[a]...	5	47	87	129	173	441
Subtotal.....	14	74	307	440	1,209	2,044
Parika						
Citrus.....	1	-	7	16	1	25
Bananas/plantains..	11	5	34	12	27	89
Sugarcane.....	-	1	-	-	2	3
Various annuals....	1	-	13	-	1	15
Complex mixtures[b]..	59	16	153	20	78	326
Subtotal.....	72	22	207	48	109	458
Tiwehri						
Citrus.....	-	-	50	1	62	113
Cocoa.....	-	-	3	-	-	3
Bananas/plantains..	-	-	18	-	2	20
Pineapple.....	-	-	-	8	15	23
Sugarcane.....	-	2	3	3	12	20
Various annuals....	-	10	13	2	6	31
Complex mixtures[b]..	10	11	6	2	3	32
Subtotal.....	10	23	93	16	100	242

Continued--

Table D-8 cont'd.

Area and crop	Size class in acres of farmland					
	1-4.9	5-9.9	10-24.9	25-49.9	50 or more	Total
Black Bush						
Rice.....	-	-	902	28	-	930
Other annuals.....	1	-	47	-	-	48
Complex mixtures c/..	7	-	160	3	-	170
Subtotal.....	8	-	1,109	31	-	1,148
Four areas						
Coconuts.....	1	2	44	113	465	625
Coffee/cocoa.....	5	4	37	10	4	57
Citrus.....	2	19	127	49	106	303
Bananas/plantains..	11	5	91	55	85	247
Indiv. tree-crops..	19	30	299	227	660	1,235
Pineapple.....	1	-	-	8	15	24
Sugarcane.....	-	3	3	3	14	23
Cassava.....	1	3	20	20	30	74
Other ground provisions.....	-	5	26	2	7	40
Vegetables.....	1	1	44	-	-	46
Corn.....	-	2	9	4	4	19
Black-eyed peas....	-	1	3	8	-	12
Rice.....	1	-	902	30	-	933
Simple tree-crop mixtures.....	-	-	4	79	434	517
Complex mixtures..	81	74	406	154	254	969
Total land in crops	104	119	1,716	535	1,418	3,892
Idle cropland.....	3	12	52	30	82	179
Total cropland.....	107	131	1,768	565	1,500	4,071
Other land.....	35	64	652	657	1,637	3,045
Total farmland.....	142	195	2,420	1,222	3,137	7,116

a/ Mainly coconuts, citrus, bananas and plantains, other fruits and ground provisions.
b/ Mainly bananas, plantains and ground provisions, with a few vegetables.
c/ Mainly coconuts and mixed fruits, with some ground provisions and vegetables.

Crops in Black Bush Polder

Rice on the plots laid out for that purpose accounted for 930 acres of the land in crops in Black Bush Polder. Most of this area produced both fall and spring rice. It is interesting to note that 8 operators of sample units in that project had already substituted cabbage, tomatoes, and other vegetable crops for rice on 30 acres of their assigned rice plots. In total, 49 of the 77 respondents in Black Bush reported growing one or more vegetable crops, but their total plantings of vegetables probably occupied no more than about 50 acres.

Crops in the Pomeroon

Notwithstanding the questionable wisdom of attempting to prorate the area occupied by mixed stands among the component crops, an attempt was made to do so in the Pomeroon, where this procedure seemed slightly more feasible than in the other sample areas. In this area, almost 1,000 acres were reported to be in stands of individual tree crops, and an additional 500 acres in simple mixtures could logically be divided among the two principal species represented. Also, part of the acreage of annuals was reported on a crop-by-crop basis. This left mixed stands corresponding to only about 20 percent of the total land in crops; these complex mixtures were arbitrarily allocated according to the use recorded for the remainder of the land in crops. Summing the results produced the following distribution of land in crops on a sole-crop equivalent basis, which was multiplied by 5 to obtain a rough estimate of total crops for the entire Pomeroon River sample area:

Crops	Acres in sample	Acres in district
Coconuts.....	1,071	5,355
Citrus.....	285	1,425
Bananas/plantains.....	454	2,270
Coffee.....	73	365
Cassava (bitter and sweet).....	124	620
Other ground provisions...	39	195
Vegetables.....	4	20
Corn.....	55	275
Black-eyed peas.....	43	215
Other.....	6	30
Total.....	2,154[a/]	10,770

a/ A sum about 5 percent larger than the revised total appearing in table D-7, which suggests that it would be appropriate to reduce the district estimates, in the aggregate, by about 5 percent.

The multiplier of 5 is a tentative factor based on the ratio of total farmland in the sample units to total farmland reported in the 1952 census. In the lower Pomeroon, at least, there seems good reason to believe that total land in farms has not changed greatly since 1952. The multiplier would have been 4.8 if based on the corresponding ratio of land in crops, 6.9 if based on the ratio of farm numbers, and 6.3 if based on the acreage of land in coconuts.

It is relevant to compare these area totals with the initial and adjusted totals produced for the Pomeroon area in the annual estimating procedure followed in the Ministry. It is understood that the initial data are based on information received in written reports and/or orally from the local agricultural field assistant, and that the adjusted estimates reflect changes which take account of trends, market data, and other relevant considerations. A comparison of the available crop acreage data is as follows:

Crop	1952 Census	1973 estimates from survey	1973 Ministry estimates Initial	1973 Ministry estimates Adjusted
	acres			
Coconuts.....	6,739	5,355	1,500	4,319
Citrus.....	336	1,425	1,656	2,386
Coffee.....	1,340	365	75	700
Bananas.....	266	2,270	750	750
Plantains....	2,916		2,400	8,400
Cassava (bitter and sweet).....		620	366	366
Other ground provisions..		195	344	344
Tomatoes.....	n.a.	20	17	17
Other vegetables..	n.a.		n.a.	n.a.
Corn.....	287	275	185	500
Black-eyed peas.....	n.a.	215	18	18

n.a. = not available.

The 1973 estimates from the survey are generally compatible with the 1952 census data if allowance is made for changes which could plausibly have taken place during the intervening two decades. During that period, for example, sizable plantings of citrus are known to have taken place at various locations in Guyana, and it is probable that some of the new citrus acreage in the Pomeroon has replaced coffee, which shows a corresponding acreage decline. Meanwhile, the combined acreages of bananas, plantains, cassava, and other ground provisions (which cannot be compared separately because of differences in grouping procedures) show little change between 1952 and 1973, according to the estimates based on the sample survey.

When the survey estimates are compared with the initial and adjusted Ministry estimates, it is clear that in some cases the adjusted estimates are probably more accurate than the initial ones, whereas the converse appears true in other cases. The initial estimate of 1,500 acres of coconuts, for example, appears lower than plausible, whereas the adjusted estimates for plantains and coffee appear even less plausible. The most plausible estimate for corn acreage would probably be somewhere between the initial and adjusted levels. Improved approaches to estimating acreage, yield, and production data for major crops or crop groups are urgently needed.

Marketing Practices

There was almost no advance sale of foodcrops in Guyana; practically all respondents said that their produce was sold during or soon after harvest, with payment received in cash

at the time of delivery. Some products were sold to neighborhood consumers or itinerant buyers (with boats or trucks) at the farm or in a nearby community; others were delivered to the Guyana Marketing Corporation (GMC) at Charity or Parika; others were sold after delivery to markets at Port Mourant (from Black Bush) or at Georgetown (mainly from Parika and Timehri). A few producers used their own boats or other transport for delivery to market, while many used contract haulers.

Copra from the Pomeroon was ordinarily shipped by boat to an oil plant in Georgetown. Other individual crops were sometimes sold wholly or mainly to the GMC; sometimes wholly or mainly to private buyers; and sometimes to both the GMC and one or more private buyers. Producers were not asked to name individual buyers of their crops, but the nature of their responses did not suggest that many were continuously paired with a single buyer.

The relative importance of the GMC as a buyer of foodcrops other than rice and coconuts varied among the several areas. Approximate percentage distributions for the Pomeroon and Parika producers with 5 acres or more of farmland are as follows:

Principal buyer	Pomeroon	Parika
	-----percent-----	
Guyana Marketing Corp.....	57	22
Private buyers.....	21	46
Both GMC and private.....	22	32
Total.....	100	100

In the Pomeroon, more producers reported selling to the GMC than to private buyers. The percentage selling to the GMC was somewhat higher for producers with 5 to 25 acres of farmland than for those with larger units. In Parika, more of the respondents mentioned private buyers than the GMC; in Timehri and Black Bush, only a few sales to the GMC were reported.

As might be expected, a few barbed comments about the GMC operations were volunteered, but virtually no respondent indicated that he had difficulty in finding a buyer and transport for his crops, or that he was conscious of serious deficiencies in the physical handling of his products or in the competitive structure of the available markets. Considering the difficulties of access to foodcrop farms and frequent criticism of the "middleman" in the press, it is surprising that the respondents were so silent on this topic. Along with other scraps of evidence from the survey, it may point to attitudes which attach relatively low urgency to augmenting cash income beyond the level necessary to assure food, shelter, clothing, and certain other amenities. Such attitudes are by no means irrational.

Design and Administration of the Black Bush Project

Planning for the Black Bush Land Settlement Project took place during the 1957-60 period. Some of the first settlers were installed in Lesbeholden-North unit as early as 1961; at present, settlers are to be found throughout the North and South units of all four communities (Lesbeholden, Mibikuri, Johanna, and Yakasari). In total, the

project provides lots for about 1,200 families, but the number of resident families is somewhat less.

The general pattern has been to assign each family a 2.5-acre homestead and a 15-acre rice plot, in separate portions of the project unit. With minor exceptions, the rice plots are wholly and exclusively planted to both fall and spring crops of rice, while the homesteads are fully planted to a diverse combination of perennial and annual foodcrops. Coconuts, citrus, mangoes, plantains, bananas, guavas, pawpaws, pears, and a wide variety of other tropical fruits are commonly included among the perennials of the mixed plantings; small openings among the perennials are devoted to production of sweet cassava, beans, eggplant, tomatoes, sweet potatoes, and various other annuals. In some portions of the project, plots of cabbage, carrots, onions, and other vegetables are to be found. The acreage devoted to rice apparently reached a peak as early as 1964.

The homestead plots provide a considerable opportunity for an intensive sort of production which improves the year-around utilization of family labor. Combined labor inputs on these plots and the rice fields were such that a number of families were employing hired workers occasionally or frequently, while other families performed substantially all farm work with their own labor. Thus it appears that the assigned land resources were reasonably well matched to the peak-load work capabilities of the typical family.

Although the original plot assignments appear to have been of a reasonable size for typical families, it is clear that certain changes have become necessary with the passage

of time. For example, several of the original settlers have died, leaving widows who were not necessarily prepared to continue cultivation of the same land area. Among current deviations from the original design, the following were encountered:

- A widow's rice plot had been reassigned, leaving her to continue occupying the homestead.

- An aging settler had allowed one of his sons to occupy half of the original homestead, and to build a home thereon. As the son was engaged in off-farm work, he took no part in farming the rice plot.

- The adjoining homesteads and the corresponding rice parcels were recently reassigned to two brothers, each with a family. One of the parcels included a house constructed by the settler who had vacated the parcel. For the time being, then, one brother was occupying the dwelling located on his brother's houselot, working both rice parcels, and sharing with his absentee brother in the expenses and returns for one of the two units.

- The children of one couple had completed their studies at the local BBP school and had reached a point of continuing their education at a higher level school on the main highway. The settler had arranged for them to occupy a house on the main road, while he and his wife continued to live with the youngest child on the homestead at BBP. Hence, the one family needed to maintain two homes.

- A unit assigned to an individual qualified as a mechanic was being farmed with considerable use of hired labor, while the mechanic and his family continued to reside on the main road, where he conducted a sizable repair shop. He reported going to the farm about 3 days a week and relying on the farm as well as on the shop for an important part of his living.

- Another unit, with no buildings or permanent crops on the homestead lot, was being used by two different individuals. One, with a homestead elsewhere in BBP, was assigned the rice plot, while the other (perhaps a squatter) had planted a few annual crops on part of the homestead plot.

