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An Analysis of the Production and Marketing of Pineapples from the Soesdyke/Linden Land Development Project in Guyana

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AN ANALYSIS OF THE PRODUCTION AND MARKETING OF PINEAPPLES FROM THE SOESDYKE/LINDEN LAND DEVELOPMENT PROJECT IN GUYANA

by

Cyril Kenrick Hunte

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by

Cyril Kenrick Hunte, Master of Science

Utah State University, 1981

Committee Chairman: Dr. Roice H. Anderson
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The purpose of this study was to examine the production and marketing behavior of pineapple farmers in the Soesdyke/Linden Land Development Project in Guyana. A random sample was drawn from eight locations in the project and 51 personal interviews were conducted with pineapple farmers. Emphasis was placed on ascertaining the current levels and use of basic inputs in the production process as well as determining the profitability of pineapple production. The nature and extent of the infra-structure provided by government to the project were also examined. Attention was given to the work done on providing roads and transportation as well as government funding for the project. The resource endowments of the Soesdyke/Linden Region were described in relation to the production of pineapples from the Soesdyke/Linden Development (S.L.L.D.P.).

The outcome of the study showed that although pineapple production was still a profitable venture many resources were under utilized. There was scope for employing better management and production techniques. The Infra-structure provided by government was incomplete. There was a lack of transportation facilities and a poor distribution system for pineapples, and operational and pricing efficiency were still to be attained in the processing sector of the marketing channel.

(163 pages)

CHAPTER I

INTRODUCTION

Guyana, like so many of the developing countries, utilizes a very large proportion of its resources in agriculture production. This situation is compounded by the fact that over half of the labor force, which totaled 210,000 in 1970[1], were employed in the rice and sugar industries. In addition, about half of the total farm income in the country originates from farmers' involvment with the production and marketing of rice and sugar. Futhermore, rice and sugar in combination contributed the largest share of foreign exchange earnings in 1975 (58 percent) and averaged approximately 43 percent of the total foreign exchange earnings for the period 1969-1977. Finally, these two crops together with the export of bauxite contributed 81 percent of the total foreign exchange earnings in 1975 and for the period 1969-1977, these products averaged 75 percent of the total earnings from exports (Table 1). These three industries form the basis for international trade and, at the same time, provide the foundation for the entire economy. The reason for the success of rice and sugar could be traced to the fact that these two agricultural industries were vertically integrated, and as a result, many of the production and marketing problems have been solved. A similar condition holds for the production and marketing of bauxite.

The major weakness of this export-oriented economy is that any

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[1]Bank of Guyana Annual Report 1977; Guyana National Lithographic Co. Ltd, Georgetown, Guyana, May 1978; p. 116.

Table 1. Foreign exchange earnings for sugar, rice and bauxite from international transactions: 1969-1978 (Millions of Guyana Dollars)

Commodity	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Sugar	81.7	77.6	92.2	101.8	75.9	284.8	413.1	258.7	185.7	234.6
Rice	19.7	18.3	21.3	25.3	25.0	49.0	84.8	73.6	66.8	96.0
Total	101.4	95.9	113.5	127.1	100.9	333.8	497.9	332.3	252.5	330.6
Bauxite	78.8	92.2	96.0	103.3	108.1	133.4	197.6	229.0	249.2	N.A.
Total export earnings	252.9	271.9	296.6	306.5	288.0	602.4	858.1	711.3	661.3	753.8
Percent of total export earnings (sugar and rice)	40	35	38	41	35	55	58	46	38	43
Percent of total export earnings (bauxite)	31	34	32	34	38	22	23	32	38	N.A.
Percent of total export earnings (Bauxite, rice and sugar)	71	69	71	75	73	78	81	79	76	N.A.

N.A. - Not available

Source: Derived from I.M.F., International Financial Statistics, 1979.

downward movement in prices or output in any of these three industries would certainly result in less foreign exchange accruing to the economy of Guyana and, therefore, the ability to purchase current consumption or investment goods from other countries would be reduced. The last decade was a period in which there were wide fluctuations in domestic production and market prices for rice, sugar and bauxute, and also rising oil prices. Oil imports which made up only 9 percent of the total import bill in 1969, had reached more than 25 percent in 1978. This represented an increase of 189 percent for the period (Table 2).

One effect of spending such a large proportion of foreign exchange earnings on oil purchases caused the quantity and range of other imported goods to be reduced, and this, in turn, resulted in shortages of consumer and investment goods especially during the last half of the decade.

In view of these difficulties, Guyanese policy makers inaugurated a program whereby emphasis was placed on the diversification of the economy, beginning with the agricultural sector.[2] However, with the exception of the rice and sugar industries which were fully integrated agri-business organizations, all other agriculture was still in the mold of traditional agriculture. The production practices on many family farms allowed a wide range of crops to be cultivated, but the total output of each crop was relatively small and geared generally for home consumption. Surpluses above family needs were either sold on the fresh market or were left on the land to spoil, since marketing facilities were very limited.

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[2]The agricultural diversification program was largely concerned with the "Feed, Clothe and House the Nation Program" which began during The first half of the nineteen seventies.

Table 2. Oil imports as a percent of total imports 1969-1978 (millions of Guyana dollars)

Year	Fuel and Lubricants[a]	Total Imports (fob)[b]	Percent of Total Imports
1969	18.9	214.4	9
1970	23.0	243.9	9
1971	23.6	243.3	10
1972	28.1	270.8	10
1973	48.2	338.7	14
1974	103.5	515.5	20
1975	135.0	737.0	18
1976	137.5	843.1	16
1977	160.4	731.2	22
1978	169.9	645.5	26

[a]Ministry of Economic Development, 1977

[b]I.M.F., International Financial Statistics, 1979.

Some farmers, who traded their surpluses on the fresh market, sold directly to consumers at municipal or village markets. These farmers were expected to pay a rental fee to municipal or village authorities for the use of their open-air market facilities. Other farmers traded in the wholesale market with market vendors, a few private processors or with purchasers from the Guyana Marketing Corporation (G.M.C.),[3] a government corporation which was established in 1964.

It was mandatory for the G.M.C. to purchase all agricultural produce (except sugar and rice) from all farmers who did not have their own marketing facilities but who still wanted to sell their produce in the market. In spite of this arrangement, however, there was still a great deal of uncertainty in the marketing channel. For example, because the G.M.C. did not have the optimal number of transport or processing facilities to effectively market more than fifty different kinds of farm produce from all over the country, many farmers incurred heavy losses whenever the purchasers from the G.M.C. did not arrive at the buying point to complete the sale. As a result of this, the response by farmers to the idea of increased production and greater diversification took a backward step and very soon the resulting agricultural output was far smaller than what was anticipated by policy makers. Apart from these marketing difficulties, the implementation of this diversification program also proved to be very difficult because of the relatively small number of trained agriculturalists and the insufficient infra-structure that was available. Policy measures should, therefore, not only

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[3]Hugh A. Saul. 1975. "The Marketing Strategy of the G.M.C.," A paper presented on export marketing in Basseterre, St. Kitts/Nevis, Anguilla, August.

encourage greater diversification, but should also emphasize greater specialization in production, encourage the further development of markets and marketing facilities, include methods on how the farm extension program could be improved, and must set in motion a system where more trained agriculturalists could become involved with farmers through extension programs.

Given that policy measures only emphasized greater diversification, the general outcome of this was that, instead of progressing to more commercially oriented agriculture, traditional agriculture persisted.

Pineapple production was a special case of the diversification and specialization program in Guyana. Production and marketing problems were severe and had retarded the development of the full potential of this crop.

Problem Statement

Problems experienced with the production and marketing of pineapples from the Soesdyke/Linden Land Development Project (S.L.L.D.P.) in Guyana have been a major concern for pineapple farmers and policy makers for quite some time. This development project was established in 1968 and pineapple production was to make a significant contribution to the success of the project. The nature of the problems faced by pineapple farmers ranged from insufficient quantities of basic inputs at the farm level to problems of inadequate marketing facilities in both fresh and processed markets. Other problems stemmed from the uncertainty resulting from price instability, occurring particularly in the peak marketing season when the supply of pineapples was high and the demand in the fresh market was insufficient to yield a satisfactory price. Government inputs

to the project, such as providing the basic infra-structure and effective policy, have not yet attained the level and scale whereby these problems could be solved. As a result, many pineapple farmers had rejected pineapple farming as a profitable venture and were of the opinion that the S.L.L.D.P., which was heavily subsidized by government, was not meeting the goals that were set when the project began.

Objectives of Study

The objectives of this study are:

1) To describe the resource endowments of the Soesdyke/Linden Region, giving special attention to the use of these resources in the production of pineapples from the S.L.L.D.P.;
2) To ascertain the current levels and use of basic inputs (such as land, labour, and capital); and to determine the profitability of pineapple production from the S.L.L.D.P.;
3) To compare the production and marketing techniques of pineapple farming in the S.L.L.D.P. with the production and marketing techniques from other locations; and
4) To examine the nature and extent of the infra-structure and policy measures provided by government for the S.L.L.D.P. and the region.

Limitation of Study

Pineapple production in Guyana is centered mainly in the North West Region, West Demerara and the Soesdyke/Linden Region. Because of the higher concentration of pineapple farmers and because of the larger

number of acres under pineapple cultivation in the Soesdyke/Linden Region, this study will be confined to this area (Table 3).

Table 3. Average size of pineapple farms in Guyana, 1977.

Location	No. of Farmers	Total Acres	Average Size of Pineapple Farms (Acres)
North West and West Demerara	130	172.5	1.33
Soesdyke/Linden	249	1208.2	4.85
TOTAL	379	1380.7	3.64

Source: Ministry of Economic Development Survey, 1977.

Justification of Study

Pineapple was chosen because it has the potential to earn foreign exchange through exports to neighboring Caribbean countries. During the latter part of the last decade pineapples were exported to countries in the Caribbean area; however, the market was lost due to production difficulties and an inadequate marketing program. Finally, an analysis on commercial pineapple production and marketing from the S.L.L.D.P. could serve as a model for similar work with other agricultural produce in Guyana.

CHAPTER II

REVIEW OF LITERATURE

Government directed land development projects or land settlement schemes, as they are frequently called, have had a long history in Guyana. King (1968) noted that from as early as 1880 several attempts were made by various governments of Guyana to establish land settlement schemes in different locations in the country. In spite of this long history, however, not many studies were done on these schemes, and, as a result, literature on these projects were limited. Nevertheless, Kennard (1974) reported that there were ten (10) existing land settlement schemes involving 45,000 persons and encompassing some 232,750 acres. These land settlements were Cane-Grove, Vergenoegen, Government Estates (Windsor Forest, La Jalousie and Hague), Onverwagt, Anna Regina/Tapakuma, Charity/Amazon, Black Bush Polder, Wauna, Mathews Ridge and Soesdyke/Linden Highway or the S.L.L.D.P. The land settlement schemes of the nineteenth century could have resulted from colonial governments wanting to maintain strategic locations in certain areas in Guyana. Some of the more recent schemes from about 1910 were started because the sugar estates on these lands were abandoned by foreign owners. This caused the Government of Guyana to hastily inaugurate land settlement schemes to stay some of the social problems which could have resulted as the sugar-cane workers moved away from these rural areas and into the city in search of employment. Examples of these kinds of projects were Government Estates, Lancaster, Clonbrook and the front lands of Unity (McWatt, 1963).

The S.L.L.D.P. began after the construction in 1968 of the Soesdyke/Linden Highway which connected the bauxite mining town of Linden and the capital city, Georgetown. Bearing in mind the above mentioned reasons for starting these projects and the fact that no feasibility studies were done prior to the establishment of these schemes, it should be evident that heavy losses could have resulted. In keeping with this, King reported that land settlement schemes had been haphazardly developed and were all run at tremendous losses. Although capital expenditures were high, returns in terms of revenue and profits to individual farmers were low. In addition, these projects absorbed only a small proportion of the unemployed and it may well be that the money spent on these schemes, or at least part of it, could have been more profitably used in the hinterland of the country to develop the wood-manufacturing industries. Kennard (1974) also noted that while some $20.6 million was spent for land and geodetic surveys, aerial photography, topographic mapping and maintenance and improvements of these projects, only about $6 million in revenue was collected as land rents and land clearing expenses. Apart from this, King also noted that because of poor administration, the long delays in providing social capital such as schools and roads, the failure of agricultural co-operatives, and the growing number of absentee owners and weekend farmers, all these events had hastened the rate of abandonment of some of these projects.

Implicit in the writing of King was the idea that before the commencement of any project, an evaluation must be made to determine not only the level of efficiency that could be attained in each project, but also to ascertain which of the many projects would give larger benefits, increasing thereby the general welfare in society. From this basis, the

internal rate of return would be a very useful method in determining how public funds should or should not be spent. Downer et al. (1976) were the only researchers who came close to using this technique when they estimated the agricultural output of certain crops for the period 1976-1980 from the S.L.L.D.P. This study, however, was carried out eight (8) years after the project began and even then no analysis was made to estimate the discounted benefits and costs of the S.L.L.D.P.

King further pointed out that except for the Amerindian settlements of the North West District, many of the newer projects such as the Boerasirie Extension Project, the Brandwagt/Sari Scheme and the Tapakuma Project, had been started without any new approaches to problems of planning, programming and budgeting. Moreover, some of these projects such as the cultivation of rice in the North West District had been ill-directed not only because the area was unsuitable for rice cultivation, but also because the farmers in these areas had no prior experience with the management practices associated with this crop. He further stated that agricultural co-operatives, the mechanism by which farmers would have been able to co-ordinate their activities, were not only rejected by the Amerindians who, incidentally, have had a strong tradition of co-operatives, but it was also a failure in other projects where access to goods and services were more easily available.

The Land Development Department, which was established in 1959, had as its main objective to co-ordinate the activities in these land development schemes and more specifically, its "primary function [was] not only to bring more lands under beneficial occupation, but also to develop family size farms and to build strong economically independent farmers' communities." (Annual Report, Government of British Guiana,

1954). In order to do this, this department would have co-ordinated its operation with other government departments like the Ministry of Agriculture and the Ministry of Co-operatives. As of 1978, there was a well defined administrative structure, but as King stated in 1968, that although "the ideas behind these schemes were worthy ones, it was doubtful whether the manner of execution by the lands department was in the best interest of the country's economic growth."

CHAPTER III

METHODOLOGY

The methodology to be discussed in this chapter will cover three areas. In the first section, a discussion will be given on how the data were obtained; in the second, a description will be given on how the results to the objectives were derived; and finally, the economic theory to be used in this study will be presented.

Collection of Primary Data

The primary data for this study were obtained from a questionnaire-survey where 51 personal interviews were conducted with pineapple farmers in the S.L.L.D.P. during the period of July, 1979 to August, 1979. Each questionnaire contained 50 questions covering the areas of farm management, production and input-use, policy and finance, and marketing and pricing (Appendix 1). Permission to visit farmers in the project was obtained by way of an introductory letter (Appendix 2) sent by the Deputy Chief Agricultural Officer to the Project Manager stationed in the Kurukururu settlement. Transportation to the 51 farmers in the S.L.L.D.P. was provided by the Agricultural Officer stationed at Kurukururu, a credit officer of the Guyana Co-operative Agricultural and Industrial Development Bank (G.C.A.I.D.B.) and the Mon Repos Agricultural Extension unit.

Statistical design[4]

A random sampling design, using the total number of pineapple farmers in the Soesdyke/Linden Region as the important observation, provided the basis for selecting the observations in this survey. This sample was drawn from a list of 249 pineapple farmers in twelve different locations obtained from the Ministry of Economic Development Survey of 1977. In order for the locations with the largest number of pineapple farmers to have a larger proportion of the total sample, the twelve locations were arranged in descending order of magnitude (Table 4).

Given that only 51 questionnaires were completed in the survey, the implied probability was .2 (or 51 divided by 249); while the interval for sampling was the reciprocal of the probability which was 5 (or 1 divided by .2). The range of permissible numbers went 001 to 249. Using a table of equi-distributed random numbers, the starting number randomly chosen was 034. Using the interval of 5 and beginning number of 034, fifty-one (51) numbers were chosen from the list of farmers who were each assigned a number beginning from 001 to 249. Table 5 contains the number and proportion of farmers that were drawn from the eight (8) locations.

Limitation of data

Only twenty percent of the total number of farmers were included in this study. This limitation resulted from the researcher not having enough time and money as well as not having adequate transportation. As a consequence, the inferences to be drawn from the data will not be

[4]Mr. Gerald Alleyne, Statistical Officer, Ministry of Economic Development, and the researcher were responsible for the statistical design used in this study.

Table 4. Number, acreage, location and percentage (Ptc.) of pineapple farmers in the Soesdyke/Linden Region, 1977.

Location	No. and Percent (Pct.) of Total Pineapple Farmers		No. and Percent (Pct.) of Total Pineapple Acres	
	No. of Farmers	Pct. of Total	No. of Acres	Pct. of Total
1. Kurukururu	117	47.00	538.1	44.5
2. Long Creek	48	19.30	295.0	24.4
3. Yarowkabra	29	11.70	83.3	6.9
4. Moblissa	15	6.00	41.8	3.5
5. Madewini	13	5.20	71.0	5.9
6. Hararuni	10	4.00	34.5	2.9
7. Kairuni	6	2.40	15.5	1.3
8. Dalgin	4	1.60	16.5	1.4
9. Bamia	3	1.20	8.5	0.7
10. Kuru Kuru	2	0.80	65.0	5.3
11. Dora	1	0.40	36.0	2.9
12. Loo Creek	1	0.40	3.0	0.3
TOTAL	249	100.00	1208.2	100.0

Source: Ministry of Economic Development Survey, 1977.

Table 5. Number and percentage (Pct.) of sample from each location in S.L.L.D.P.

Location	No. of Farmers Interviewed	Pct. of Total
1. Kurukururu	25	49.0
2. Long Creek	10	19.6
3. Yarowkabra	5	9.8
4. Moblissa	5	9.8
5. Madewini	2	3.9
6. Hararuni	2	3.9
7. Kuru Kuru	1	2.0
8. Dora	1	2.0
TOTAL	51	100.0

Source: Derived from statistical design

hastily generalized to cover the entire population of pineapple farmers in the S.L.L.D.P.

With the exception of one farmer, all the other farmers were resident in the Soesdyke/Linden Region. Therefore, no inferences will be drawn concerning the behavior of weekend or non-resident farmers. Finally, eighteen (18) farmers replaced an equivalent number of farmers who were randomly chosen in the sample. The reason for this was that when the researcher arrived at these farms, the farmers were either no longer producing pineapples or they were not available. As a result, they were replaced by other farmers from the same or adjacent locations. This replacement process was not entirely random, but it sufficed given the limitation mentioned in the above paragraph.

Secondary Data

Secondary data were obtained from government departments and agencies in Guyana, municipal markets, private businesses, and publications obtained from the University of Hawaii and the Utah State University Library.

Derivation of Results

The results for objectives one (1) and four (4) will be obtained from secondary sources and will be presented by using descriptive measures. Results for objective two (2) will be derived mainly from primary and partly from secondary sources. This information will be presented by using descriptive measures; econometric techniques for estimating a production function using cross-section data from the primary sources; and a break-even analysis which will be formulated from an enterprise budget for pineapple production using primary and secondary data. Results for objective three (3) will be obtained from both primary and secondary sources and will be presented by using descriptive measures.

Theoretical Framework of Study[5]

The economic theory that will be applied in this study will come from the area of agricultural marketing. The early approaches as well as the definitions used to define agricultural marketing have had varying areas of emphasis and concentration. In consequence, they

[5]R. L. Kohls and W. D. Downey. 1972. Marketing of Agricultural Products. MacMillian, New York, Chapter 2. Also, Wayne Purcell. 1979. Agricultural Marketing: Systems Co-ordination, Cash and Future Prices. Reston Publishing Company, Reston, Virginia, Chapter 1.

presented the activities of agricultural marketing as totally unrelated activities having no bearing or relevance to each other. In keeping with this, at least four approaches were used to analyze agricultural marketing problems. They were (1) the functional approach, (2) the institutional approach, (3) the behavioral systems approach, and (4) the commodity approach.

The functional approach

The functional approach was utilized because it gave specialized attention to certain activities in the marketing channel, and this in turn gave scope for study and analysis. Kohls and Downey (1972) classified these functions as follows:

A) Exchange functions

1) Buying and assembling entailed finding out the sources of supply, buying and assembling of raw and processed produce for middlemen and consumers respectively.

2) Selling encompassed the areas that are more related to the devices that influence demand such as merchandizing, advertising, and proper packaging of finished products for use by consumers.

These two functions provided the basis for possession utility.

B) Physical functions

1) Storage entailed spreading the supply over time when production was not possible and thereby bringing the supply in a more responsive position to the market demand.

2) Transportation was primarily concerned with moving the produce

to locations where the demand was greater than the supply. Included here also were the activities of loading, crating and shipping preparations.

3) Processing involved those activities that changed the form of the product from a raw state to a finished and acceptable commodity for consumers. Sometimes raw products were combined with other ingredients or were just packaged directly for the market.

These three activities (storage, transportation and processing) answered the marketing questions of when, what and where; or more precisely, they provided the basis for rendering time, form and place utilities.

C) Facilitating functions

1) Standardization established the foundation for uniform measurement either by quality or quantity. It also assisted the activities of price determination and product differentiation.

2) Financing focused on cash flow operations for changing the raw product into a finished commodity in the marketing channel as well as to losses resulting from unfavorable price movement in the market. For the former, insurance companies shared the burden by way of contracts with owners; while on the latter, this burden was shared in the future exchange markets or by policy measures involving price support programs.