- Across the road from the last-mentioned homestead, a widow with several sons was continuing to work a standard unit. Her eldest son was married and had three young children, but so far had been unsuccessful in seeking reassignment of the semi-vacant houselot across the street, or the rice parcel associated with it.

- Another homestead remained in the physical possession of a squatter, according to a local informant, although houses he erected had twice been removed by a project bulldozer.

As time passes, more and more allowance will no doubt need to be made for changes in the circumstances and employment interests of the plot holders and their families.

Moreover, the project management has already had to consider what to do about settlers who refused to pay rents or otherwise failed to abide by established rules.

Tractors are seldom used on the homestead plots, but almost invariably are employed for plowing and smoothing the rice fields and for miscellaneous transport services. Some rice is transplanted, but the broadcasting of pregerminated seed is more common, and much of the spring crop grows from dropseed. The total annual hours of use per tractor is relatively low, but a surprising number of the settlers have acquired their own tractors, which are sometimes employed in custom work for other producers. Tractors from the Rice Board's equipment pool appear to account for a much smaller share of total tractor work than was the case a few years ago, but GRB combines still perform a considerable share of the harvest.

As might be expected, complaints about failures of GRB and private suppliers of machine services to appear on time are numerous. With a limited supply of equipment, it is also natural to expect that machines will sometimes be sent to fields too wet to work, with consequent damage to soil conditions and failure to cover the entire field in a satisfactory manner. A number of farmers reported that portions of their fields went unharvested in the fall of 1973 because the combines had to detour around wet spots or lodged grain.

One informant stressed the need for more uniform timing of operations within each water control block. As it is, he said, there is considerable variation in the time of plowing

and other soil preparation operations on adjoining or nearby fields, so when water is released it does not find all inlands equally prepared. Within a single control block, some plots are prepared by the producer's tractor; others by a custom contractor; and still others by a GRB tractor. Even in the latter case, one GRB tractor does not necessarily work the plots in a single block at the same time. In many cases, then, certain plots are not allowed sufficient time for proper decomposition of the organic matter buried during the first plowing. This problem was mentioned by about one fourth of the BBP rice growers.

Variation in the time of soil preparation activities, and also in the varieties planted or self-sown, leads to variation in the time when combining should be done. Apart from the inefficient use of machines and labor which results, combining is not done at the optimum time and much of the grain shatters and becomes drop-seed for the following crop. One informant suggested a need for keeping distribution canals primed at all times during the planting season, and also for encouraging more uniformity in the timing of land preparation and planting activities within each block.

Another problem, reported by more than a third of the Black Bush rice growers, is the need for greater access to equipment for land leveling. Although services of a bull-dozer have been available for this purpose to some extent, there apparently remains a considerable unsatisfied need, which is also evidenced by the numerous low spots clearly visible in plots near the road. Aside from adversely affecting the effective use of water and the realization of optimum growth of the rice stand, such low spots frequently

impede the use of combines at harvest time. Incautious use of bulldozers, however, has sometimes buried the productive topsoil and adversely affected the soil structure.

One informant who complained about the high cost of custom machine services noted that there is now available a backpack machine with a flexible shaft and wand-mounted cutter which, for an investment of around $500, would permit one man to harvest more than an acre of rice per day, without missing spots or cutting up fields as the heavy combines do. The same equipment can be used for trimming weeds along plot perimeters, and can also be fitted with a small water pump. This grower would have been glad to borrow money to acquire such an implement. There is much to be said for encouraging the development and distribution of small-scale implements of this sort for farm units of the kind encountered in the Polder.

The same informant noted that fish are rapidly becoming scarcer in the inland waters -- perhaps as a consequence of increased use of pesticides on rice and other crops. If true, this problem deserves early attention, inasmuch as fish is an important item in the diet of many Guyanese farmers.

An additional point made by the same informant concerned the difficulty of making rapid shifts in production plans when long-term investments are involved. When homesteads were first assigned, he recalled, something was said about a bonus for planting coconuts, but later the emphasis shifted to fruit trees and various other crops. Recently, he gave serious thought to equipping his unit for a 2,000-bird laying flock, and had been encouraged to believe that a

loan for such a purpose would be available. Fortunately, however, he began by investing on a trial basis in a flock of 140 layers; before they had been in production for 3 months, the cost of feed became prohibitive and he had to liquidate the flock at a time when an 80-percent rate of production had just been attained. This, of course, was an outcome of highly unusual feed market conditions which have affected poultrymen around the world; however, he felt he might have been able to hold on to his flock if the Government had taken steps to make available a concentrate supplement, which he could have used in conjunction with local rice bran (almost a free good) plus fish by-products, to contend with the emergency situation.

The Backdam Settlers in Parika

As already noted, a subgroup within the Parika sample was drawn from among producers who had settled in the Backdam area within the last 10 years, where plots of 15 acres or less have been made available for lease through land cooperatives. It was noted that several respondents were vague about the conditions of the leases held by and from their cooperative societies; some could not even be sure of the approximate acreage they were leasing -- partly because some land is currently being taken for new ditch construction by the Government. None reported any marketing or credit transactions with his society. Instead, the main function of the societies consists of receiving public land on a long-term lease and arranging for its use by individual cooperative members.

A sizable portion of nearly all units remained in bush, and operators made repeated reference to serious drainage

problems. Five of the group who said they had worked their plots for periods of 5 to 9 years reported an average of 4 acres in crops on their 15-acre plots. Eleven who had been active for 3 to 4 years reported 3.5 acres in crops on plots averaging 13.6 acres in size. Nine recent arrivals had only 2.7 acres in crops on plots averaging 11.3 acres of farmland. Most of the operators actually resided on their units or planned to do so soon. Some 200 children from the project area are said to attend the school in Parika.

Extension assistance in the project is channeled through "key farmers" -- one for each mile along the frontage of the access road. One of the key farmers had left Government employment to settle on his 10-acre plot. He proved to have considerable technical education in agriculture, including some gained in Trinidad. He was growing cabbage, carrots, sweet potatoes, cassava, and a few hot peppers on about 3 acres of land cleared from bush within the last 3 years. A Honda garden tractor was being used for soil preparation and cultivation, and a small portable pump was in use to take water from a ditch for sprinkling newly set plants with a hand-held hose. Adequate internal drainage for the 3 acres was provided by ditches, one of which had been newly dug by a hired "spade-man." Fertilizer was being used on all or most crops, and the operator expected that his intensive cultural practices would eventually reward him with a good income.

The role of local leadership in stimulating progress at the Backdam settlement was evident. One influential local leader is the headmistress of the Parika School, who is also head of the Local Council. As a dedicated educator,

with strong interests in agriculture, vocational training in the practical arts, and the role of women in agriculture and community development, she has taken a special interest in the project. To this end, she has encouraged educational use of the 2-acre school farm and looks forward to seeing initiation of the first women's land settlement project. She was emphatic in stressing the significance of the fact that the families in Backdam were living at the site of the cultivated land, rather than a mile or two away, where the women would have had less opportunity to participate in agricultural operations and influence farming activity and techniques.

Access

Respondents in the Backdam area and elsewhere seldom mentioned that access to their farms was a problem -- probably because they were too accustomed to difficulties which clearly constrain production potentials. For good reason, water transport has been widely used by agricultural producers in Guyana for more than three centuries; it still offers an economical means of moving produce out of the riverine districts. Difficulties of access to these areas, however, are likely to inhibit timely acquisition of the varied inputs, both large and small, needed on almost a day-to-day basis in modern agriculture. Even information -- one of the most precious of these inputs --is difficult to acquire as needed in the riverine locations. Expanded and modernized river transport and communications facilities could fortify the production potential of these areas.

The high capital costs of road construction obviously represent a constraint on the development of new areas.

Once such investments are made, moreover, they can rapidly become ineffective if maintenance is neglected. The entry road to the Backdam portion of Parika, where about 25 sample farms were located, afforded the survey team an example of this problem. The road was built on a satisfactory alignment well above normal water level. Although it must be considered a tertiary class of feeder road, it includes at least one sturdy bridge. In the absence of maintenance to shape the road with a crown sufficient to throw surface water, however, the sticky clay surface had acquired enough deep ruts and pockets to prevent the entry of a two-wheel drive vehicle assigned to the farm survey team, and a 2-mile walk was necessary to permit interviews at the first few farmsteads down the road. Except for obstacles near the entrance, moreover, the road was perfectly driveable in much of its extension, notwithstanding the rain which fell during the inbound walk. Several months later the road was again available for use by a two-wheel drive vehicle. One or more of the local tractors equipped with a homemade drag and used on some sort of self-help basis could easily have helped to keep the road open all or most of the year. Gravel or laterite surfacing, of course, would represent an important improvement. Without adequate maintenance, however, no new investments in roads can be expected to provide effective communication over any considerable period of time to farming settlements such as this one.

APPENDIX E. SURVEY OF 1973 FOODCROP YIELDS IN THE POMEROON

Under the farming system which characterizes foodcrop production in much of Guyana, the task of determining per acre yields of individual crops is extremely complicated -- not only for crop reporters and statisticians but also for farmers themselves. This holds under both objective and subjective methods of crop estimating. Much of the difficulty comes in determining the area occupied by the individual species of perennial and annual crops commonly grown in mixed plantings. In addition, the harvest of many foodcrops continues over much of the year, instead of being discrete as in the case of rice. To determine annual crop production, the foodcrop grower must record or recall the results of harvesting or marketing and consumption activities which took place months earlier; to calculate yields he must solve complex problems of definition and of measurement.

Determining Areas Occupied by Species in Mixed Stands

In establishing new stands of long-lived perennials such as coconuts or citrus, it is common practice to interplant shorter-lived perennials like bananas or plantains, and these species in turn may be interplanted with certain annuals. Changes in the composition of these mixed plantings

over time depend partly upon survival rates of the longer-lived species and partly on the practices followed in providing replacement plants or in allowing suckers or volunteer seedings to develop.

An important conceptual or definitional problem in determining the base acreage for yield estimates relates to the degree of competition or complementarity among the various species in mixed stands. If competition is strong, as when bananas and plantains or several species of citrus are intermingled on a single plot, it is logical to pro-rate the total plot area among the species involved and report yields of each crop on a "sole-crop equivalent" basis. On the other hand, there may be virtually no competition between young coconut trees spaced 30 feet apart and an interplanted crop of bananas or plantains, with or without additional annual species. In such a case, it would be illogical to allocate any appreciable portion of the area to the coconuts, and a pro-rating approach also lacks meaning in cases of complementarity, as when one crop provides shade needed by another. Another definitional problem arises when short-lived annuals can be incorporated in a multiple-cropping system with two or more harvests per year; in such cases, yields may be reported on a per-crop or a per-year basis.

The measurement problem involved in determining crop areas increases in complexity as the homogeneity of various mixed plantings becomes blurred over time. Blank spaces in perennial stands may increase, or they may be filled with species different than the original one. Annuals may be used to fill irregular gaps of no more than a few square rods, or single filler rows of annuals or perennials may be introduced where narrow gaps are found. Under such circumstances, it may be useful to calculate the sole-crop

equivalent area of each of the principal perennials by counting the number of trees or plants and dividing by a number representing the normal population per acre for the given species when found in solid plantings.

Scope of the Yield Survey

To explore some of the problems involved in obtaining meaningful estimates of foodcrop yields in Guyana, and to cast some light on actual yields realized in 1973 in the Pomeroon, a brief survey was undertaken between March 27 and 29, 1974, on a subsample of farms which had been visited 2 months earlier to obtain more general information about farm resources, farm organization, and production potentials (see appendix D).

The yield survey interviews were completed within the equivalent of 2 working days by the two individuals who had supervised the earlier farm survey in the Pomeroon and elsewhere in Guyana. Using the interviewers from the earlier Pomeroon farm survey as guides, it was possible to encounter respondents for 33 farm units from a list of 40, chosen to give as adequate coverage as possible to four perennial and four annual crops commonly found on the 100 units included in the original farm survey. (The seven farm operators chosen for the yield survey but not interviewed included several who were traveling away from the district, one who was otherwise occupied, and one who died just prior to the interviewer's arrival. One was omitted for lack of time to make the lengthy trip to his residence.)

The Use of Tree Counts

The yield survey was structured on the hypothesis that estimated numbers of trees or plants would provide a more meaningful base for yield calculations than direct responses about acreages occupied by the several perennial components of mixed stands. Accordingly, no attempt was made to obtain comprehensive direct estimates of the areas occupied by individual perennials, although such data were recorded when possible. Moreover, the minimum acreage detail required in the earlier farm-unit survey had permitted a sizable area of crops to be included under the heading of "mixed annuals and perennials."

Respondents were asked to report the total number of trees or plants of each species, and then to distribute the total among the following three subgroups: "young and not yet bearing," "abandoned or otherwise unproductive," and "productive trees." This procedure proved helpful in making sure that trees in all three subgroups were uniformly included, but the proportion classified as "abandoned or otherwise unproductive" turned out to be smaller than had been anticipated. It also proved important to distinguish between tree counts at the time of the interview and tree counts which had prevailed before the 1973 floods.

The hypothesis that estimated numbers of trees or plants could provide a meaningful base for yield calculations proved, in practice, to have severe limitations. In the present context, this approach worked reasonably well for citrus stands of bearing age. Citrus acreages per farm were not large, tree spacings were fairly regular, stands seldom included any large excess of trees above the normal full-count per acre, and there was little vagueness about the

concept of a "tree." Hence, respondents found it relatively easy to give assured and apparently meaningful responses when asked to report on the number of their citrus trees which had passed the non-bearing stage. Moreover, the area occupied by incomplete stands could be reduced to a sole-crop equivalent or full-stand basis, by computations based on a norm of 90 orange trees per acre. This procedure did not seem to be equally appropriate for non-bearing orange stands, inasmuch as some growers reported excess numbers of filler trees which were to be thinned at a later date, whereas others planted only trees to be kept throughout the bearing stage.

The latter problem was somewhat more acute in the case of coconuts. The norm for a full stand was taken to be 50 trees per acre, yet of 16 growers for whom both tree numbers and acreage estimates were available, five reported stands of more than 100 trees per acre and two of the five reported more than 200 trees per acre. These high tree densities were associated with the temporary presence of large numbers of young trees, some of them self-sown.

Even more difficulty was experienced in obtaining meaningful answers to questions about the stands of bananas and plantains. A number of respondents were clearly baffled by the questions -- partly because of the blurred distinction between "plants" and "suckers," and partly because actual stand counts were unknown. The norm for a full stand of both bananas and plantains has been taken as 300 plants per acre (although high disease losses have prompted the recent recommendation that plantains be set at 450 per acre). Many growers follow such guidelines in establishing new solid stands, but plants sucker freely, and it soon becomes difficult to distinguish the count of suckers from the count of plants.

Because of severe damage caused to various crops during the 1972 floods, an unusually large number of new plantings of bananas and plantains were established early in 1973. Normally, a fruit bunch from each surviving first-generation stem would have been ready for harvest 9 months to a year later, at which time a single second-generation sucker would have been reserved for producing a second harvest. Other second-generation suckers would have been removed. In the case of bananas, the same process might be repeated for several generations, whereas third-generation plantain suckers might be taken up to start a new stand. In either case, however, many excess suckers might eventually be transplanted to fill gaps in stands of the same or different perennial species. But the normal sequence for the plantings established after the 1972 floods was interrupted by the recurrence of floods around the end of 1973, so that potentially productive plants or suckers were destroyed before they became productive. How many of the plants or suckers growing during 1973 might ordinarily have been kept for production of fruit bunches had become a purely hypothetical question by March 1974, while the number of plants remaining in that month was scarcely relevant to calculating yield performance in 1973. In cases where reported plant counts could be compared with a direct acreage estimate, the number of plants per acre sometimes reached unrealistically high levels -- especially in view of the facts that most bananas and plantains were interplanted with coconuts or other perennials. Two growers, for example, reported 2,000 or more plantains and bananas per acre and four others reported more than 600 per acre. The difficulty of estimating plant counts and crop production was expressed in the words of one respondent: "Here we just farm wild. We don't take any check." (This grower thought he had about 2,000 plantains, interplanted with sweet cassava, on 2 acres; however, he

also thought the plantains were spaced about 9 to 10 feet apart, which would correspond to a stand of 450 to 550 per acre. Perhaps he underestimated the acreage and overestimated the number of plants.)

Responses Concerning Output

Two important components of foodcrop production in the Pomeroon are the amounts marketed and the amounts consumed in the home or given away. (Pomeroon growers seldom use much of their output to feed livestock, and amounts reserved for seed were insignificant in the present context.) Respondents were asked separate questions about quantities marketed and quantities used by the families, so as to forestall any possibility that the latter might be omitted. On the whole, the extra questions probably improved the adequacy of responses, although some growers might have been able to make direct estimates of the combined output, particularly in the case of the total number of coconuts gathered.

In the Pomeroon, coconuts are sometimes marketed without processing (as nuts) and sometimes after being made into copra on the farm. Nuts vary considerably in size; notions about the average weight of nuts ranged from 6 ounces to a pound or more. Growers producing copra reported conversion ratios of three to four nuts per pound of copra. Crop output is commonly reported in thousands of nuts, but such a figure lacks precision without broadly applicable conversion ratios.

Some farmers seemed best able to report their citrus production in numbers of fruits, whereas others reported by weight. The average weight of oranges obviously varies widely, so the conventional conversion ratio of three fruit

per pound can provide only a rough approximation to actual output.

Likewise, some growers could best report their production of bananas and plantains by the bunch, whereas others reported their sales by weight. Few if any were able to report average bunch weight with much confidence -- instead, they tended to comment that some bunches would weigh 15 to 20 pounds, some 30, some 40 and some up to 60 or more -- not a very sound basis for arriving at a meaningful average for their particular crop.

In designing the questionnaire, it was anticipated that respondents would have considerable difficulty in recalling actual sales or production over a period as long as a year. Hence, they were also asked to report sales and home consumption for the 2 weeks immediately preceding the interview. However, 1973 was a year of near-total crop failure for most growers, and sales in the more recent fortnight were also abnormal and of little use for purposes of the yield survey. At best, they provided a useful opening lead to focus the respondents' thinking on the subject of crop output.

Experience in various other similar surveys suggests that faulty recall for a period as long as a year would lead to some understatment of sales. Fears about use of survey data for income-tax enforcement actions also make some farmers cautious about revealing the full extent of their sales. The latter consideration was probably of only minor importance in the present context -- partly because yields were at near failure levels in any event, and partly because of the rapport with respondents which had already been established in the course of the earlier farm survey. It was clear, however, that many respondents had almost no

capacity to recall the details of crop output during an extended period such as the 1973 calendar year. (An exception was one grower who produced a well-kept and carefully summarized account book, with an apparently reliable record of sales weights and receipts for each of his principal crops. Unfortunately, he did not have a comparably reliable statement of the acreages or tree numbers represented.)

In similar circumstances, survey respondents are often asked to estimate their "normal" yields when such differ from experience during the year in question. This approach would have had little merit in the Pomeroon -- after 2 years of severe flooding and concurrent losses of plantains and coconuts to diseases and pests, growers would have found it difficult to cope with the concept of a "normal" yield. The grower with the best records did not consider that he had experienced anything approaching a normal output in his 4 years on the farm. Others could only reminisce: "This place used to give 300,000 nuts per year." The latter quotation reflects an additional observation -- the larger coconut growers, who used considerable hired labor in harvesting operations, seemed best able to produce an approximate estimate of the annual harvest.

Acreage Estimates

It was not originally intended to use direct estimates of the acreages occupied by individual perennials. Nevertheless, a pooling of information from the yield survey and the earlier farm survey made it possible to extract direct estimates of areas occupied by individual crops in a majority of cases. As a first approximation, interplanted areas were counted in full for each crop, partly because it was judged that the actual crop combinations which occurred were near

neutral on the scale from competitive to complementary. In other words, it was assumed that a full stand of plantains would not interfere with the development of the stands of young coconuts or citrus in which they were interplanted. In a minority of cases, where direct estimates of areas were not available, acreage was estimated from tree counts, and this procedure was also followed as an alternative approach in cases where estimated tree densities were below the norms of 50 per acre for coconuts, 90 for oranges, and 300 for bananas and plantains.

Growers were asked to state the total area planted in 1973 to each of four annuals -- black-eyed peas, corn, cassava, and eddoes -- and to distribute the planted acreage for each crop among the following categories: "abandoned before harvest," "still to be harvested," and "already harvested." Some found it easier to respond by giving the dimensions of planted areas in rods, while other preferred to report in acres. Given the sizable difference between "Dutch" and "English" rods (12 vs. 16.5 feet), informants who reported in rods were asked to identify the measure they had in mind; in at least one case it was accidentally discovered that the informant mistakenly thought the English rod was the shorter of the two.

Realized Yields in 1973

With the foregoing explanations and qualifications, yield experience on the 33 farms can now be summarized on crop-by-crop basis. Most growers reported for more than one crop, but no one grower produced all eight crops on appreciable acreages. Yields from scattered trees in numbers equivalent to less than an acre are excluded from the summary, but yields of annuals in plantings as small as

a tenth of an acre are included. In a few cases, data for one crop or another on a given farm had to be excluded for incompleteness, but each of the 33 farms is represented in the summary for at least one crop, and usually for three to four. By crops, the number of usable yield records was as follows:

Coconuts	17
Oranges	13
Plantains	16
Bananas	15
Black-eyed peas	15
Corn	12
Cassava	25
Eddoes	6

Coconuts

The 17 yield records for coconuts showed a total output of 1.7 million nuts from 604 acres, or an average of 2,800 nuts per acre. With the acreage reduced in cases where tree stands were below the norm of 50 per acre, the yield would be 3,000 nuts.

A considerable share of the acreage in coconuts also had bananas and/or plantains. This was no doubt related to the fact that 35 percent of the 41,000 coconut trees were reported to be of non-bearing age. The high proportion of young trees, in an area where total coconut acreage does not seem to be expanding rapidly, appears surprising relative to the normal productive life of the species. However, it corresponds very closely to the judgment of the local agricultural field assistant, who believes the current average tree life in the Pomeroon to be only 10 to 12 years, of which at least 3 to 4 years are non-bearing. In his judgment, productive trees at 5 to 6 years of age can be

expected to yield 200 to 250 nuts per year, under normal conditions in the Pomeroon, and yield may reach 300 to 350 nuts per tree under highly favorable conditions. These norms correspond to a range of 10,000 to 17,500 nuts per acre for a full stand of 50 productive trees, and to a range of 6,500 to 11,000 for stands in which 35 percent of the 50 trees are of non-bearing age.

In 1973, only one of the 17 growers gave information indicating a yield of more than 250 nuts per productive tree, and the second highest yield per productive tree was less than half this level. Four growers indicated yields per productive tree in the 70 to 90 range, while others were even lower. Only three growers had indicated yields of more than 5,000 nuts per acre. Notwithstanding the low yields per acre, fewer than 5 percent of all trees were listed as abandoned or non-productive. This figure, together with the high percentage of trees in the young, non-bearing group, suggests that growers have been attempting to replace the very substantial losses to pests, disease, and excess water.

Oranges

The 13 orange growers reported a total 1973 output equivalent to 117,000 pounds from 58 acres, or about 2,000 per acre. Estimated tree counts were below the norm of 90 per acre on four of the 13 farms, but adjustments to a full-stand basis would raise the average yield only to 2,100 pounds. Non-bearing trees accounted for 36 percent of all orange trees and abandoned trees for about 5 percent -- almost exactly the same proportions as for coconuts.

In the agriculture field assistant's judgment, a normal yield for the Pomeroon is 700 oranges per tree, with a range

between 500 and 1,500. At three oranges per pound and 55 productive trees per acre, these norms would correspond to about 230 pounds per productive tree or 13,000 pounds per acre. Only one grower indicated a yield per productive tree slightly above the norm, but he classed a majority of his trees as either young or abandoned owing to flood damage. Thus his yield per acre was less than 7,000 pounds. The second highest yield per productive tree was 110 pounds, which gave rise to the highest yield per acre (7,900 pounds on a full-stand equivalent basis).