4) Market intelligence related to obtaining timely data for analyzing, interpreting and disseminating information on current

and expected supply, demand and price conditions in the market.

The major shortfall of the functional approach to marketing was that specialization disrupted the continuity in the total system since activities were analyzed separately. This implied that efficiency could be attained in one area while the total marketing system as a single unit was inefficient.

Institutional approach

The institutional approach focused on the behavioral decision process of retailers, wholesalers, brokers, commission men, speculative middlemen, processors, manufacturers and facilitative organizations such as stockyard companies, grain exchanges and fruit auctions. The shortfall of this approach was that it did not consider the problems of technical or pricing efficiency. Instead, it placed most of its emphasis on understanding the behavior of individuals or entities in the marketing channel.

The behavioral systems approach

The behavioral systems approach high-lighted the ability of marketing organizations to change and adopt new techniques in marketing. In this respect, emphasis was placed on developing new technology or better input-output relationships so that marketing cost could be reduced. Further, emphasis was placed on obtaining market power which would have given a larger share of the market to a particular firm. To do all these effectively, resources were allocated towards understanding the behavior of individuals in society and especially towards improving the communication system in the marketing channel. Inherent in this approach was the

ideas that any newly developed system that enhanced the image of the company in the eyes of consumers would be very useful in the long run. In other words, this approach showed that in addition to the economic forces, other social phenomena were also equally important. The major disadvantage of this approach, however, was that an over allocation of resources in these areas would be counterproductive to ideas of reducing marketing cost.

The commodity approach

This approach focused on the product after it left the original point of production to the point of consumer purchase. It therefore high-lighted the problems of spoilage, poor quality control, duplication of transportation as well as unnecessary handling of the product, among other things. The disadvantage of this approach was that no or only little attention was given to interstage coordination which was so necessary in deriving a marketing system that was efficient.

Definitions of agricultural marketing

With these four distictive approaches forming the foundation for marketing analysis, the definitions that were coined to describe this process, high-lighted only a particular aspect of marketing, and in so doing, it totally ignored other pertinent areas of the marketing process. Therefore, Bakken's definition in 1953 conveyed the idea that agricultural marketing should be confined to the area of exchange; while Phillips' definition in 1968 supported the idea that agricultural marketing should be limited to information gathering and communications. Because these definitions presented the notion of independence and specialization, they could therefore be ascribed to functional and behavioral systems

approach. In like manner, Kohls and Downey (1972) defined marketing as "the performance of all business activities involved in the flow of goods and services from the point of initial agricultural production until they were in the hands of the ultimate consumer." Similarly, Dahl and Hammond (1977) viewed marketing "as a sequential series of functions that need to be performed as the input or product moves from its point of primary production to ultimate consumption." Inherent in these two definitions by Kohls and Downey and Dahl and Hammond were the basic elements of the farm-gate concept which endorsed the commodity approach to agricultural marketing.

Inview of these disjointed approaches and limited definitions of agricultural marketing, the direction taken was to find a definition and an approach that would satisfy all the elements of the marketing process. To this end, researchers such as Kohls (1957), Shaffer (1958), Godwin and Jones (1971) and Purcell (1973) were all calling for a systems approach which would focus on the concept of interstage coordination. Hence, it was against this background that Bremyer (1976) questioned whether marketing could be distinguished from production and later disagreed with the idea that these two activities should be thought of as mutually exclusive events. He, therefore, suggested that the recombination of resources that took place at each stage of marketing was production. This implied that marketing was a continuous process which began from the combination of inputs on the farm to the time the consumer utilized the product. Therefore, in order to satisfy these requirements, Purcell (1977) defined agricultural marketing "as the set of economic and behavioral activities that were involved in coordinating the various stages of economic activity from production to consumption." This definition had integrated all the

stages in the marketing process which began at the production level on the farm, and through the stages in the marketing channel, and finally ending after the consumer had derived whatever utility there was at the time of consumption.

This new approach, which will be adopted in this study, is called the "Systems Approach" and has the following elements.

Elements of the systems approach

1) The entire continuum, from producer to consumer, becomes the focal point of attention.
2) Levels of efficiency and coordination are viewed in the context of the total marketing system.
3) Emphasis is placed on vertical integration, encouraging thereby the control of the different stages in the marketing channel by a single management.

The unique feature of the systems approach was that it incorporated all the functions that were done separately under the four (4) different approaches that were previously mentioned. If any detailed study was needed, the availability of data was more readily obtained and, therefore, any type of analysis, be it by complex mathematical models or simple descriptive techniques, could be effectively done on the ever changing relationships in the marketing system.

The marketing channel available to pineapple farmers in the S.L.L.D.P. is presented in Figure 1. Emphasis is placed on the flow of the product from production to consumption.

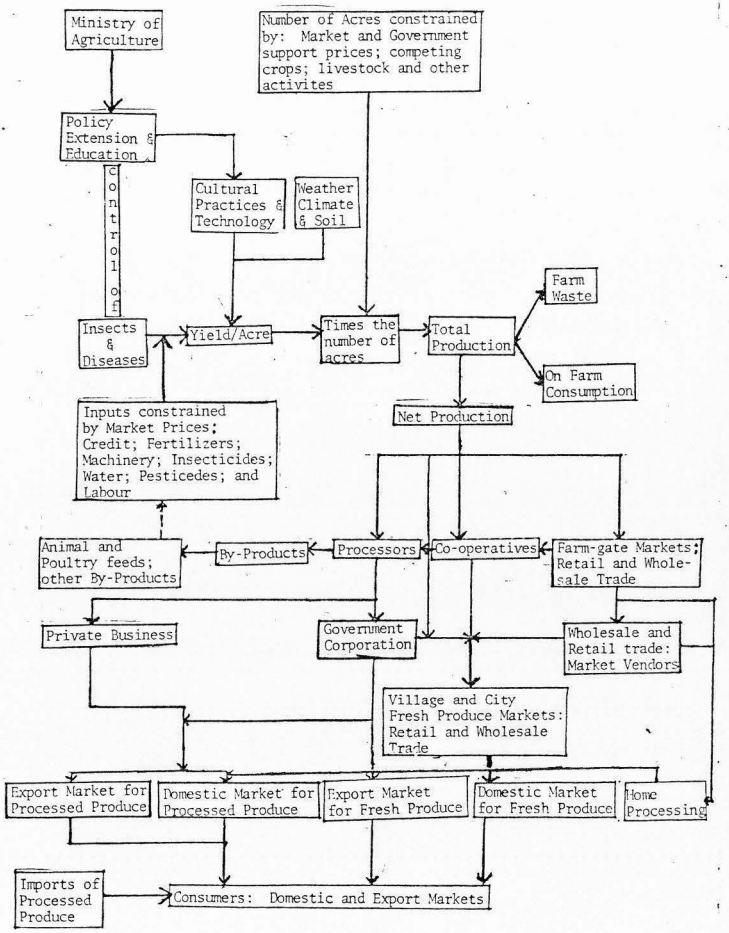

Figure 1. Marketing channel for pineapple from the S.L.L.D.P.

CHAPTER IV

RESULTS AND ANALYSIS

This chapter presents the results from the questionnaire-survey in combination with the secondary information that was collected. The chapter will be divided into three sections. In the first section, a description of the resource endowment of the Soesdyke/Linden Region is given. This will be followed by the analysis on the farm practices of pineapple production in the S.L.L.D.P. and from other locations. And finally, in the third section, a description of the infra-structure provided by the government will be given.

Resources[6]

Size and location of Soesdyke/ Linden Region

The Soesdyke/Linden Region covers some 400 square miles (25.6 million acres)[7] and although it was relatively near to the capital city, Georgetown (only 24 miles away at some points), the Soesdyke/Linden Region was generally uninhabited until the early nineteen sixties. This situation was changed in 1968 when the Soesdyke/Linden Highway, linking

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[6]H. N. Ramdin. 1976. Ministry of Agriculture "Soil Survey." Ministry of Agriculture publication, Georgetown, Guyana. Also, A. V. Downer. 1979. "Settlement on the White Sands." Paper presented at the Fifth Commonwealth Conference on Development and Human Ecology, Guyana, April.

[7]Guyana Development Plan: 1972-1976. Ministry of Economic Development publication, Georgetown, Guyana, p. 141-142.

the bauxite mining town of Linden with the capital city, Georgetown, was completed and the S.L.L.D.P. was inaugurated in the same year.

Size and location of S.L.L.D.P.

Of the total acreage in the Soesdyke/Linden Region, only 73,592 acres (less than three-tenths of one percent) were assigned by the Government of Guyana to the S.L.L.D.P. The S.L.L.D.P. is situated on the right bank of the Demerara River (going downstream) between 57°.7' to 58°.16' west longitude and 6°.3' to 6°.38' north latitude and consists of the following eight settlement areas: 1) Badarima--2,905 acres; 2) Kurukururu--7,595 acres; 3) Yarowkabra Agricultural Lots--11,055 acres; 4) Yarowkabra Extension--10,720 acres; 5) Long Creek--9,440 acres; 6) Clemwood--11,279 acres; 7) Moblissa Newton--15,428 acres; and 8) Moblissa Paddock--5,170 acres. The eight settlement areas and the manner in which these settlements are distributed along the highway are shown in Figure 2. The distance between Badarima and Moblissa Paddock is 38 miles, some 14 miles greater than between Badarima and Georgetown.

Location of pineapple farmers in the S.L.L.D.P.

Correlating the data in Table 5 with information in Figure 2 would show the locations where most of the pineapples were cultivated. Of the total number of pineapple farmers in the survey, 88 percent were located in Kurukururu, Long Creek, Yarowkabra and Mobilssa areas. The remaining 12 percent were located outside of the political boundaries of any of the settlements but were all within the 38 mile distance of the S.L.L.D.P.