Plantains

The 16 plantain growers reported total 1973 production of 152,000 pounds from 84 acres, or about 1,800 pounds per acre. Adjustments to a full-stand equivalent basis on four farms would raise this average to 2,050 pounds per acre. Heavy losses to Moko disease and to the 1972 and 1973 floods can be blamed for much of the gap between this figure and the 7,000-pound level which the agricultural field assistant would consider more normal, even after allowing for ordinary losses to disease. The four highest survey yields ranged between 5,000 and 6,000 pounds.

Bananas

Fifteen growers reported a total production of 165,000 from 258 acres, or about 640 pounds per acre. On six farms, however, estimated plant counts were well below the norm of 300 per acre, so that adjustments to a full-stand equivalent basis would raise the average yield to 1,130 pounds. One farm with a relatively large acreage and low production depressed this weighted average considerably; a simple average of the 15 individual yields on a full-stand equivalent

basis would be about 1,700 pounds. Any of these three estimates of the average 1973 yield, however, must be considered well below a normal level. The three highest yields per reported acre fell in a range between 2,000 and 3,000 pounds, but adjustment to a full-stand equivalent basis gave one of these growers a theoretical yield of approximately 8,000 pounds.

Black-Eyed Peas

The 15 growers of black-eyed peas planted about 27 acres, abandoned all but 6.5 acres before harvest, and reaped an estimated total of 1,165 pounds, corresponding to 50 pounds per planted acre or 200 pounds per acre harvested. Insect damage as well as excess water caused abandonment of some of the stands. One grower mentioned that a dust previously used for insect control was not available when needed in 1973. The district's crop was almost a total loss.

Corn

The 12 corn growers planted about 28 acres and abandoned 15 before harvest. Production from the remaining 13 acres totaled 8,550 pounds of shelled corn (plus a few ears harvested green); thus the average yield was 300 pounds per acre planted or 650 pounds per acre harvested. Five growers with about an acre each had yields of 1,000 to 2,700 pounds per harvested acre.

Cassava

Cassava plantings by the 25 growers totaled 77 acres, including both bitter and sweet varieties. Thirteen growers

had abandoned 26 acres, leaving 51 acres from which 211,000 pounds were harvested. The average yield was 2,750 pounds per acre planted, or 4,140 pounds per acre harvested. One grower who harvested a total of 43,700 pounds from 3 of his 4 planted acres thought he had achieved a normal yield; three more growers with fractional acreage reported yields of 6,000 to 8,600 pounds per acre, and one grower with a sizable acreage reported an output of 5,000 pounds per acre.

Eddoes

The six growers who reported yield results for eddoes planted about 5 acres and harvested about 4, with a total production of nearly 20,000 pounds. The grower who had the highest cassava yield also had the highest yield of eddoes (7,000 pounds per acre), but he deemed this scarcely up to normal expectations. Two others, each with an acre or less, reported yields at the 4,000-pound level, while two more failed to harvest any.

Some Tentative Suggestions on Improving Crop Estimates for the Pomeroon

Dependable annual estimates of crop production and yields at national, regional, and sometimes local levels comprise an indispensible base for agricultural planning. Much good work on crop statistics has been done in the past, under conditions which for foodcrop reporting are peculiarly challenging. At present, the time is ripe for reviewing existing procedures and attempting to take advantage of possibilities for achieving improved results.

The nature of agricultural production and marketing systems in Guyana requires considerable departure from any

uniform application of crop estimating procedures to all crops and in all areas. Specialized techniques are needed for gathering data about individual crops or groups of crops in the various regions. One approach may be needed for perennials, for example, and a different approach for annuals. Marketing channels must also be considered in determining how best to collect the basic data for making crop estimates. The following comments, then, are intended only to open a discussion of possible improvement of crop estimating procedures for selected crops in one district of Guyana.

Useful and Questionable Data Sources

During recent inter-censal years, Guyana's production statistics for crops other than rice and sugarcane have depended heavily upon judgments of the field staff. In certain instances, these observers may have been fortified with information from recent local surveys or other special kinds of local data, but frequently they have been able to make only "horseback" judgments of total acreage and total output (or output per acre) for their respective districts. By identifying the kinds of supporting data which they can acquire and the kinds of questions which they can answer on a judgment basis, results of the existing procedures can be improved. To the extent that statisticians can obtain other supplementary information through special surveys of farmers, marketers, or other informants, it is important to focus on the specific kinds of questions which such informants can best answer. Observations made and experience gained in the yield survey cast some light on these points, which will be discussed on a crop-by-crop basis.

Coconuts

Traditionally, the larger coconut growers of the Pomeroon have processed much of their crop into copra for sale to one of the two oil mills in Georgetown. Direct contacts with representatives of these mills are already made to determine aggregate purchases of copra; more details could probably be obtained about copra receipts from the Pomeroon, as well as from other regions of the country.

Inasmuch as copra production represents an important but variable fraction of total coconut output in the Pomeroon, information about copra sales alone will not provide a sufficient basis for estimating total coconut output. Possibly a few informed observers in marketing channels can judge total sales of coconuts as nuts; if not, it would be possible, and not extremely costly, to conduct an annual or biennial sample survey of growers with 5 acres of more of coconuts in the lower Pomeroon. This could provide useful information about total production and about yield per acre or per tree.

An annual survey, however, would scarcely be necessary to maintain an adequate knowledge of coconut acreage. Year-to-year changes in the Pomeroon's coconut acreage are likely to be modest, and it should be possible for a qualified local observer to judge trends with fair accuracy for several years at a time. To make such judgments useful, of course, would require a dependable estimate of acreage in a benchmark year, based on census data, a sample survey, or on results of aerial photo interpretation.

When reliance is to be placed on information obtained through interviews with a sample of farmers, data should be

obtained on acreage occupied by coconuts, intended tree spacing, number of productive trees, and number of replacement trees of nonbearing age. (The count of non-bearing trees should exclude volunteer or other plants not in position as replacements.) If the foregoing items are all included on the questionnaire, interviewers can be trained to check the sum of productive and non-bearing replacement trees against a calculated population for the specified acreage and spacing, and to probe into any substantial discrepancies.

For the area as a whole, changes in the proportion of productive trees to non-bearing replacements will be useful in judging and/or interpreting changes in yields per acre. Actual observations by the local field assistant during the course of his ordinary work can provide some indication of changes in the proportions of productive and non-bearing trees.

If local informants are to be asked to judge year-to-year variations in yields, it may be best to explore changes in the number of nuts collected per productive tree, and to use this statistic in calculating yield per acre.

Bananas and Plantains

At present, the Guyana Marketing Corporation (GMC) is a major buyer of bananas and plantains in the Pomeroon. Efforts should be made to obtain regular reports of purchases or shipments of these items by GMC on a monthly or quarterly basis. These quantities would need to be expanded to account for purchases by private buyers and for home consumption. If possible, reports should include actual or estimated average weights per bunch. Inasmuch as it is

normal to harvest only one bunch per plant during a period of 6 months or longer, an estimate of the number of bunches harvested is roughly equivalent to an estimate of the number of plants harvested. From this, a full-stand acreage equivalent could be calculated if a judgment could be made about the proportion of the normal plant stand harvested for the period. The latter coefficient, in turn, would depend upon judgments about disease losses, age of plants, and similar technical performance factors.

The initiation of sample surveys as a basis for obtaining data about banana and plantain acreages, yields, and plant stands must be approached with great caution under the sort of farming system which prevails in the Pomeroon. Farmers simply cannot respond easily to such questions about their banana and plantain production activities, for reasons which have already been set forth. However, any sample survey of coconut growers might seek to determine the proportion of the coconut acreage interplanted with bananas, which are more closely associated with coconut production than are plantains. Possibly these growers could also hazard reasonable guesses about the number of banana bunches harvested within the preceding 6 months.

Oranges

As in the case of bananas and plantains, the GMC is a major buyer, and summaries of their purchases or shipments on a monthly or quarterly basis would be a useful start toward estimating production. Local observers could probably estimate an approximate multiplier to use for taking account of purchases by private buyers, or the buyers themselves could be interviewed. Home consumption would also need to be estimated -- possibly on a per capita basis.

As in the case of coconuts, gradual changes in citrus area can be judged fairly easily from year to year, once an acceptable benchmark is established. The quantity of planting stock distributed through Ministry efforts can be used as a guide; recipients could be asked to indicate whether the materials were to be used for replacement or expansion.

Any survey inquiries should include questions on numbers of productive and non-bearing replacement trees, as in the case of coconuts.

Black-Eyed Peas and Corn

In the Pomeroon, both black-eyed peas and corn are commonly grown on measurable plots of open land. Farmers should have no great difficulty in answering survey questions about the area under cultivation during months not far removed from the time of interview. Provision must be made to accept responses in fractions of acres and in plot dimensions of length and width, in rods. Also, the number of feet per rod should be determined; the terms "Dutch measure" and "English measure" are subject to confused interpretation, and farmers may be less familiar with the concept of square rods than with the length and width of their plots.

It should not be anticipated that farmers can recall details of crops harvested or abandoned more than a few months before the interview. Soon after the harvest, they should be able to recall the acreage planted, the acreage abandoned before harvest, the acreage harvested, and the quantity harvested. Given the relatively small acreage of these crops planted per grower, however, as well as their

scattered geographic distribution, any sample surveys still need to reach a relatively large sample and will be relatively time-consuming and expensive. (The same would apply to sample surveys of growers of plantains and ground provisions.)

Inasmuch as much of the seed for black-eyed pea production is distributed through or with the knowledge of the agricultural field assistant, he is in a good position to make an early estimate of the planted acreage of this crop. In the Pomeroon, however, planted acreages of most other crops cannot be determined by this approach.

GMC purchases of corn may be helpful in judging total output, but the proportion going to other buyers could change rapidly from time to time.

Cassava and Other Ground Provisions

The extended harvest period for these crops, the small acreage per unit, the relative importance of the output used at home, the tendency to interplant these crops with others in irregular fashion, and their geographic dispersion within the Pomeroon are factors which combine to complicate the task of making reliable annual estimates of acreage, production, and yield. For the time being, rough approximations by informed observers can still prove useful.

A Quarterly Field Investigation

Probably the simplest and cheapest way to make substantial improvement in overall crop estimates for the Pomeroon would be to schedule regular quarterly or

semiannual field visits by an experienced statistical reporter from the Ministry's Georgetown staff. His task would be to collect timely observations and judgments from a few key local informants, such as the agricultural field assistant, a local representative of the GMC, private buyers, selected tradespeople and a few farm operators. Repetitive visits by such a reporter could be supplemented by occasional special surveys when feasible.

APPENDIX F. DRAINAGE AND IRRIGATION PROGRAMS IN GUYANA

A reconnaissance-level examination of drainage and irrigation in Guyana was undertaken during the study to assess the relationship of foodcrop production and water control. This appendix provides an overview of this examination. It consists of two components: a review of on-going and planned D&I projects, and an assessment of the status of declared D&I areas.

On-Going and Planned D&I Projects (Including Areas Now Under Local Authority Drainage and Irrigation Responsibility)

Pomeroon River

It is planned that, from 1971 to the end of 1974, nearly G$1.5 million will be spent on the Pomeroon from Cozier Canal to Aberdeen. This work includes sea defense dam, facade drain and sidelines. River defense works are projected under self-help. This is an important foodcrop area. Expenditures fall under "flood relief"; this is not a declared drainage and irrigation area.

Tapakuma Extension

Eight thousand gross acres from Somerset and Berks to Cozier Canal are being provided with sea defense, facade

drain and main irrigation and drainage works, as well as subsidiary works. Eventually it is planned to add 100 cusecs pumping capacity at Dawa for irrigation and 400 cusecs pumping capacity at Somerset and Berks for drainage.

Tapakuma

To relieve drainage problems in the northern part of the project, two 70 cusec pumps are on order for Perth and two 200 cusec pumps are on order for Andrews. As with all the planned drainage pumping schemes, installation will be delayed by a shortage of construction materials that must be of U.S. origin. (Finance is through an Export-Import Bank loan.) By 1978, it is expected that two 200 cusec pumps will be in place at Hampton Court and shortly thereafter two 100 cusec pumps at La Belle Alliance.

Maria's Lodge to
Supenaam River

This area's drainage and irrigation is the responsibility of two local authorities (one at Huist T'Dieren); reconditioning of drains with some flood relief assistance is underway. Drainage is generally poor; irrigation is by pumping onto lands along the Ituribisi Creek and from swamps in the back and the Essequibo River, but the total area covered by irrigation is small. Harza has done a study of this area.

Essequibo Islands

Responsibility for drainage and irrigation works rests with local authorities and private proprietors. About

G$100,000 of flood relief money is being spent on reconditioning of drainage works in Leguan.

Vergenoegen/Bonasika

Subsidiary drainage and irrigation works are being constructed on a cooperative development area back of Parika, and in Lookout.

Kamuni/Potosi

Subsidiary drainage and irrigation works are being constructed in Concordia.

Haslington/Belfield

One 150 cusec drainage pump is expected to arrive from the United States this year for installation at Golden Grove, and one of a planned three 100 cusec pumps will arrive for installation at Craig Milne to relieve serious drainage difficulties in the Golden Grove/Victoria drainage and irrigation area and in Belfield. Improvement works to existing drainage channels will also be carried out.

Cane Grove

Three 100 cusec drainage pumps for La Bonne Mer and two 70 cusec pumps for Melville are on order to relieve drainage problems caused by high Mahaica River stages. These may be installed by 1976.

Mahaica-Mahaicony-
Abary Project

Phase I of this project has been under construction for some time, covering the area along the coastline from the Abary River to below Rosignol (excluding sugar estate lands) and inland to the planned main canal on the Abary right bank. Phases I and II have a gross command area of 120,000 acres, of which 85,000 acres are now under cultivation (rice, 60,000 acres; coconuts, 6,000; ground provisions, 2,000; pasture, 4,000; and Bookers sugar estate management, 13,000). The facade drain reconditioning and extension from Onverwagt to Rosignol is under way, together with construction of new sluice, main drains and irrigation canals, and a flood control and reservoir dam. Eight drainage pumps are on order from a U.S. manufacturer; four 150 cusec for Onverwagt and two 100 cusec for Bath to be installed by 1976 and two 100 cusec for Weldaad to be installed at a later date. Recent budget cutbacks put in doubt any early progress on the flood control and irrigation dam.

Sheet Anchor/Fyrish

Two 70 cusec drainage pumps for Gibralter and two 100 cusec pumps for Borlam are on order. These may be in place by 1978. A number of additional improvements to the drainage system are also proposed to improve water control in Nos. 1 - 25, Gibralter/Courtlands and Fyrish drainage and irrigation areas and in Sheet Anchor/Palmyra and Hammersmith/Borlam.

Hogstye

Two 150 cusec drainage pumps for Whim may be in place by 1978; these will complement the new facade drain connecting Hogstye to Bloomfield. Drainage in Bloomfield/Whim, Lancaster/Manchester and Ulverston/Salton drainage and irrigation areas and in Hogstye estate will be improved.

Black Bush Polder

By 1980, 11 drainage pumps may be in place to relieve drainage difficulties in Black Bush Polder: two 100 cusec and two 150 cusec at Mibikuri, two 150 at Lesbeholden and four 150 cusec at Joppa. These pumps are on (phased) order.

Black Bush Frontlands and Backlands require more reliable supplies of irrigation water than can presently be provided from Black Bush Polder supplies and works. Harza is undertaking a study of the situation. There currently exist difficulties of water stealing by frontlands occupants of Black Bush front canal water, and it may be necessary to complement stricter controls with a separate distribution system. An irrigation pump to supply additional water for Lots 52-74 and the Manarabisi Cattle Pasture is proposed. The Port Mourant Follow-Up Co-Operative Land Society has made a successful beginning in constructing subsidiary drainage and irrigation works, and can effect drainage into a Bookers high-level trench when Bookers is not irrigating.

Declared Drainage and Irrigation Areas: Status and Assessment

An assessment of the status of declared drainage and irrigation areas by major region is given in table F-1.

Appendix Table F-1. Declared Drainage and Irrigation Areas – Status and Assessment

REGION	GROSS AREA	MAIN DRAINAGE AREA [a/]	MAIN IRRIGATION AREA [a/]	IRRIGATION PUMP CAPACITY	DRAIN PUMP CAPACITY	CROP ACREAGES						COMMENTS
						RICE	CANE	GROUND PROVISIONS	PASTURE	OTHER	UNCULTIVATED	
	– – – – – – Acres – – – – –			– – – Cfs. – – –		– – – – – – – – – – – Acres – – – – – – – – – – –						
Essequibo												
Tapakuma	37,270	32,410 (25,000)	25,000 (25,000)	300	200	21,000	– –	500	960	900 c.	1,050	1. Water use efficiency approximately 30 percent. 2. Minor drainage System Maintenance problems (19,000 acres subsidiary works provided by Drainage and Irrigation Board). 3. Severe sling mud problems between Lima/Somerset and Berks and to lesser extent Lima to Unu Creek – sluices periodically blocked. 4. 7,840 acres low-lying lands periodical inundated: especially Labelle Alliance to Somerset and Berks.
Tapakuma Extension	8,000	7,200	7,200	100	400	1,400	– –	– –	190	230 c. 350 f. 160 cf.	– –	– –
Johanna Cecelia/ Annandale	5,530	3,780 (3,000)	3,600 (200)	– –	– –	2,260	– –	– –	– –	320 c.	960	1. Subsidiary drain and irrigation works in poor condition (maintained by private proprietors).
West Demerara												
Vergenoegen/Bonasika	32,760	29,460 (8,000)	20,000 (3,000)	– –	– –	3,550	610	2,580	310	120 f.	21,200	1. Subsidiary drainage and irrigation only. Approximately 8,000 acres (mainly Vergenoegen to Greenwich Park and Kent Dam Area), plus new works at Parika Backdam under construction. 2. 13,900 acres are unoccupied State Lands. 3. Much undeveloped freehold land in rates arrears. 4. No river defence which presents difficulties with spring tides. 5. Some main drains silted and need reconditioning. 6. Water supply from Boerasire Conservancy insufficient to irrigate entire area.
Den Amstel/ Fellowship	1,080	880 (800)	700 (300)	– –	– –	370	170	60	30	– –	110	1. One low section at Fellowship sometimes inundated. 2. Dry weather irrigation water unreliable.
Vreed-en-Hoop/ La Jalousie (West)	2,870	2,570 (2,570)	2,570 (2,000)	– –	50	1,660	280	70	300	– –	– –	– –
Vreed-en-Hoop/ La Jalousie (East)	2,120	1,900 (1,700)	1,200 (1,200)	– –	– –	1,480	– –	– –	70	– –	120	1. Drainage and Irrigation Board also drains 1,135 acres private land free of rates in Vreed-en-Hoop.
North Klien/ Pouderoyen	650	540 (540)	490 (410)	– –	– –	410	– –	– –	– –	– –	– –	– –

REGION	GROSS AREA	MAIN DRAINAGE AREA a/	MAIN IRRIGATION AREA a/	IRRIGATION PUMP CAPACITY	DRAIN PUMP CAPACITY	CROP ACREAGES						COMMENTS
						RICE	CANE	GROUND PROVISIONS	PASTURE	OTHER	UNCULTIVATED	
	– – – – – – Acres – – – – –			– – – Cfs. – – –		– – – – – – – – – – – Acres – – – – – – – – – – –						
Canals Polder	24,790	21,700 (17,000)	21,400 (13,000)	– –	– –	2,000	11,030	– –	– –	4,250 ct. & p.	4,010	1. Subsidiary drainage and irrigation facilities poor due to extreme length and narrowness of landholdings.
La Retraite	700	590 (590)	590 (500)	– –	– –	300	220	– –	10	20 ct. & p.	30	– –
Potosi/Kamuni (Jacob's Lust to Georgia)	5,300	4,660 (– –)	– – (– –)	– –	– –	– –	300	700	– –	260 ct.	3,400	1. Subsidiary drainage Jacob's Lust - Georgia (Outside Estates), non-existent; minor construction at Concordia. 2. No subsidiary irrigation works (water-courses) and no reliable water supply available. 3. Rates largely uncollected.
East Demerara												
Garden of Eden	1,270	1,040 (1,040)	1,000 (1,000)	– –	– –	– –	770	70	– –	30 f.	90	1. Gravity irrigation from East Demerara Conservancy not possible during driest periods. 2. Drainage of Pegasse land in back of area caused severe subsidence and drainage difficulties.
Craig	1,330	1,140 (940)	1,100 (940)	– –	– –	70	530	150	40	130 ct. & p.	140	1. Gravity irrigation from East Demerara conservancy not possible during driest periods. 2. Low area in middle of Craig does not drain properly.
Plaisance	580	500 (450)	450 (450)	– –	48	– –	330	50	– –	– –	60	1. Gravity irrigation from East Demerara conservancy not possible during driest periods.
Reterverwagting/ Triumph	1,520	1,490 (1,490)	1,300 (1,300)	– –	96	– –	1,100	– –	– –	40 f. 40 c.	– –	1. Gravity irrigation from East Demerara conservancy not possible during driest periods.
Buxton/Friendship	2,230	2,180 (2,000)	2,000 (2,000)	– –	96	– –	930	50	520	150 f. 190 c.	– –	1. Gravity irrigation from East Demerara conservancy not possible during driest periods. 2. Subsidiary drainage needs improvement where drains cross sand reefs. 3. Younge empolder in South not properly drained.
Golden Grove/ Victoria	7,840	5,050 (1,100)	4,800 (800)	– –	96	380	– –	740	– –	3,060 c.	370	1. Worse irrigation situation than (1) above. 2. Subsidiary irrigation facilities need improving/structures need replacing: maintained by local authorities and private proprietors. 3. Third-depth drains inoperative. 4. Three sluices blocked frequently. 5. Pump discharges to canal and can be blocked. 6. Pump capacity inadequate.

Appendix Table F-1. Declared Drainage and Irrigation Areas – Status and Assessment (Continued)

REGION	GROSS AREA	MAIN DRAINAGE AREA a/	MAIN IRRIGATION AREA a/	IRRIGATION PUMP CAPACITY	DRAIN PUMP CAPACITY	CROP ACREAGES						COMMENTS
						RICE	CANE	GROUND PROVISIONS	PASTURE	OTHER	UNCULTIVATED	
	Acres			Cfs.		Acres						
Ann's Grove (to Lancaster)	5,100	3,810 (3,200)	3,300 (700)	– –	– –	320	– –	240	580	2,550 c.	110	1. Irrigation supply as in Golden Grove. 2. Drainage inadequate during heavy rainfall periods.
Mahaica and Helena	2,750	2,500 (2,000)	2,100 (1,200)	– –	– –	960	– –	350	– –	490 c.	– –	1. Irrigation supply as in Golden Grove. 2. Drainage hampered by high water levels in Mahaicony River.
Cane Grove	10,830	7,220 (3,600)	7,200 (2,000)	– –	180	4,380	– –	1,070	1,410	130 c.	– –	1. During wet season sluices cannot discharge to river - severe flooding especially of provisions. 2. Irrigation supply determined by availability from East Demerara Water Conservancy.
Park/Abary	2,800	2,710 (2,710)	(200)	24	– –	1,140	– –	90	400	910 c.	– –	1. Subsidiary drains need maintainance (By local authority). 2. Small amount of irrigation water available by pumping from Burma drain.
Mahaicony/Abary	12,690	11,340 (11,000)	11,300 (9,500)	96	– –	9,540	– –	– –	1,390	– –	– –	1. Drainage probably insufficient for non-rice - discharge to Macaicony River. 2. Irrigation pump capacity inadequate. 3. Saline intrusion into Mahaicony River. limits irrigation pumping during dry weather.
East Berbice Sisters	100	80 (80)	– – (– –)	– –	– –	40	– –	10	– –	– –	– –	1. River dam suffers erosion problems. 2. Drainage works need reconditioning.
Lots 1-25	9,380	6,940 (– –)	– – (– –)	– –	– –	1,480	– –	– –	5,080	120 c.	– –	1. Severe sling mud problems hamper sluice effectiveness. 2. Empolder dams inadequate, No. 1–No. 15. 3. Inadequate drainage system and sea defenses maintained by local authority.
Gibralter/Courtland	2,540	2,020 (– –)	– – (– –)	– –	– –	90	140	370	1,280	– –	– –	1. Gravity drainage is severely deficient. 2. Severe sling mud problems hamper sluice effectiveness.
Fyrish	420	400 (– –)	(– – (– –)	– –	– –	100	– –	– –	120	– –	– –	1. Similar to Gibralter/Courtland.
Rosehall	980	910 (910)	590 (400)	– –	70	400	170	– –	120	50 c.	– –	1. Main drains undersized. 2. Irrigation water supply depends on release from Port Mourant Estate.
Bloomfield/Whim	1,980	1,930 (– –)	1,900 (– –)	– –	– –	890	860	– –	– –	80 ct. & p.	– –	1. Outfall channels silt badly in dry season and require extensive maintenance. 2. Condition of drainage system poor. 3. Irrigation water supply inadequate; depends on release from Black Bush Polder.
Lancaster/Manchester	2,210	2,160 (– –)	1,600 (– –)	– –	– –	1,330	– –	– –	– –	380 c.	– –	1. Similar to Bloomfield/Whim.