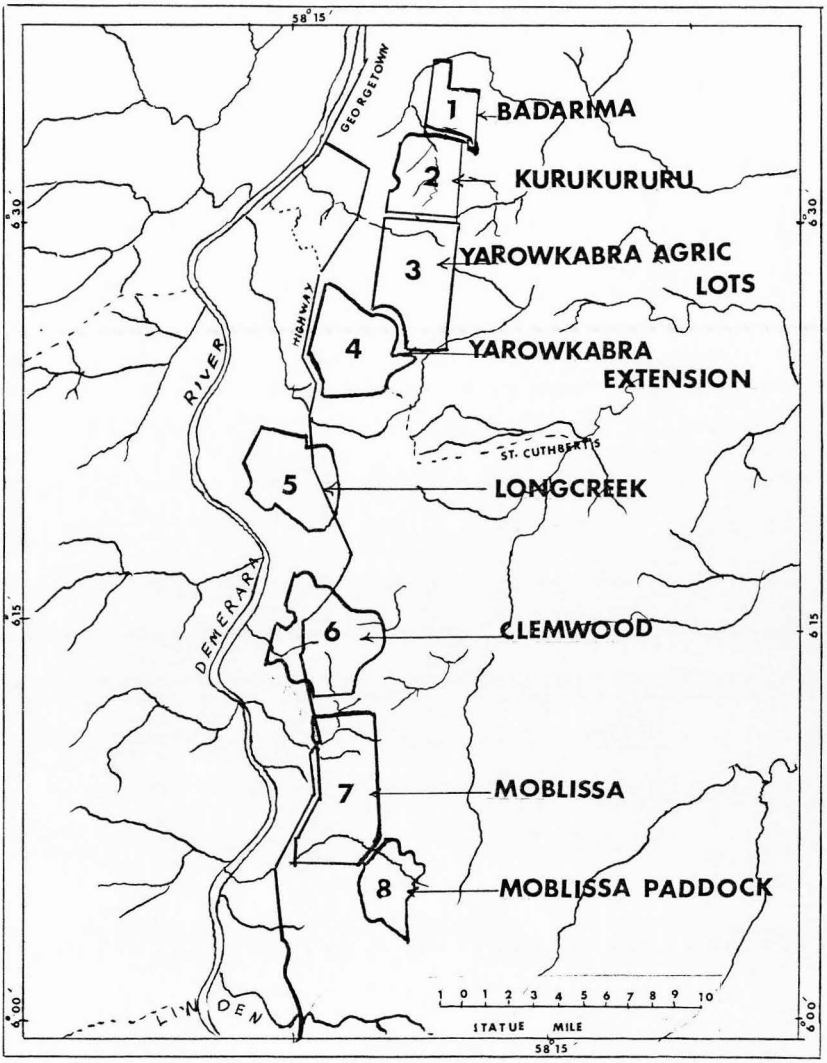

Figure 2. Soesdyke/Linden project areas

Soils of the Soesdyke/Linden Region[8]

Soil of the Soesdyke/Linden Region is part of the "White Sand Formation" which extends as far as Surinam where it is known as the "Zanderij." The White Sand Formation consists of white and brown sands. The white sands are pure quartz with depths of up to 30 feet in some locations; while in others, there could be a hard pan less than 6 feet below the surface. Generally, these soils contain one to five percent non-siliceous material, mainly organic matter with some clay particles, and they were formed after the removal of iron-oxides by tannius and chelating compounds provided by Wallaba and Dakama leaves, among others. White sands, which support some types of vegetation and are found in larger quantities near water-ways, are interspersed with brown sands which vary from sandy clay loams to sands; they derive their color from iron-oxides which are in various states of hydration.

The soils of the eight settlement areas are within the White Sand Formation and are approximately 60 to 200 feet above main sea-level with a topography ranging from undulating to hilly to steep, especially in gully systems. The soils in the S.L.L.D.P. are made up of white medium to course quarts sand; yellowish brown to yellowish red sand; loamy sand; sandy loams (brown sand); kaolinitic and lateritic clays; and in the low lying areas and swamps, which contain organic deposits, are peat and muck soils as well as old marine clays. Pineapples along with tomatoes and other vegetables were the "best[9] crops" suitable for the soils in the S.L.L.D.P. (Table 6). The "best soil" for the range of crops was

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[8]Downer, p.2 and Ramdin, p.6-7.

[9]The word "best" used in this section comes from the Ranking System employed by Ramdin (1976), p. 33-35.

Table 6. Suitability ratings by soil series for the production of specific crops. Summary for the eight areas in the Soesdyke/Linden Region.

No.	Soil Name	Flooded Rice	Sugar Cane	Coconuts	Oil Palm	Citrus	Cocoa	Bananas and Plantains	Adapted Ground Provisions	Tomatoes and Other Vegetables	Onions	Pineapples	Black-eye Peas	Soyabeans	Maize	Planted Pasture	Peanuts	Coffee	Cashew Nuts	Tobacco
1.	Anira Peat	4	4	4	4	4	4	4	3	3	4	4	4	4	4	3	4	4	4	4
2.	Lama Muck	4	4	4	4	4	4	2	2	2	2	2	4	4	3	2	4	3	4	4
3.	Dageraad Sandy Loam	4	2	2	1	1	3	3	2	1	1	1	2	2	2	2	2	1	1	1
4.	Tiwiwid Sand	4	4	3	4	4	4	4	4	3	3	2	4	4	4	4	4	4	3	3
5.	Ituni Sand	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6.	Mixed Alluvial Land	4	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4
7.	Tabela Sand	4	4	3	4	4	4	4	4	3	3	2	4	4	4	4	3	4	2	3
8.	Kasarama Loamy Sand	4	2	1	1	1	3	3	2	1	1	1	1	1	2	1	1	2	1	1
9.	Ebini Sandy Loam	4	2	1	1	1	3	3	2	2	2	1	2	2	2	1	2	2	1	2

Source: Ministry of Agriculture Soil Survey, by H. N. Ramdin, 1976.

Kasarama Loamy Sand which was less than 2 percent of the total acres in the S.L.L.D.P. and was found in Moblissa. Finally, some of the sandy soils in Yarowkabra have the potential for making glass products.

Soils Most Suited for Pineapple Production

Using Table 6, which was made from Ramdin's ranking system, the "best soils" suited to pineapple production were Dageraad Sandy Loam, Kasarama Loamy Sand, and Ebini Sandy Loam. These were followed by Tabela and Tiwiwid Sands and Lama Muck--the second best types. At the bottom of the ranking system were Mixed Alluvial Land, Anira Peat and Ituni Sand. Less than 3 percent of the total 73,592 acres in the S.L.L.D.P. were classified as "best soils" suitable for pineapple production and they were found in Moblissa and Badarima. However, 68 percent of the remaining soils were ranked as "second best soil" for pineapple production and could be found in all eight settlements. Tiwiwid Sand, which made up a large proportion of this second ranking, accounted for 63 percent of the soils in the S.L.L.D.P. and was found in all eight settlements. The largest quantity of Tiwiwid Sand was in Moblissa Newtown (12,519 acres) while the smallest quantity was in Badarima (1,534 acres). The remaining 29 percent, consisting of Anira Peat, Ituni Sand and Mixed Alluvial Land, were ranked as "third best" for pineapple production.

Location of "best" and "second best soils" most suitable for pineapple production

The largest quantity of "best" and "second best soils" most suitable for pineapple production was found in the Moblissa areas (18,520

acres). This was followed by the Yarowkabra areas (10,745 acres), Clemwood (9,644 acres), Long Creek (7,575 acres), Kurukururu (3,883 acres), and Badarima (1,666 acres) (Table 7).

Climate

The climate in the Soesdyke/Linden Region is tropical with humidity and temperature relatively high.[10] The average maximum and minimum temperatures were approximately 90°F and 68°F respectively for period 1974-1978. The temperature figures were taken at the Timehri International Airport which is west of the Yarowkabra Agric-Lots and between the Soesdyke/Linden Highway and the Demerara River (Table 8).

Rainfall

Although it rains intermittently throughout the year, it is generally accepted that there are two wet and two dry seasons every year. The annual distribution of rain is as follows:[11]

Long wet season	May to mid-August
Long dry season	Mid-August to November
Short wet season	December to mid-February
Short dry season	Mid-February to April

The average annual rainfall for period 1974-1978 was 98 inches with a high of 115 inches in 1976 and a low of 89 inches in 1977. The wettest months for period 1974-1978 were May, June, July, and January with an average rainfall of 12 inches for these four months. The driest month was October with an average rainfall of 4.24 inches for period

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[10]Ramdin, p. 7-8.

[11]K. F. S. King. 1968. Land and People in Guyana. Commonwealth Forestry Institute, University of Oxford, p. 10.

Table 7. Ranking, location, acreage of soils best suited for pineapple production in the S.L.L.D.P.

Ranking for Pineapple Production	Soil Type	Badarima	Kurukururu	Yarowkabra Agric-Lots	Yarowkabra Extension	Long Creek	Clem-wood	Moblissa Newtown	Moblissa Paddock	Total
Best Soil 3%	Dageraad Sandy Loam	132	0	0	0	0	0	0	0	132
	Kasarama Loamy Sand	0	0	0	0	0	0	440	886	1,326
	Ebini Sandy Loam	0	0	0	0	0	0	44	357	401
Second Best 68%	Tiwiwid Sand	1,534	3,883	2,257	8,283	6,904	9,514	12,519	1,207	46,101
	Tabela Sand	0	0	0	0	27	0	1,346	1,721	3,094
	Lama Muck	0	0	0	205	644	150	0	0	999
Third Best 29%	Anira Peat	724	460	177	54	1,022	949	463	14	3,863
	Mixed Alluvial Land	29	114	1,506	789	843	666	521	836	5,304
	Ituni Sand	486	3,138	7,115	1,389	0	0	95	149	12,372
100%	TOTAL	2,905	7,595	11,055	10,720	9,440	11,279	15,428	5,170	73,592

Source: Derived from Soil Survey 1976; Tables 2 to 11 on p. 23-32.

Table 8. Maximum and minimum temperatures (F°) Timehri Airport, Guyana: 1974-1978

Month	1974		1975		1976		1977		1978	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	87	68	88	68	88	67	88	64	88	64
February	88	68	88	67	88	66	88	66	89	65
March	88	67	92	66	88	68	87	67	91	66
April	91	69	92	67	89	69	90	66	91	66
May	92	67	91	70	89	69	91	68	a	a
June	89	68	90	71	89	70	89	71	a	a
July	90	69	91	68	90	70	a	a	a	a
August	91	69	91	70	92	70	a	a	a	a
September	93	70	92	70	96	70	91	70	a	a
October	92	70	93	70	95	69	93	70	a	a
November	91	70	91	70	94	69	a	a	a	a
December	92	67	89	70	89	67	a	a	a	a
AVERAGE	90.35	68.50	90.67	68.92	90.58	68.67	89.63	67.75	89.75	65.25

Source: Hydrometeorological Division, Ministry of Works and Communications, Guyana.

a- Not available

1974-1978 (Table 9). Rainfall figures for specific locations within the project are recorded in Table 10. Kairuni is located between Moblissa and Long Creek; while Kuru Kuru is located between Long Creek and Yarowkabra Extension.

The effect of rain on pineapple

Since no irrigation practices are carried out by pineapple farmers in the S.L.L.D.P., the ripening of the pineapple fruit is dependent upon the rain. In consequence, the largest quantity of pineapples are harvested during the long wet season--May to mid-August; while the smallest quantity harvested occurs during the short wet season--December to mid-February. An average rainfall of 50 inches per year is adequate for pineapple growth but it could be grown successfully in areas with 20 to 100 inches per year once there is an efficient drainage system.[12]

Drainage[13]

The project area is drained eastwards by the Demerara River and its tributaries. From the west, it is drained by a few tributaries of the Mahaica River. Over the Soesdyke/Linden Region are several creeks which drain the entire area, and for many of the settlements, they provide the political boundaries between settlement areas.