Appendix Table F-1. Declared Drainage and Irrigation Areas – Status and Assessment (Continued)

REGION	GROSS AREA	MAIN DRAINAGE AREA a/	MAIN IRRIGATION AREA a/	IRRIGATION PUMP CAPACITY	DRAIN PUMP CAPACITY	CROP ACREAGES						COMMENTS
						RICE	CANE	GROUND PROVISIONS	PASTURE	OTHER	UNCULTIVATED	
	– – – – – – Acres – – – – –			– – – Cfs. – – –		– – – – – – – – – – – Acres – – – – – – – – – – –						
Ulverston/Salton	3,420	3,300 (– –)	2,600 (– –)	– –	– –	1,820	– –	– –	– –	1,040 c.	30	1. Similar to Bloomfield/Whim.
Limlair/Kildonan	2,640	2,560 (– –)	2,000 (– –)	– –	– –	1,730	– –	– –	– –	360 c.	390	1. Similar to Bloomfield/Whim.
Black Bush Polder	32,540	27,000 (20,000)	27,000 (20,000)	400	– –	14,000	– –	80	– –	160 v.a/ 2,000 m. 100mis.	2,320	1. Sluice efficiency low due to deposition of sling mud and accretion/erosion of foreshore.
OTS 52 – 74	24,270	22,350 (22,350)	18,200 (7,400)	240	– –	17,680	– –	– –	– –	3,680 c.	740	1. Sling mud accretion problems. 2. Irrigation works need reconditioning.
Manarabisi Cattle Pasture	28,750	28,470 (– –)	– – (– –)	– –	– –	– –	– –	– –	16,490	10 c. & f.	11,970	1. Only 10,000 acres have drainage and irrigation facilities. 2. No internal works. 3. 300 acres leased recently to Bookers for sugarcane.
Crabwood Creek	5,060	4,360 (4,360)	– – (– –)	– –	– –	3,400	– –	– –	750	– –	– –	1. Not all 4,100 acres have subsidiary irrigation system.
Total	276,000	240,000 (137,000)	169,000 (93,000)									

Note:
- c. = coconuts (and provisions)
- f. = tree fruits
- cf. = coffee
- ct. = citrus
- p. = provisions
- v. = vegetables
- m. = mixed
- mis. = miscellaneous

a/ Acres in parentheses are net.

b/ Results of the farm survey suggest this is too low. Vegetable acreage may be several times the 160 acres estimated by the Ministry of National Development and Agriculture for 1973.

APPENDIX G. SUGAR ESTATE EXPANSION PLANS

There are currently 11 sugar factories in Guyana. The independently owned factory at Versailles is old and inefficient and will probably close down, with production shifting to Wales. That shift will fully utilize current excess capacity at Wales.

An expansion of the Blairmont factory is under construction; an expansion of Enmore has recently been completed, and a possible expansion of Skeldon is under study. Diamond and Leonora have excess capacity at present. Apparently the remaining factories at Uitvlugt, L.B.I., Rose Hall and Albion will in 1974 operate near capacity. Albion and Uitvlugt anticipate increased input of farmers' cane.

Blairmont has available to it -- mainly through Kabaweb Ranch -- 11,000 to 12,000 acres of first-rate clay soil. This year an additional 3,000 acres of estate land will be brought under cane cultivation at Blairmont: 1,550 acres were formerly leased to a cooperative, and the major part of the remainder are from Kabaweb Ranch. This 3,000-acre expansion only begins to encroach on the good soils of the ranch; however, it will result in utilization of Abary River water for irrigation to the feasible limit. Already there are difficulties with salinity intrusion during dry years and these can be expected to be exacerbated by the planned

3,000-acre expansion, although to some extent the additional water requirements will be reduced by improved water recirculation within the estate. Further expansion of the Blairmont cane acreage would be made more attractive by completion of the Mahaica-Mahaicony-Abary Phase I Project.

Enmore has 800 new acres this year, and the factory could accommodate another 800 acres of estate cane production although readily available soils are not particularly suitable for cane. Cassava production is being considered on 800 to 3,000 acres of unutilized land in Enmore. The factory will receive farmers' cane from 2,000 additional acres in the next 3 years.

A 30,000-ton expansion (approximately 9,000 acres) at Skeldon is under study. Bookers has recently been leased 8,800 acres near Skeldon that could be put into cane: 3,000 acres in the Manarabisi Cattle Pasture and the rest directly back of Skeldon adjacent to the water path. Current estimates are that with improved water recirculation on Skeldon estate, 200 cusecs additional peak period withdrawals would be required by this expansion.

Diamond factory could accommodate the production of about 6,000 acres of cane. Current expectations are that this will come from the following areas:

- 1,000 acres being reclaimed in back of Diamond
- 1,000 acres being rented in Dunoon, West Bank
- 200 acres being rented in Flensburg, West Bank (plus a lesser amount in Georgia)

- 380 acres being rented in Glasgow, West Bank
- perhaps 1,000 acres from West Bank farmers
- perhaps 500 acres in Aurora
- perhaps more acreage from East Bank farmers in Land of Canaan, below Alliance, and near Fulton (before Garden of Eden)
- possible 1,500 acres reclaimed from Lamaha Conservancy.

The Demerara Company assumes that little of this increased acreage will come from land currently in crops, although there might be minor conversion of pasturelands. Tenure and land title problems hamper farmer cane expansion in certain areas, including Friendship (where property lines cross in back part of grant and where some land is "undivided," that is, it was given to 53 former soldiers and their descendents). Similar problems also arise on the West Bank.

The West Bank from Jacob's Lust to Georgia is lightly cultivated and provided with main drainage works. Farmer cane expansion is being encouraged here -- probably for Diamond if Versailles production shifts to Wales. There are several difficulties associated with expanding farmer cane cultivation in the area, including land title disputes and access problems at Strik-en-Huevel koker. Demerara Company is renting land in the area and is encouraging farmers to plant cane.

Leonora estate has no additional lands that can be put under cane but the factory can accept the additional production from about 1,700 acres of farmer cane. Expansion is phased as follows through 1976:

- 1974: 50 acres No. 1 Canal Polder, 60 acres Hague, and 270 acres Rosinante Cooperative
- 1975: 40 acres Rosinante, 100 acres Den Amstel and 150 acres Blankenburg
- 1976: 50 acres each in Hague, Ruby and Blankenburg.

Expansion plans as outlined above should bring industry output to approximately 400,000 tons in the near future (360,000 tons are expected this year; 300,000 from Bookers). The second expansion phase calls for industry output of 500,000 tons. The sugar industry has submitted to Government an expansion plan whose details are unknown to us. It is clear, however, that to reach this goal would require lands beyond that to which the industry now has access (100,000 tons of sugar will require approximately 30,000 acres of cane land). It would also presumably require irrigation water beyond that now available in all areas: Boerasirie and East Demerara Water Conservancies and Abary and Canje Creeks. Of course, water deficits might not hinder expansion of farmer cane because farmer cane is presently over 90 percent unirrigated -- and low yields reflect this lack of irrigation water. There is, of course, a land/water tradeoff to reach 500,000 tons.

In summary, we find few instances where land currently in foodcrops will be shifted to sugarcane. Shifts will affect some rice lands but will involve a significant

amount of clearing of currently unutilized lands (although some of this new land was cultivated at some time in the past). On the other hand, land that does go into cane will be at least temporarily kept from foodcrop production, although the land improvements necessary for cane would prove useful to foodcrop production in the future, and it apparently is a concern of the sugar factories that farmers can be quick to shift out of cane as disillusionment sets in. For the near future, Demerara River development north of Dunoon on either bank of the river must contend with cane acreage expansion and, on the East Bank, with urban expansion. The same holds true but perhaps to a lesser extent (if Versailles factory does shut down) for Canals Polder and West Coast Demerara as far as Ruby. In the longer run, of course, competition will be keener than it is now on East Coast Demerara, East Coast Berbice (even with Black Bush Polder), and along Corentyne.

APPENDIX H. COMPARISON OF AGRICULTURAL CENSUSES

Table H-1. Farm Units by District and Size: Guyana, 1952 and 1968

Designated districts[a/]		Holdings with 0.1 to 49.9 acres farmland[b/]										Holdings of 50 or more acres farmland in 1952	Farm households without land in 1968
		Total		0.1 - 2.4		2.5 to 9.9		10.0 to 24.9		25.0 - 49.9			
1952	1968	1952	1968	1952[c,d/]	1968	1952[c,d/]	1968	1952	1968	1952	1968		
CD 1-4	Corentyne & East Berbice	8,083	9,432	2,475	3,704	4,266	2,841	1,218	2,628	124	259	138	1,973
5&6	West Berbice	3,025	2,500	345	837	1,658	896	820	649	202	118	211	626
Berbice		11,108	11,932	2,820	4,541	5,924	3,737	2,038	3,277	326	377	349	2,599
CD 7-9	Upper & Lower East Coast and Georgetown	5,649	4,572	2,644	2,682	2,206	1,208	657	481	142	201	290	2,442
10	East Bank, Demerara	528	595	227	308	221	194	60	68	20	25	49	304
11	Upper & Lower Demerara River	223	459	34	248	113	136	38	55	38	20	123	157
7-11		6,400	5,626	2,905	3,238	2,540	1,538	755	604	200	246	462	2,903
12&13	West Demerara	3,489	2,663	1,418	839	1,436	1,179	543	563	92	82	56	922
Demerara		9,889	8,289	4,323	4,077	3,976	2,717	1,298	1,167	292	328	518	3,825
CD 14&15	Essequibo Islands	2,331	2,629	429	837	1,415	1,189	391	472	96	131	77	240
16-18	Essequibo Coast	3,262	3,272	624	685	1,885	1,532	501	926	252	129	141	347
14-18		5,593	5,901	1,053	1,522	3,300	2,721	892	1,398	348	260	218	587
19	Northwest	233	1,256	2	308	43	409	139	502	49	37	41	31
20	Mazaruni/Potaro	200	474	65	127	109	279	26	63	--	5	2	112
Essequibo (less Rupununi)		6,026	7,631	1,120	1,957	3,452	3,409	1,057	1,963	397	302	261	730
Guyana, less Rupununi		27,023	27,852	8,263	10,575	13,352	9,863	4,393	6,407	1,015	1,007	1,128	7,154
21	Rupununi	18	n.a.	--	n.a.	--	n.a.	11	n.a.	7	n.a.	18	n.a.
Guyana		27,041	n.a.	8,263	n.a.	13,352	n.a.	4,404	n.a.	1,022	n.a.	1,146	n.a.

n.a. = not available.

a/ It is not certain that the districts as grouped were wholly co-terminate in the two censuses. b/ Distribution in 1952 based on size in Rhynland acres (a unit equal to 1.052 English acres). c/ The 2.0-to-4.9-acre size group of the 1952 census has been subdivided on the assumption that one-sixth of the units in Berbice and Essequibo, and one-third of the units in Demerara, were of 2.0 to 2.4 acres.

d/ Includes estimated component.