The Badarima and Kurukururu creeks drain the settlements of the same name from the west; from the east, these two settlements are drained by the Lama and Laluni creeks. Yarowkabra is drained on the west by a creek of the same name and in the east by a tributary of the Maduni

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[12]C. Baichoo. 1979. Pineapple Cultivation. Ministry of Agriculture publication (mimeo), Georgetown, Guyana.

[13]Ramdin, p. 7.

Table 9. Average monthly precipitation (inches) for Kairuni, Kuru Kuru, Timehri, Linden and Long Creek: 1974-1978.

Month	1974	1975	1976	1977	1978	Average 1974-1978
January	12.14	13.73	16.17	2.03	6.18	10.05
February	4.13	6.45	15.35	3.24	1.34	6.10
March	8.00	1.54	10.50	4.68	1.70	5.28
April	5.33	2.90	10.65	6.36	7.26	6.50
May	4.28	9.06	15.49	12.79	13.58	11.04
June	13.61	14.88	15.31	13.77	11.88	13.89
July	11.50	11.17	12.17	14.58	8.23	11.53
August	11.44	8.98	4.23	8.24	13.73	9.32
September	7.34	8.92	3.34	8.18	6.80	6.92
October	5.14	5.42	1.00	4.66	4.99	4.24
November	7.19	5.63	3.80	3.89	5.46	5.19
December	5.65	12.20	6.52	6.67	8.06	7.82

Source: Derived from data obtained from the Hydrometeorological Division, Ministry of Works and Communication, Guyana.

Table 10. Average yearly precipitation (inches) for Kairuni, Kuru Kuru, Timehri, Linden and Long Creek: 1974-1978

Settlement	1974	1975	1976	1977	1978	Average 1974-1978
Kairuni	6.69	8.28	8.52	7.18	7.23	7.58
Kuru Kuru	11.11[a]	9.07	9.65	6.86[b]	7.24	8.79
Timehri Airport	8.82	8.67	11.24	7.11	8.09	8.79
Linden	7.35	7.87	9.55	7.48	6.95	7.84
Long Creek	7.97	8.15	8.75	7.04	7.58	7.90

Source: Derived from data obtained from the Hydrometeorological Division, Ministry of Works and Communications, Guyana.

[a]Average for 6 months

[b]Average for 10 months

River. Yarowkabra Extension is partly drained in the west by the Kurukururu and Manduni creeks as well as by a branch of the Hararuni creek. The Long Creek area is drained by a creek of the same name and in the east by the Haimaruni or Low Wood creek. Clemwood, Moblissa and Moblissa Paddock areas are drained on the west by the Loo, Kairuni and Moblissa creeks. Despite the fact that there were numerous creeks within the S.L.L.D.P., drought conditions occurred in many areas. At the same time, some depressional areas were flooded because some of the creeks were too small or they were blocked with fallen trees. Creek water is mostly used in the home and partly in agriculture. A very large percentage, however, is not used at all and is allowed to go as waste.

Management, Production and Marketing

The production and marketing of pineapples, like so many other agricultural products in Guyana, follow very closely the traditional approach to agricultural organization, and it is within this framework that the behavior of pineapple farmers in the S.L.L.D.P. will be analyzed.

Management

Management and ownership of farms

Pineapple farming in the S.L.L.D.P. is organized through family farm units which makes full use of immediate family members (husband, wife and children) as well as members of the extended family. Ownership and control of the available resources and daily farm activities are, therefore, centralized within the family structure. In this regard, 96 percent of the farmers in this study had control and ownership over the available resources and daily management practices. Of the remaining 4 percent (2 farms) there was a separation of ownership and management. One was managed by a hired manager while the other was managed by a caretaker who was a distant relative of the owner. With this type of management and ownership structure, the majority of farmers had the opportunity to exercise individual and/or family initiative and ingenuity, and above all, they had the opportunity to identify their efforts with the output and returns. From a policy standpoint, it was envisaged that agricultural co-operative societies would have been the main type of business organization in the S.L.L.D.P. According to the records from the Ministry of Co-operatives in 1979, there were 35 agricultural

production co-operative societies in the Soesdyke/Linden Region (Table 11); but many resident farmers in the project did not want to be identified with any type of co-operative society. A major reason against co-operatives was that some members were non-resident in the project and this made it difficult to organize and co-ordinate the activities of the co-operative. Many of the non-resident farmers were also part-time farmers who had other jobs in Georgetown, and this also prevented the smooth running of the co-operative. Compounding the problem further was a shortage of skilled personnel to manage the 35 independent co-operatives. Having one agricultural co-operative for the S.L.L.D.P. would have been easier to manage as well as being more efficient in the allocation of scarce resoruces. Downer et al. (1976) proposed that each settlement have a full-fledged co-operative with two representatives

Table 11. Agricultural production co-operative societies in the Soesdyke/Linden Region, 1979.

Location	Number of Agric Production Co-ops
Kurukururu	15
Long Creek	4
Moblissa	2
Yarowkabra	3
Madewini	2
Hararuni	3
Kuru Kuru	1
Timehri	2
Atkinson Field	1
Loo Creek	2
TOTAL	35

Source: Ministry of Co-operatives, Guyana, 1979.

from each settlement on the umbrella (Highway) co-operative. This solution would have reduced the number of co-operatives on the Highway and lessen the shortage of skilled personnel. However, this solution would not have solved the problem of the inefficient allocation of resources.

Another concern to farmers was that instead of the Land Development Department issuing individual leases to families, a Block Lease, containing several agricultural and residential lots, was issued to a co-operative. The reason for such a policy was that the agricultural co-operative societies would have had access to larger amounts of capital and other farm inputs at cheaper prices. What this policy overlooked, however, was that, apart from the difficulty in co-ordinating the production activities at the farm level, farmers were not able to directly identify their efforts with the resulting returns. The mixing of resident and non-resident farmers in a single co-operative saw some resident farmers contributing more in terms of labor hours on the farm without receiving a commensurate return for their efforts. The outcome of this was that although family initiative and ingenuity could still be injected into farm operations, the ability of farmers to identify their efforts with the returns was absent. Many farmers were very resentful to the ideas of co-operatives under these conditions, and the end result was that many acres of land, which had been leased to co-operative societies, were still to be developed. Given this situation, it should be clear that the nature of agricultural co-operatives as economic institutions were still to be understood and implemented in the S.L.L.S.P.

Size of farms

In a survey done on small farm financing in Guyana, it was

reported that 63 percent of the farmers operated farms of less than five acres.[14] The size of farm plots in the S.L.L.D.P. are from 5 to 30 acres of land.[15] For the pineapple farmers in this study, the average farm size was 16.92 acres with the most frequent farm size being 10 acres.

Forty-seven percent of the farms in the study were 10 acre farms. With a total of 863 acres in the study, the resulting distribution of farm sizes was, therefore, skewed to the right with only 12 percent of the farms being more than 20 acres (Table 12).

Land tenure

Land allotted to the farmers in the S.L.L.D.P. are state lands which have been set aside for agricultural and residential purposes. These lands are leased for 25 years with conditions for renewal for a further 25 years. The rental rate of residential lots are twenty-four dollars per year while the rental rate for agricultural plots are as follows:[16]

1) $2.00 per acre for the first 5 years.
2) $4.00 per acre for the second 5 years.
3) Thereafter, the rate at which rent is payable shall be liable to revision by the President of Guyana at five yearly intervals during the currency of the lease.

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[14]G. L. Lewars. 1977. "Small Farm Financing in Guyana: 1968-1970." published by the University of the West Indies, p. 13.

[15]A.V. Downer, A. Cho Chung Hing, J. Brassington, & L. Neckles. 1976. A Program for the Development of the Soesdyke/Linden Highway over the Period 1976-1980. Ministry of Agriculture, Georgetown, p. 2.

[16]State Lands Act. 1966. "Lease of State Lands for Residential and Agricultural Purposes," published by the Government of Guyana, Georgetown, chapter 62:01.

Table 12. Frequency and average size of pineapple farms in survey.

Location	10 Acres	11-20 Acres	21 Acres and Over	Total Farmers	Total Acres	Average Farm Size (Acres)
Kurukururu	14	8	3	25	449	17.96
Long Creek	6	3	1	10	142	14.20
Yarowkabra	0	3	2	5	109	21.80
Moblissa	2	3	0	5	74	14.80
Madewini	1	1	0	2	29	14.50
Haruruni	1	1	0	2	30	15.00
Kuru Kuru	0	1	0	1	12	12.00
Dora	0	1	0	1	18	18.00
TOTAL	24	21	6	51	863	16.92
PERCENT OF TOTAL	47	41	12	100	---	-----

The number of titles that were issued to farmers in the S.L.L.D.P. are recorded in Table 13. Only 4 percent of the farmers said that they were awaiting the lease to their land. However, at least 28 percent of the farmers wanted some form of security on which they could borrow money to improve their farming, and this indirectly led back to the problem of the block lease. The block lease was only useful if all the members in a co-operative society agreed to use the lease as collateral. If, however, a farmer in the co-op wanted to borrow money, he had no access to the block lease, although his land was included in it.

Distance to farm

Except for one farmer who traveled at least 26 miles to his farm (farmer might have been living in Georgetown), all the other farmers were living in the S.L.L.D.P. Fifty-one percent of these farmers lived

Table 13. Land titles issued in the S.L.L.D.P., August, 1979.

Location	Titles Issued
Kurukururu	525
Yarowkabra	371
Moblissa	153
Long Creek	84
TOTAL	1,133

Source: Land Development Department, 1979.

less than one mile away from their farm while only four percent had to travel as much as 10 miles (Table 14).

The reason for considering traveling distances resulted from the fact that some of the residential lots (half acre each) and agricultural plots were not adjacent to nor incorporated in the allotted acres leased to each farmer. This approach was taken by the administration because in the initial stages of the project, it was felt that by having all the residential lots relatively near to each other, it would have been very simple to provide utilities and other services which were necessary for community development. The approach, however, was counter productive to the project, because whereas security was established in the residential areas, there was none in the farming areas, and consequently, many of the crops produced on the agricultural plots were stolen. Although only 12 percent of the pineapple farmers complained about stealing, many other types of farmers, especially the non-resident farmers, suffered heavy losses through pilferage.

Table 14. Traveling distance to farms by farmers in survey.

Miles	Percent of Farmers
Less than 1 mile	55
Between 1 and 2 miles	24
Between 2.5 and 5 miles	16
Between 6 and 10 miles	4
Greater than 26 miles	2
TOTAL	100

Production

Production, or output, depends a great deal on the type of inputs that are used as well as on the quality of the management techniques employed by farmers. In general, farmers have control over these two areas in the production process. What limits production, however, are variables over which farmers have little or no control and these variables are usually determined exogenously. Examples of variables over which farmers have no control are climate, rainfall, and market prices for both inputs and output; while those over which they have some control are pests and diseases and government policy. Nevertheless, the use of controllable inputs, such as pesticides, weedicides and fertilizers are limited by the financial resources available to farmers. Output of farmers in the S.L.L.D.P. was constrained by uncontrollable exogenous

variables, limited financial resources, the poor use of inputs and inadequate management techniques.

Pineapple varieties

The Montserrat pineapple, which is conical in shape and averages between three to five pounds at harvest-time was the most common variety found in the S.L.L.D.P. All 51 farmers in the survey cultivated Montserrat pineapple. Several other varieties were also cultivated. Examples of these were the Sugar-Loaf, Black-Antigua and Tiger-Head. Many farmers said they cultivated three varieties different from Montserrat. Of these, 41 farmers cultivated Sugar-Loaf, 3 cultivated Black-Antigua, and 3 others cultivated Tiger-Head pineapple. The Kurukururu area was the only location where all four varieties were cultivated. In the other seven locations, only Montserrat and Black-Antigua were cultivated (Table 15). Whereas only 20 percent of the farmers specialized in Montserrat cultivation, 73 percent of them cultivated both Montserrat and Sugar-Loaf. The remaining 7 percent had a combination of three or four varieties on their farms (Table 16).

Cultivation Practices

Given that only four varieties were cultivated by these 51 farmers, it was not uncommon to find several combinations of planting material on each acre. In the survey, 86 percent of the farmers used basal suckers which reproduced a pineapple in 14 to 16 months; 12 percent used side shoots which reproduced a pineapple in 18 to 20 months; and the remaining 2 percent used crown-slips which reproduced a pineapple in 18 to 24 months (Table 17).

Table 15. Location and number of farmers in survey cultivating each variety

Location	Varieties and Number of Farms			
	Montserrat	Sugar-Loaf	Black-Antigua	Tiger-Head
Kurukururu	25	20	3	3
Long Creek	10	8	0	0
Moblissa	5	3	0	0
Yarowkabra	5	4	0	0
Madewini	2	2	0	0
Haruruni	2	2	0	0
Kuru Kuru	1	1	0	0
Dora	1	1	0	0
TOTAL FARMERS	51	41	3	3

The combination of varieties and planting material used on each farm necessitated selective harvesting to correspond with the different maturity dates. Every pineapple had to be checked before harvesting commenced. This caused a greater strain on labour since every acre had to be checked more than once. For example, on an acre of 5000 pineapples, only about 3000 pineapples could be picked at the main harvest; while the remaining 2000 pineapples had to be left on the plants since they were still green. Farmers, therefore, had to return on different occasions to pick the pineapples in smaller quantities as they ripend. A further problem was created when farmers, after reaping the 3000 pineapples, replanted new material of different types, such as suckers, side shoots and crown slips, on the same acre. This, of course, compounded and perpetuated the harvesting problems for the next season. Apart from the problems raised on planting material, farmers also did not plant the optimum quantity of plants on each acre. According to Baichoo

Table 16. Combination of varieties grown by farmers in survey.

Location	Montserrat only	Montserrat and Sugar Loaf	Montserrat Sugar-Loaf and Black Antigua	Montserrat Sugar-Loaf and Tiger-Head	Montserrat Sugar-Loaf Tiger-Head and Black Antigua	Total Farmers
Kurukururu	5	16	1	1	2	25
Long Creek	2	8	0	0	0	10
Moblissa	2	3	0	0	0	5
Yarowkabra	1	4	0	0	0	5
Madewini	0	2	0	0	0	2
Haruruni	0	2	0	0	0	2
Kuru Kuru	0	1	0	0	0	1
Dora	0	1	0	0	0	1
TOTAL FARMERS	10	37	1	1	2	51
PERCENT OF TOTAL	20	72	2	2	4	100

Table 17. Planting material used by farmers in various areas.

Location	Suckers	Side-shoots	Crown Slips	Total
Kurukururu	20	5	0	25
Long Creek	9	1	0	10
Moblissa	5	0	0	5
Yarowkabra	4	0	1	5
Madewini	2	0	0	2
Haruruni	2	0	0	2
Kuru Kuru	1	0	0	1
Dora	1	0	0	1
TOTAL FARMERS	44	6	1	51
PERCENT OF TOTAL	86	12	2	100

(1979),[17] ten thousand to fourteen thousand plants should be planted on each acre. Only 16 farmers were able to say how many plants they had on each acre. The range for these 16 farmers varied from 400 to 20,000 plants on each acre. The most frequent number was 5,000 plants while the average was 4,679 plants per acre for the 16 farmers (Table 18).

The outcome of this non-standardized method of planting resulted in small yields at the main harvest, thus causing the cost per acre and per pound of pineapple to be relatively high. At some stage the harvesting cost alone would have exceeded the expected income after the pineapple sale. For example, if the cost of harvesting an acre of pineapple was fifty dollars and the market price for a pound of pineapple was eighteen cents, then the farmer must harvest at least 277.8 pounds

[17]C. S. Baichoo. 1979. "Pineapple Cultivation." Ministry of Agriculture Report (mimeo), Georgetown, p. 4.

Table 18. Plants per acre for farmers in survey.

Plants per acre	No. of Farmers
400	1
1,000	1
1,750	1
2,000	2
3,000	1
4,000	3
5,000	5
8,000	1
20,000	1
Average per acre	**Total Farmers**
4,697	16

on an acre to pay the harvesting cost. At smaller quantities, farmers preferred to leave the crop in the field, thereby contributing to on-farm spoilage. On some occasions, however, a small proportion of these pineapples were given away at a zero price to friends or relatives who usually used their own labour time to reap the pineapples.

Ratoons

Ratoons were another means of cultivating pineapples. They grow from underground buds and bear in 12 to 14 months. The yield from the ratoon crop is within the range of 30 to 60 percent of the plant crop. After the third ratoon, the field should be replanted.[18] In the survey, 53 percent of the farmers did not know how many ratoons they cultivated because they had only begun planting within the last eighteen months.

[18]Ibid., p. 46.

For the remaining 47 percent, the average number of ratoons cultivated by farmers in the survey was two.

Average years in pineapple production

The average number of years in pineapple production by farmers in the survey was 4.6. This, therefore, indicates their rather limited experience with this crop (Table 19).

Table 19. Average years in pineapple production by farmers in survey.

Location	No. of Farmers	Total Farm Years	Average Farm Years Per Farmer
Kurukururu	25	132	5.28
Long Creek	10	43	4.30
Moblissa	5	9.5	1.90
Yarowkabra	5	26	5.20
Madewini	2	6	3.00
Haruruni	2	9	4.50
Kuru Kuru	1	7	7.00
Dora	1	2	2.00
TOTAL	51	234.5	4.60

If farmers had used crowns as the original planting material and produced two ratoons, then the plants would have had to stand in the field for 4.6 years, or 55 months (Figure 3). This production pattern compares favorably with the average farm years for farmers in the survey.

Use of fertilizers and pest and disease control methods

To optimize yields on each acre, fertilizers, pesticides and weedicides must be used. The Ministry of Agriculture recommended an

Harvesting Time		First Crop	Ratoon 1	Ratoon 2
Minimum	0 time	18 months	30 months	42 months
Maximum	0 time	24 months	38 months	52 months

Figure 3. Harvesting pattern of pineapple crop

application of 400 pounds per acre of fertilizer combination 12.12.17.2. For weed control, two chemicals, Diuron or Gesaprin, were recommended.[19] The Ministry was responsible for spraying pests and diseases on the farms; but because of staff and transportation problems, this service was limited. More will be said on this in a later section.

Of the farmers in the survey, 40 of them (78 percent) were not using any fertilizers. The reason was that it was too expensive to apply the quantities that the Ministry recommended. Of the remaining 11 farmers only 5 were using commercially produced fertilizers which were 15.15.15, 12.12.17.2, limestone and urea. The other 6 farmers were using chicken manure from their farm or from other farms. Chicken manure was free except for loading and transporting costs.

Only 30 farmers (59 percent) were using pest and disease control methods. They used at least 8 different chemicals with the most frequently used being malathion, which was followed by aldrin, chloradane, phoxin, Mirex,[20] folimat, gesaprin and dipterex in that order. Finally,

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[19]Ibid., p. 46.

[20]In the United States, the use of Mirex has been banned by the E.P.A. since it was felt that it caused cancer and birth defects in laboratory mice, and had also been detected in human tissue samples in the south. See National Geographic Publication, February, 1980, p. 160.

only 11 farmers (22 percent) were using both fertilizers and pest and disease control methods simultaneously (Table 20).

Those farmers who tried to use pests and disease control methods suffered when infestation of their fields resulted from pest and diseases coming from adjacent fields which were poorly managed, or were under bush, or had been abandoned by farmers who no longer were in the S.L.L.D.P. and might have returned the land to the Land Development Department.

A more obscure source of infestation resulted when farmers, who were allocated land by the Land Department, did not occupy the land. Operating farmers were separated from each other in a chequered pattern with surrounding bush providing a haven for pests and diseases. The inadequate use of fertilizers and poor plant protection against pests, like the mealy bug and diseases such as gummosis, black and soft-rot, resulted in relatively small pineapple acreage production.

Acres in pineapple and farm records

For the period 1975-1978 no more than 1600 acres of pineapples were cultivated in the S.L.L.D.P. (Table 21). This represented only about three percent of the "best" and "second best" soils which totaled 52,053 acres.

For farmers in the survey, information on acreage was available for only two years. Most of the farmers (92 percent) did not keep written records and they could recall information from no more than two years past. In 1978 and 1979, 284.5 and 301.5 acres respectively were cultivated with pineapples by farmers in the survey. Although there was a decline in pineapple acres at Yarowkabra and acreage at Madewini and

Table 20. Farmers in survey using fertilizers and pest and disease control methods.

Location	No. of Farmers	Fertilizer Use		Pest and Disease Control		Farmers using both Fertilizers and Pest and Disease Control Methods	
		Yes	No	Yes	No	Yes	No
Kurukururu	25	8	17	15	10	8	17
Long Creek	10	0	10	3	7	0	10
Moblissa	5	1	4	3	2	1	4
Yarowkabra	5	2	3	5	0	2	3
Madewini	2	0	2	1	1	0	2
Haruruni	2	0	2	1	1	0	2
Kuru Kuru	1	0	1	1	0	0	1
Dora	1	0	1	1	0	0	1
TOTAL	51	11	40	30	21	11	40

Table 21. Acres in pineapples in S.L.L.D.P.: 1975-1978.

	1975	1976	1977	1978
Acres	1,595	840[a]	1,600	1,200

Source: Ministry of Agriculture, Georgetown.

[a]Downer, et al., p. 3.

Dora were unchanged over the period, there was still a moderate increase in pineapple acreage of 6 percent for farmers in the survey. In spite of this increase, however, only 33 and 35 percent of the total land of 863 acres were cultivated in 1978 and 1979 (Table 22). Except for one-eighth of an acre which was planted with cash crops, most of the land allotted to farmers was not cultivated and was still under bush.