Source: Computed and assembled by RRNA from the report of the 1952 Sample Agricultural Census (Agriculture in British Guiana, Vol. 1, No. 1) and from preliminary and unverified summary sheets of the 1968 Agricultural Census.

Table H-2. Number of Agricultural Holdings, Occupied Area and Cultivated Area: Guyana by Designated Districts and by Tenure, 1952 and 1968

Designated districts		Holdings[a]						Occupied area (000 acres)					Cultivated area 1968 (000 acres)[a]		
		Full owners or managers		Part owners		Tenants		1952		1968[a]					
1952	1968	1952	1968	1952	1968	1952	1968	Owned or managed	Rented	Full owners	Part owners	Tenants	Full owners	Part owners	Tenants
CD 1-4	Corentyne & East Berbice	1,685		2,327		4,209		55.1	31.9						
5&6	West Berbice	753	1,128	1,618	754	865	877	64.4	50.3	6.3	7.5	6.1	5.3	6.3	5.6
Berbice		2,438		3,945		5,074		119.5	82.2						
CD 7-9	Upper & Lower East Coast & Georgetown .	1,817	2,470	1,345	557	2,777	1,669	58.9	97.8	11.6	4.4	7.0	10.2	4.1	6.3
10	East Bank, Demerara .	158	205	96	13	323	377	9.3	3.3	1.4	0.1	0.4	0.6	0.1	1.3
11	Upper & Lower Demerara River	92	250	47	24	207	188	19.3	6.2	1.3	0.3	0.7	0.6	0.2	0.5
7-11		2,067	2,925	1,488	584	3,307	2,234	87.5	107.3	14.3	4.8	8.1	11.4	4.4	8.1
12&13	West Demerara	1,713	1,426	858	246	974	1,002	21.8	7.1	10.4	2.0	5.4	4.9	1.6	4.4
Demerara		3,780	4,351	2,346	830	4,281	3,236	109.3	114.4	24.7	6.8	13.5	16.3	6.0	12.5
CD 14&15	Essequibo Islands ...	702	771	687	240	1,019	1,632	24.5	9.5	5.4	2.3	10.6	4.4	1.8	6.7
16-18	Essequibo Coast	947	1,445	1,206	256	1,250	1,647	40.2	22.1	11.3	3.0	11.0	8.6	2.5	10.2
14-18		1,649	2,216	1,893	496	2,269	3,279	64.7	31.6	16.7	5.3	21.6	13.0	4.3	16.9
19	Northwest	184	809	5	9	85	453	6.3	2.5	5.5[b]	0.2[b]	4.5[b]	3.3	0.1	2.7
20	Mazaruni/Potaro	42	130	5	1	155	344	1.8	1.2	0.7	--	1.6	0.4	--	1.3
Essequibo (less Rupununi)		1,875	3,155	1,903	506	2,509	4,076	72.8	35.3	22.9[b]	5.5[b]	27.7[b]	16.7	4.4	20.9
Guyana, less Rupununi		8,093		8,194		11,864		301.6	231.9						
Rupununi		1		1		34		1,801.7	603.8						
Guyana		8,094		8,195		11,898		2,103.3	835.7						

a/ Data for 1968 include only holdings with 0.1 to 49.9 acres of farmland. b/ Includes estimated component.

Source: Computed and assembled by RRNA from the report of the 1952 Sample Agricultural Census (Agriculture in British Guiana, Vol.1, No.1) and from preliminary and unverified summary sheets of the 1968 Agricultural Census.

APPENDIX I. FARM PRODUCTION EXPENSES

Table I-1. Returns Per Acre Over Specified Expenses for Selected Cropping Alternatives in Designated Localities

Crop alternatives	Gross output			Specified expenses					Returns less specified expenses ($)
	Yield[a] (lbs.)	Price[b] (¢/lb.)	Receipts ($)	Materials ($)	Machine services ($)	Manual labor		Total[c] ($)	
						Days	Dollars		
1. Farmers' sugarcane	50,000	0.80	400						
Molasses			20						
Total[d]			420	49	28	37	174	266	154
2. Rice:									
Fall	1,960	5.15	101						
Spring	1,260	5.15	65						
Total[d]	3,220		166	22	65	4	19	121	45
3. Plantains	5,000	8.40	420						
Eddoes	6,000	8.00	480						
Vines	2,000	4.00	80						
Total[e]			980	80	--	90	423	518	462
4. Cassava[f]	6,000	8.00	480	20	--	54	254	289	191
5. Staked tomatoes[g]	6,000	26.50	1,590	295	15	100	470	795	795
6. Corn	3,000	8.00	240						
Black-eyed peas	1,300	.40	520						
Total[h]			760	222	47	--	--	284	476

a/ Plausible yields for the selected cropping alternatives and designated localities.
b/ Farm prices chosen for approximate compatibility with the 1972 retail prices of table 21.
c/ Includes $15 allowance for land rent.

Continued--

Table I-1 (continued)

d/ The expenditures for farmers' sugarcane and rice apply to portions of the coastal plain where two crops of rice can be grown, and are adapted from data published in Report of a Commission of Inquiry into the Sugar Industry in Guyana, September 1968.

e/ Data for the combination of provisions and vines apply at East Bank Essequibo and are adapted from "Cost of Production Study on Certain Ground Provisions," an anonymous mimeograph prepared pursuant to a request of the Minister of Natural Resources made on November 4, 1960, and now available in the Memory Bank of the USAID Mission.

f/ Data for cassava are adapted from the same source as given in footnote e and apply at Canals Polder.

g/ Data for staked tomatoes apply for sandy soils and are adapted from a study by B.R. Edelman, G.A. Marlowe, C.M. Geraldson, S.J. Locasio, and L.H. Halsey, Estimated Resource Requirements, Costs, and Returns for Four Vegetable Production Alternatives on Coastal Clay Soils and Sandy Soils of Guyana (University of Florida, Department of Food and Resource Economics, December 1971).

h/ Data for corn (grown in the long rainy season) and black-eyed peas (grown in the short rainy season) apply in the Intermediate Savannahs, and are adapted from Paul J. Hooker, A Preliminary Study of the Economic Potential for Beef Cattle, Grain, and Legume-Seed Production in the Intermediate Savannahs of Guyana Using a Linear Programming Model (University of Florida, Department of Food and Resource Economics, Economic Report 51, July 1973).

APPENDIX J. TOTAL AGRICULTURE AND RELATED GOVERNMENT EXPENDITURES, 1973 REVISED ESTIMATES

(In millions of dollars)

Program structure	Ministry of National Development and Agriculture				Other ministries[d]	All ministries	
	Technical divisions[a]	Lands and lands settlement[b]	Drainage and irrigation	Other agencies and corporations[c]		Total	Allocation to foodcrops
Farm production goals							
Supply technology:							
Crop research	1.79	--	--	.27	--	2.06	1.50
Livestock and poultry research.....	.90	--	--	--	--	.90	--
Crop extension	.55	--	--	1.52	--	2.07	.50
Livestock and poultry extension	.18	--	--	--	--	.18	--
Seed and plant distribution	.18	--	--	.35	--	.53	.18
Improve management:							
Train agricultural specialists	.07	--	--	.01	--	.08	.05
Train farmers and youths	.04	--	--	.41	.34	.79	.58
Cooperative training	--	--	--	--	.50	.50	
Supply farm inputs:							
Fertilizer and chemicals	--	--	--	3.09	--	3.09	.10
Farm machinery	.02	--	--	1.91	--	1.93	--
Miscellaneous farm supplies	--	--	--	1.11	--	1.11	--
Farm credit:							
Operating loans	.54	--	--	5.98	--	6.52	.40
Ownerships and improvement loans	--	--	--	.94	--	.94	.20

Continued--

Appendix J. (continued)

Program structure	Ministry of National Development and Agriculture				Other ministries[d]	All ministries	
	Technical divisions[a]	Lands and lands settlement[b]	Drainage and irrigation	Other agencies and corporations[c]		Total	Allocation to foodcrops
Improve water control:							
Sea and river defense ..	--	--	3.97	--	--	3.97	.50
Drainage and irrigation	--	--	1.97	.82	--	2.79	.40
Provide land to workers:							
Coastal land settlement	--	1.29	--	--	--	1.29	.20
Interior land settlement	--	.19	--	.73	--	.92	.90
State farm operations (net)	--	1.00	--	.50	--	1.50	1.75
Stabilize farm prices:							
GMC foodcrop program ...	--	--	--	.70[e]	--	.70	.70
Rice program	--	--	--	-11.52[f]	--	1.52	--
GMC milk program	--	--	--	.25[g]	--	.25	--
Marketing goals							
Improve efficiency:							
Market information	--	--	--	.01	--	.01	.01
Market research	--	--	--	.01	--	.01	.01
Grades and standards ...	--	--	--	.65	--	.65	--
Market regulation	--	--	--	--	--	--	--
Expand marketing facilities:							
Processing	--	--	--	2.24	--	2.24	.05
Storage and handling ...	--	--	--	7.51[h]	--	7.51	.10

Continued--

Appendix J. (continued)

Program structure	Ministry of National Development and Agriculture				Other ministries[d]	All ministries	
	Technical divisions[a]	Lands and lands settlement[b]	Drainage and irrigation	Other agencies and corporations[c]		Total	Allocation to foodcrops
Reduce transport costs:							
Market roads construction	--	--	--	--	.10	.10	.10
Interior roads construction	--	--	--	--	5.00	5.00	1.50
Air freight subsidy, Interior	--	--	--	.13	--	.13	.10
Expand demand							
Improve nutrition:							
Nutrition education	--	--	--	--	.55	.55	.55
School feeding	--	--	--	--	.11	.11	--
Food inspection	--	--	--	--	.04	.04	.03
Consumption incentives:							
Retail food price control	--	--	--	--	.03	.03	.02
Wheat subsidy	--	--	--	--	12.50[i]	12.50	--
Food fairs and exhibitions	--	--	--	--	.65	.65	.45
Expand exports:							
Overseas representation	--	--	--	--	.30	.30	.03
Trade fairs	--	--	--	--	.05	.05	.01
CARICOM participation ..	--	--	--	--	.05	.05	.05
Administrative overhead ...	.05	.40	.46	1.57	1.60	4.08	
Total	4.32	2.88	6.40	19.19	21.82	4.61	10.82

Continued--

Appendix J. (continued)

Note: This table reflects Government's net expenditures for Agriculture programs in 1973. It includes expenditure by all Government agencies that have programs with agricultural objectives concerned with agriculture, i.e., the Ministry of National Development and Agriculture, all agriculture corporations, and other Ministries. Thus the total of $56.61 million shows the amount of Government funds that flowed into all aspects of agriculture during 1973.

The data were derived from the revised estimates of 1973 expenditure, through interviews with Government officers. The figures are therefore not intended to be precise in an accounting sense but more importantly to focus on the relative importance of Government's policies and programs in agriculture.

a/ Includes the divisions falling under the Chief Agriculture Officer, i.e., Research, Extension and Veterinary Divisions.

b/ Includes expenditure by the Lands Department and Land Development Division.

c/ Includes Ministry of National Development and Agriculture, Agriculture Bank, Guyana Rice Board, Guyana Marketing Corporation and Global-Agri Industries.

d/ Includes Ministries with some expenditure for agriculture including primarily the Ministries of Trade, Cooperatives, Foreign Affairs, Education and Health.

e/ This represents the net gain on foodcrop purchases.

f/ This figure is negative as a result of a profit made on sales by the Guyana Rice Board.

g/ This represents the net loss on the milk plant operations.

h/ This figure includes capital expenditure on rice silos. or 1973.

i/ Includes $12 million as subsidy on flour.

APPENDIX K. GMC PRICING

This appendix contains data relevant to the pricing practices of the Guyana Marketing Corporation (GMC). The data include GMC prices paid to farmers, the quantity of purchases, and the Georgetown wholesale price for 10 food-crops for the years 1942 to 1973, as shown in the following table.