Table 22. Acres in use by farmers in the survey: 1978-1979.

Location	Total Acres	Acres in Pineapples 1978	Percent of total acres in 1978	Acres in Pineapples 1979	Percent of total acres in 1979
Kurukururu	449	177	39	188	42
Long Creek	142	45.5	32	48	34
Moblissa	109	8	7	10.5	10
Yarowkabra	74	19	26	17	23
Madewini	29	11	38	11	38
Haruruni	30	8	27	9	30
Kuru Kuru	12	10	83	12	100
Dora	18	6	33	6	33
TOTAL	863	284.5	33	301.5	35

Production 1979 and forecast of output December 1979 to February 1980

Only 45 farmers were able to give information on pineapple production; the remaining six did not know the quantities they produced or sold. The average quantity produced per farmer was 3,809 pounds (Table 23).

Table 23. Pineapple production (pounds) by farmers in survey, 1979.

Location	Farmers	Total pounds	Average per Farmer (Pounds)
Kurukururu	22	100,429	4,565
Long Creek	9	17,743	1,971
Moblissa	3	6,166	2,055
Yarowkabra	5	18,533	3,707
Madewini	2	14,278	7,139
Haruruni	2	9,366	4,683
Kuru Kuru	1	4,722	4,722
Dora	1	175	175
TOTAL	45	171,412	3,809

Sixty-seven percent of the farmers were certain of harvesting a crop during December 1979 through February 1980. Of those remaining, 27 percent were not expecting a crop during the December/February period. The reasons given were that they were replanting or they had just begun for the first time during the last year. The final six percent were not sure if they would have harvested any pineapples but they were optimistic. From the 67 percent who expected a crop, only 16 farmers were able to forecast an expected quantity and this amounted to 84,710 pounds, an average of 5,294 pounds per farmer (Table 24).

Table 24. Forecast of pineapple production (pounds) by farmers in survey: December, 1979 - February, 1980.

Location	Farmers sure of crop	Farmers not expecting a crop	Farmers not sure of crop	Farmers expecting a crop	Forecast pounds
Kurukururu	16	8	1	6	11,660
Long Creek	8	2	0	3	15,800
Moblissa	3	2	0	3	48,000
Yarowkabra	3	1	1	2	5,400
Madewini	1	1	0	0	0
Haruruni	1	0	1	1	3,500
Kuru Kuru	1	0	0	0	0
Dora	1	0	0	1	350
TOTAL	34	14	3	16	84,710
PERCENT OF TOTAL	67	27	6	31	--

Forecast of increase acreage

Seventy-three percent of the farmers hoped to increase their output of pineapples by utilizing more land. However, a majority needed more finance and equipment to implement their program. Of the remaining 27 percent who were not going to increase their pineapple acreage, two of them wanted more land since they had already utilized all the land they received from the project. Six others said they would not use more land in pineapples because the cost of production was greater than the market price. An additional four said, because profits were higher in citrus than in pineapple production, they would concentrate their efforts in citrus. The final two said they were going out of farming entirely and gave the reason that poor marketing was the main cause for discontinuing. The expected increase in land cultivated with pineapples

was estimated at 194 acres. Using the 1979 production figures from Table 22, this implied that the total acres cultivated with pineapples would increase to 495.5 acres, or 57 percent of total acres for farmers in the survey. The average increase in acres for 37 farmers was 5.24 acres per farm (Table 25).

Table 25. Forecast of increase acreage by farmers in survey: 1979/1980

Location	Increase acres, yes	No increase in acres	Increase in acres	Average increase per farmer
Kurukururu	16	9	67	4.19
Long Creek	9	1	46	5.11
Moblissa	4	1	41	10.25
Yarowkabra	4	1	23	5.75
Madewini	1	1	4	4.00
Harurumi	1	1	5	5.00
Kuru Kuru	1	0	4	4.00
Dora	1	0	4	4.00
TOTAL	37	14	194	5.24
PERCENT OF TOTAL	73	27	--	--

Equipment

One of the reasons for the relatively small utilization of land could be ascribed to the type of equipment that farmers used to produce pineapples. As previously mentioned, pineapple cultivation in the S.L.L.D.P. was a labour intensive operation, and in keeping with this, the type of equipment used by farmers was usually hand tools. The most popular hand-tool was the cutlass, followed by the shovel, hoe and axe in that order. For the 51 farmers in the survey, each had on the

average ten pieces of hand-tools with an average value of one hundred and nine dollars and ninety-seven cents ($109.97). Most of the larger capital investments were in the area of transportation vehicles. Most of this equipment, however, was out of service due to poor maintenance and lack of spare parts which were still to be imported into the country.

Some farmers who owned a chain-saw had nothing to do with this piece of equipment once they had cleared their land of the large trees. The five chain-saws, which were reported, were all in good working order, but there was no job for which it could be used on the owner's farm. A more useful hand tool would have been a speed-weeder since it would have had more use on an annual basis, and would have reduced the man-hours spent for weeding. None of the farmers in the survey had a speed-weeder. If a market existed where farmers could have rented these pieces of equipment, it would have been better for the entire project. Farmers who had large investment in capital equipment were reluctant to give any information on the vaule of these capital inputs. Table 26 summarized the data on the available equipment found in the survey.

Difficulty in obtaining farm tools

Many farmers complained about the difficulties and unnecessary cost they incurred when trying to buy farm equipment such as cutlasses, files and other hand tools. For example, to purchase a file from a supplier involved not only paper work by the Ministry of Agriculture and other government agencies, but it also included the bus and hire car fares for the round trip from the farm to Georgetown and back to the farm. If these traveling expenses were added together, it would show that the trip would cost just as much or more than the cost of the

Table 26. Quantity and value of farm equipment owned by farmers in survey.

Item	Kurukururu	Long Creek	Moblissa	Yarowkabra	Madewini	Haruruni	Kuru Kuru	Dora	Total and Average
Axes	31	15	6	6	4	2	3	4	71
Hoes	47	11	5	3	1	5	4	3	79
Shovels	37	14	12	6	2	7	2	2	82
Forks	19	7	3	1	1	1	0	0	32
Files	8	0	0	0	0	0	0	0	8
Cutlasses	108	27	22	12	12	29	7	4	221
Spades	5	8	4	2	0	2	0	0	21
Rakes	4	4	2	0	0	1	0	0	11
Mattocks	4	0	0	2	0	0	0	0	6
Total Hand Tools	263	86	54	32	20	47	16	13	531
Average Hand Tools per Farmer	11	9	11	6	10	24	16	13	10
Total Value of Hand Tools	$2,944.52	$990.15	$553.62	$313.74	$198.24	$378.92	$121.30	$107.78	$5,608.27
Average Value of Hand Tools Per Farmer[a]	$117.78	$99.02	$110.72	$62.75	$99.12	$189.46	$121.30	$107.78	$109.97

Table 26. Continued.

Item	Kurukururu	Long Creek	Moblissa	Yarowkabra	Madewini	Haruruni	Kuru Kuru	Dora	Total and Average
Chain-saws	2	1	0	0	0	1	0	1	5
Land Rovers	2	0	2	0	0	0	0	0	4
Tractors	2	0	0	0	0	2	0	0	4
Tractor Implements	3	0	0	0	0	1	0	0	4
Trailer	1	0	0	0	0	0	0	0	1
Lorry	1	0	0	0	0	0	0	0	1
Jeep	1	0	0	0	0	0	0	0	1
Van	0	0	1	0	0	0	0	0	1
Car	0	1	0	0	0	0	0	0	1
TOTAL	12	2	3	0	0	4	0	1	22

[a]These average values do not include the value of chain-saws or other larger equipment.

file. Needless to say, the opportunity cost of the entire activity to the farmer would be just as much as the value of one day's work on his farm. One reason for using this system to obtain farm tools was to cut out the exorbitant prices charged by middlemen who purchased most of the farm equipment from the regular suppliers and in turn sold them on the black-market to farmers. Having a farmers' supply co-operative on the highway would have solved this problem of obtaining basic inputs for farmers.

Use of family labour

Most farm labour was provided through the immediate and extended family systems. Ninety percent of the farmers in the survey used family labour on an average of two adults[21] and approximately three children per farm (Table 27). Given the quantity and use of land and capital, it could be hypothesized that there might exist a situation where there was an excess number of labourers on these farms. This hypothesis will be tested later.

Hired labourers

Sixty-one percent of the farms used hired labour (Table 28). Hiring practises were not directly based on hourly rates but it was on a daily basis or on a piece rate. The piece-rate, which was used frequently by farmers and contractors, grew out of the method employed to hire labour to do specific jobs and this could be more aptly called "Job-work." Job-work was organized along the following method: A farmer agreed with

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[21]Adults refer to immediate family members on the farm as well as to grandparents, uncles and aunts. Children refer to members in the immediate family as well as to grandchildren and cousins on the farm.

Table 27. Family labour used by farmers in survey.

Location	Total Adults	Average Adults per Farm	Total Children	Average Children per Farm
Kurukururu	50	2.00	78	3.12
Long Creek	17	1.70	24	2.40
Moblissa	9	1.80	13	2.60
Yarowkabra	11	2.20	4	0.80
Madewini	4	2.00	6	3.00
Haruruni	8	4.00	5	2.50
Kuru Kuru	2	2.00	0	0.00
Dora	2	2.00	8	8.00
TOTAL	103	2.02	138	2.71

Table 28. Farms in survey using hired labour.

Location	Farms Using Hired Labour	Farms Not Using Hired Labour
Kurukururu	15	10
Long Creek	7	3
Moblissa	4	1
Yarowkabra	3	2
Madewini	0	2
Haruruni	1	1
Kuru Kuru	1	0
Dora	0	1
TOTAL	31	20

a contractor (an oral contract in most cases) to do a certain job for an agreed sum of money. The contractor might do the work on his own, or he might work along with hired workers whom he employed. After the job was completed, the contractor was paid and he in turn paid his workers. The types of jobs done most frequently by hired labour were land clearing, followed by weeding, planting, harvesting, and hauling in that order (Table 29).

Table 29. Number of farms in survey using hired labour for specific farm activities.

Location	Clearing	Planting	Weeding	Harvesting	Hauling
Kurukururu	13	11	10	6	3
Long Creek	4	3	4	3	0
Moblissa	4	1	3	0	0
Yarowkabra	2	1	2	2	0
Madewini	0	0	0	0	0
Haruruni	1	0	1	0	0
Kuru Kuru	1	0	1	0	0
Dora	0	0	0	0	0
TOTAL	25	16	20	11	3

A major setback to this system of job-work was that many farmers had severe cash flow problems and this prevented the smooth working of this system. Most of the hired labourers needed their money immediately after completing their work. To give an example, if a farmer sold his pineapples to the Guyana Marketing Corporation (G.M.C.) and then had to wait at least two weeks for payment, harvesting labourers could not be paid until the farmer received the money from the G.M.C. Labourers

became irritated by this long delay and did not accept nor were they interested in the reasons put forward by the farmer for himself or on behalf of the G.M.C.; they needed their money within 24 hours. Although there were labourers in the area who could be hired, they were usually unavailable. If, however, payment could be made as soon as the job was completed, there was no problem in attracting labourers. Since many farmers did not have money for this purpose, this option was closed to many of them.