GMC Purchases and [illegible] Commodities,
Wholesale Pri[illegible]
Price, [illegible]

Commodity	1964	1965	[illegible]	[illegible]	[illegible]	[illegible]	1970	1971	1972	1973	1974
Plantain											
GMC prices paid (¢).	3.8	[illegible]	[illegible]	[illegible]	[illegible]	6.1	6.1	6.2	7.7	8.5	7.0
Georgetown wholesale price (¢).....	4.9	4.3	[illegible]	[illegible]	[illegible]	8.0	7.1	8.3	12.1	15.8	-
GMC purchases (000 lbs.).....	1,473	6,394	3,2[illegible]	7,260	1,878	3,776	5,562	3,660	1,663	5,629	-
Eddoes											
GMC prices paid (¢).	4.0	3.9	4.9	6.4	6.2	6.0	7.9	5.3	6.3	6.9	6.0
Georgetown wholesale price (¢).....	6.4	4.5	8.2	6.4	8.2	8.0	7.3	8.5	8.5	13.4	-
GMC purchases (000 lbs.).....	97	50	55	430	891	1,493	382	175	657	846	-
Cassava											
GMC prices paid (¢).	2.3	2.7	1.7	2.6	2.3	2.8	2.7	4.3	7.5	4.7	5.0
Georgetown wholesale price.....	3.4	3.2	5.0	6.9	9.0	8.2	6.4	9.6	13.5	11.1	-
GMC purchases (000 lbs.).....	4	5	1	9	204	359	526	668	910	2,190	-
Corn											
GMC prices paid (¢).	5.7	n.a.	6.2	6.3	7.0	6.0	6.7	6.1	6.9	8.3	14.0
Georgetown wholesale price.....	n.a.	5.8	6.7	7.2	6.7	6.8	7.2	9.7	10.5	10.0	-
GMC purchases (000 lbs.).....	903	n.a.	1,268	2,070	2,628	1,344	918	1,383	290	416	-

continued --

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Pumpkins											
GMC prices paid (¢).	-	2.1	3.3	3.9	3.7	3.6	3.1	3.1	4.0	5.0	2.0-4.0
Georgetown wholesale price (¢).....	3.2	4.0	5.1	4.4	5.1	5.3	5.8	6.8	9.6	9.0	-
GMC purchases (000 lbs.).....	-	40	108	122	845	570	636	349	68	747	-
Cabbages											
GMC prices paid (¢).	-	17.2	-	26.8	21.9	24.6	18.0	24.1	17.6	17.1	15.2-17.0
Georgetown wholesale price (¢).....	30.0	30.5	30.6	27.8	30.6	31.5	32.8	34.5	30.1	27.5	-
GMC purchases (000 lbs.).....	-	-	-	26	54	25	143	333	187	42	-
Tomatoes											
GMC prices paid (¢).	-	26.8	22.4	26.0	25.0	24.5	22.5	20.5	18.5	23.9	21.0-25.0
Georgetown wholesale price (¢).....	n.a.	n.a.	34.7	40.8	34.7	35.0	44.4	35.5	42.7	45.8	-
GMC purchases (000 lbs.).....	-	2	3	9	13	18	52	115	79	109	-
Black-eyed Peas											
GMC prices paid (¢).	-	16.0	-	15.7	20.2	26.9	27.2	25.2	27.9	41.8	40.0-45.0
Georgetown wholesale price (¢).....	16.0	16.4	18.0	34.1	34.9	35.0	26.5	52.0	55.1	42.1	-
GMC purchases (000 lbs.).....	-	32	-	16	49	13	50	25	12	71	-

continued--

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Yams											
GMC prices paid (¢).	6.5	5.4	7.4	7.6	10.4	8.6	6.0	6.1	6.0	7.7	6.0
Georgetown wholesale price (¢).....	9.2	5.8	10.3	9.3	10.3	11.1	10.6	15.0	16.2	17.8	-
GMC purchases (000 lbs.).....	164	140	96	123	280	1,138	1,513	645	902	273	-
Sweet Potatoes											
GMC prices paid (¢).	6.1	4.4	7.0	8.5	10.0	8.0	7.9	8.2	8.6	10.2	10.0
Georgetown wholesale price (¢).....	9.8	6.1	13.7	10.6	13.7	13.8	12.3	14.3	15.3	18.5	-
GMC purchases (000 lbs.).....	120	66	18	88	149	576	556	292	182	347	-

n.a. = not available.

BIBLIOGRAPHY

Appraisal Team from Agricultural Capital Project Course. "Project Appraisal Report: Wauna Land Development Scheme Oil Palm Project." Course sponsored by the Guyana Ministry of National Development and Agriculture and the USAID Mission, Guyana, November 1972.

Blue, William G. "White Sands Soils Adjacent to the Atkinson-McKenzie Highway." A report submitted to the Guyana Ministry of Agriculture and Natural Resources in July 1967, prior to a contract between the Government of Guyana and the University of Florida.

Brandow, G.E. Interrelations Among Demands for Farm Products and Implications for Control of Market Supply. Bulletin 680, The Pennsylvania State University, College of Agriculture, Agricultural Experiment Station, University Park, Pa., August 1961.

British Guiana (Guyana) Development Program, 1966-72. Georgetown, Guyana: Government Printery.

Caribbean Development Bank. The Coconut Industry of the West Indies. Prepared by Dr. Carleen O'Loughlin. Technical Report No. 6, Barbados, November 1972, vol. I.

Chambers, Robert. Settlement Schemes in Tropical Africa. New York: Praeger, 1969.

Chesney, H.A.D., and Gordon, K. "A Bibliography of Soil Science Research in Guyana." Mon Repos, Guyana: Central Agricultural Station, 1973.

Cox, Milo L., and Newberg, Richard. "Evaluation Report: Guyana Agricultural Sector." 1968. Draft available in the Memory Bank of the USAID Mission, Guyana.

Cummings, Leslie P. "The Canals Polder." University of Guyana, Department of Geography, 1970.

Cummings, Leslie P. (ed.). Essequibo Islands: Land Tenure and Land Use. University of Guyana, Department of Geography, Occasional Paper No. 2, 1973.

The Daily Chronicle (Georgetown, Guyana), various issues, 1973-74.

Dumont, Rene. Report to the Government of British Guiana on Planning Agricultural Development. Report 1706, FAO Expanded Program of Technical Assistance. Rome: FAO, June 1963. Reproduced by the Government Printery, Georgetown, Guyana.

Guyana, Department of Agriculture. Agricultural Statistics of British Guiana, 1950-1956. Georgetown, Guyana: Government Printery, December 1961.

The Guyana Graphic (Georgetown, Guyana), various issues, 1973-74.

Guyana. Guyana Statistical Abstract, 1971.

Guyana. Guyana Statutes.

Guyana, Ministry of Agriculture. Plan for the Development of the North West Region, 1972-76.

_____. Plan for the Development of the South Pakaraima Region, 1972-76. Mimeo, undated.

_____. Regional Agricultural Development Plan, 1972-76: Soesdyke/Linden Region. September 1971.

Guyana, Ministry of Finance, Statistical Bureau. Consumer Expenditure Survey, 1969-70.

Guyana, Ministry of Labor and Social Security, Manpower Survey Office. Report on a Survey of Manpower Requirements and the Labor Force, 1965. Vol. II. Human Resources in Guiana. Georgetown, Guyana: Government Printery.

Guyana, Ministry of National Development and Agriculture. Agricultural Research: Guyana. Vol. 4. Mon Repos, Guyana: Central Agricultural Station, 1970.

_____. Cane Farming Annual Report, 1972.

_____. Eleventh Land Development Conference and Field Exercises. Proceedings of Conference Held 19-21 May 1973, Georgetown, Guyana.

_____. The Farm Journal, vol. XXI, no. 1.

_____. Farm Size Distributions and Tenancy Patterns: Annandale to Left Bank Supenaam River, August 1973.

_____. Grow More Food, 1973.

Guyana. "State Paper on National Service by the Prime Minister." National Assembly Paper No. 3/1973. Georgetown, Guyana, December 1973.

Hazenberg, Carl F. "Effective Crop Nutrition (Fertilization) for the Loamy Sands of Guyana." Georgetown, Guyana: Guyana Development Corporation, 1969. Available in the Memory Bank of the USAID Mission, Guyana.

_____. "Peanut Production and Feasibility Study in Guyana." Georgetown, Guyana: Guyana Development Corporation, January 1969. Available in the Memory Bank of the USAID Mission, Guyana.

_____. "Production and Feasibility of Growing Corn-Soybeans in Guyana." Georgetown, Guyana: Guyana Development Corporation, February 1969. Available in the Memory Bank of the USAID Mission, Guyana.

Herbert, John H., Jr. "Report of Investigations Concerning Agricultural Schemes in Guyana." Task Order No. 2 Report. Submitted to the Ministry of Agriculture and Natural Resources by the University of Florida, April 1969.

Kirby, John. Essequibo Islands: Analysis of Land Use Patterns. Georgetown, Guyana: University of Guyana, Department of Geography, Occasional Paper No. 3, 1973.

Lyman, John. West African Production and Export Prospects for Palm and Palm Kernel Oil to 1980. U.S. Department of Agriculture, Foreign Agricultural Service, Report FAS-M-248.

Madramootoo, Harry. The Story of Rice in Guyana. Georgetown, Guyana: Guyana Rice Corporation, 1973.

Matadial, W., et al. (Team I). "Matthew's Ridge Citrus Project." Appraisal Team from Agricultural Capital Project Course. Georgetown, Guyana, November 1972.

Mittelholzer, Alex S. Potato Production in the Guyana Highlands, 1973.

Rankine, Lloyd B. Comparative Economics of Root Crop Production in Selected Countries of the Commonwealth Caribbean. Part I. Costs and Returns for Specified Root Crops. Occasional Paper No. 8. St. Augustine, Trinidad: University of the West Indies, September 1972.

_____. Extra- and Intra-Caribbean Trade in Root Crops. Occasional Paper No. 9. St. Augustine, Trinidad: University of the West Indies, 1973.

Richardson, Bonham C. "Spatial Determinants of Rural Livelihood in Coastal Guyana." The Professional Geographer, vol. XXV, no. 4 (November 1973), pp. 363-368.

Scott, Walter O., and Aldrich, Samuel R. Modern Corn Production. Champaign, Ill.: S&A Publications, 1970.

_____. Modern Soybean Production. Champaign, Ill.: S&A Publications, 1970.

Shaw, Byron T. An Analysis of Agricultural Research in Relation to the Increasing Demand for Agricultural Products. Production Research Report No. 104, USDA Agricultural Research Service, 1969.

U.N., Food and Agriculture Organization. Agricultural Commodity Projections, 1975 and 1985. Vol. II. Methodological Notes. Statistical Appendix. Rome: FAO, 1967.

_____. Agricultural Services Division. Cassava Processing. Agricultural Services Bulletin No. 8 (AgS/ASB/71/2), 1971.

_____. Processed Tropical Fruit: Trends and Outlook for Production and Trade of Canned Pineapple and Processed Exotic Fruit. Commodity Bulletin Series 51. Rome: FAO, 1972.

University of Florida. A comprehensive series of reports covering several years of technical assistance provided to the Ministry of National Development and Agriculture. Available in the Memory Bank of the USAID Mission, Guyana.

University of Illinois. Unpublished trip reports of consultants on soybean production to the Government of Guyana, under sponsorship of the USAID Mission. The reports are

filed with the Mission as follows: K. Hinson (Feb./Mar. 1974); F. Davidson (Nov./Dec. 1973); Carl Hittle (Oct. 1973); Alvin Nelson (Mar. 1974); Scott Cramer (Jan./Feb. 1974); Sheldon Williams (Jan. 1974).

U.S. Department of Agriculture, Economic Research Service. Economic Progress of Agriculture in Developing Nations, 1950-68. FAER No. 59. Washington, D.C., May 1970.

Watt, J.E. "Land Development as a Supporting Service to Agriculture in 1973." Paper presented at the Umana Yana Staff Conference, February 1973.

Young, Alan. Approaches to Local Self-Government in British Guiana. London: Longmans, 1958.