Ranking of farm problems

Farmers were asked to rank their farming problems. Seven different problems were considered and the ranking and frequency on each problem are shown in Table 30.

Table 30. Position and frequency of farm problems identified by farmers in survey.

Position	Activity	First Place	Second Place	Third Place
First	Pest and Disease	31	3	0
Second	Marketing	12	10	1
Third	Credit	3	0	3
Fourth	Harvesting	1	2	1
Fifth	Land Preparation and weeding	2	0	0
Sixth	Water	1	1	1
Seventh	Farm Housing	1	0	0

Pest and diseases was considered to be the most serious problem in the S.L.L.D.P. The pest most often mentioned was the mealy-bug. Another type of distrubance was caused from wild animals such as labba

and deer which ate the pineapple while it was still on the plant in the field. Marketing was the second major problem because there were transportation difficulties and no proper roads within the project. Credit was the third problem and was followed by land preparation, water and farm housing problems.

Long Creek water problem

Thirty percent of the farmers from the Long Creek area complained of water problems and this resulted in part from the manner in which the land was allotted to farmers. The Long Creek area, which is shaped in an oval form, has two creeks (Long and Haimaruni creeks) forming the boundaries of this area. Instead of having the land allotted in vertical positions to the two creeks (Figure 4), it was allotted in parallel positions (Figure 5). Farmers who had their plots at the side of the creek (farmers A and C in Figure 5) got the water for themselves; while farmers in area "B" had no direct access to the creeks. Although a well is to be sunk in the area, efforts should be made to correct the allotment problem, thereby allowing more farmers to use the water from the creeks for agricultural purposes.

Credit

Despite the fact that many farmers had cash flow problems and were in need of credit to improve their farming operations, 98 percent of them in the survey had never borrowed money from either the traditional sources, such as money lenders, pawnbrokers and shopkeepers, or from the commercial enterprises such as private commercial banks or the Guyana Co-operative Agricultural and Industrial Development Bank (G.C.A.I.D.B.). A majority, however, did make attempts in the past to

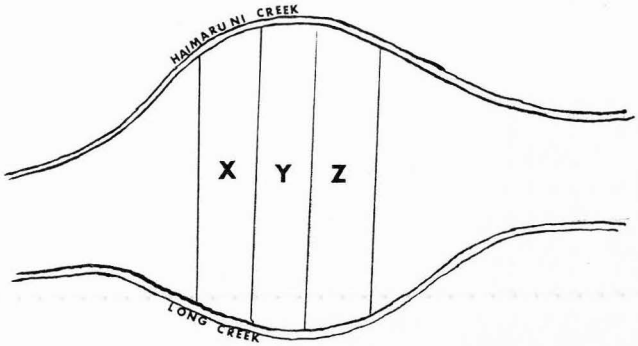

Figure 4. Proposed reallocation of land at Long Creek

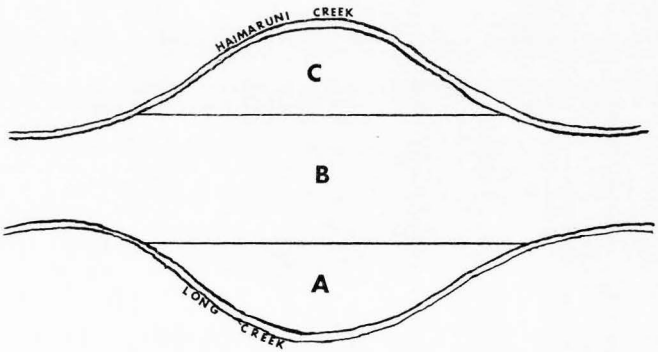

Figure 5. Present allocation of land at Long Creek

negotiate loans from the commercial banking sector; but since they had no collateral to secure the loans, they had to forget the idea of borrowing money. The lack of collateral could have been partly solved if farmers had individual leases, instead of the block leases that were granted to the co-operatives on behalf of farmers.

Direction of credit

The G.C.A.I.D.B. made most of their loans to farmers of traditional crops such as rice and sugar-cane and to saw-milling, fishing and relatively large livestock ranches. The G.C.A.I.D.B., more specifically, was created in 1973 to provide credit to small farmers and agricultural co-operatives. Part of the loan terms of this bank is shown in Table 31.

Table 31. Terms of loans from G.C.A.I.D.B.

Category	Initial life of loan	Collateral Requirements
Short Term Loan	Less than 24 months	An instrument of change on a borrower's crop or livestock
Medium Term Loan	24 to 60 months	An instrument of change on crops, cattle, and a first mortgage on land, buildings or equipment
Long Term Loan	60 to 120 months	Firt mortgage on land, buildings, machinery and livestock

Source: Ministry of Agriculture, Guyana 1979

Most of the loans granted by the G.C.A.I.D.B. came under the heading of "mixed farming," which by definition means all farmers who produce cash crops, other crops (for example, pineapples), livestock and poultry. No special arrangements were made for pineapple production or for specific crops or livestock enterprises located in the region. Put

differently, this was a non-specialized arrangement, having many elements to service different types of farmers and, at the same time, spreading the risk of the loans over many activities on each farm. In July, 1979, approximately 124 loans, amounting to G$8.8 million, were made in the Soesdyke/Linden Region by the G.C.A.I.D.B. A large proportion of these loans went to finance capital equipment purchases for saw milling and coal operations which had lower default rates and uncertainty, as well as assured markets and better business organizations than pineapple farming operations.

Credit requirements

Because of the exhaustive and greatly detailed loan application form, which had to be filled out before a loan could be granted, many pineapple farmers in the survey felt it was almost impossible to obtain credit from the agricultural bank. Also, since a large majority of the farmers did not have any written farm records, and particularly, any available information from which a balance sheet, operating and cash flow statements could be made, this further discouraged them from worrying with obtaining credit from the G.C.A.I.D.B. or other banks.

Pineapple sales

Ten percent of the farmers did not have any sales at the time the survey was made. Fifty-three percent of the farmers in the survey had pineapple sales less than $500. Forty percent of the farmers in Kurukururu had sales greater than $500 while 60 percent of the farmers at Long Creek had sales smaller than $500.

A closer look at pineapple sales revealed that 37 percent of the farmers had sales between one dollar and two hundred and ninety-nine

dollars. Also, only 11 percent of the farmers in the survey had sales greater than one thousand dollars and they were located in Kurukururu, Yarowkabra, Madewini and Haruruni areas (Table 32).

Table 32. Distribution of pineapple sales by range and location for farmers in survey.

Location	Sales greater than $1000	Sales Between: $701-$1000	$500-$700	$300-$499	$1-$299	No Sales Yet
Kurukururu	3	3	4	4	9	2
Long Creek	0	1	2	2	4	1
Moblissa	0	1	0	0	2	2
Yarowkabra	1	1	1	0	2	0
Madewini	1	0	0	0	1	0
Haruruni	1	0	0	1	0	0
Kuru Kuru	0	1	0	0	0	0
Dora	0	0	0	0	1	0
TOTAL	6	7	7	7	19	5
PERCENT OF TOTAL	11	14	14	14	37	10

The total volume of pineapple sales for the 46 farmer amounted to $37,366 with the highest, lowest and average farm sales being $7,000, $30, and $812, respectively. The highest and lowest volume of pineapple sales occurred in Kurukururu and Moblissa (Table 33).

Cost of production of pineapple from S.L.L.D.P.

Central to the concept of using scarce resources is the idea of knowing the level of efficiency that could be attained with the use of scarce resources in a particular activity. Further, knowledge about the

Table 33. Volume of farm sales by farmers in survey for period May-August, 1979.

Location	Total Pine-apple Sales	No. of Farmers	Average Pineapple Sales	Highest Sales	Lowest Sales
Kurukururu	$24,589.23	23	$1,069.10	$7,000.00	$45.00
Long Creek	$3,193.80	9	$354.87	$792.00	$54.00
Moblissa	$1,110.00	3	$370.00	$900.00	$30.00
Yarowkabra	$3,336.00	5	$667.20	$1,800.00	$150.00
Madewini	$2,570.00	2	$1,285.00	$2,520.00	$50.00
Haruruni	$1,685.88	2	$842.94	$1,199.88	$486.00
Kuru Kuru	$849.96	1	$849.96	$849.96	$849.96
Dora	$31.50	1	$31.50	$31.50	$31.50
TOTAL	$37,366.37	46	$812.31	$7,000.00	$30.00

relationship between inputs and output is of paramount importance in the production process. Equally important also is the idea of knowing the relative profitability derived from the use of the resources in a particular activity. In this pineapple study, these ideas will be explored. First, the relationship between input to output will be pursued by way of enterprise budgets and the second on profitability will be pursued by way of a break-even analysis. The first budget will be done with the coefficients from the Ministry of Agriculture; while the second budget will be done with the coefficients provided by farmers in the survey. The break-even analysis will be done with the coefficients obtained from farmers in the survey.

Assumptions for use of inputs[22] to output

The following assumptions refer mainly to the input coefficients suggested by the Ministry of Agriculture.

1) It was assumed that all the planting material on an acre were basal suckers which reproduced one pineapple per plant after 24 months. Also assumed was that 10,000 suckers were planted on each acre with the cost per basal sucker at 3 cents each and average weight per pineapple of 4 pounds.

2) It was assumed that 2000 pounds of limestone per acre was applied with cost per pound at 25 cents. In addition, 400 pounds of 12.12.17.2 at cost of 39 cents per pound was applied on an acre. Also, 40 pounds of F.T.E. one month after planting and another 40 pounds were applied after harvesting. The cost per pound was 15 cents.

3) To control pests, mealy bugs for example, it was assumed that for 10,000 plants, 20,000 fluid ounces of 50 percent Phoxin was needed. Cost per fluid ounce was 8 cents.

4) It was assumed that all farm activities such as clearing, planting, weeding, fertilizing and harvesting were done by labour intensive methods with the use of hand tools.

5) It was assumed that all the pineapples produced were sold at a farm gate price of 18 cents per pound.

6) Finally, it was assumed that the enterprise budget would be for one acre of land and that the coefficients for inputs and

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[22]Coefficients were obtained from the Ministry of Agriculture Publication by C.S. Baichoo; also cost of inputs used by farmers were obtained from the questionnaire and from private suppliers.

output could be directly applied in the same manner to all the other acres in the S.L.L.D.P.

Enterprise budgets using coefficients from the Ministry[23]

In Table 34, it is shown that if 10,000 pineapples were produced and sold, the total receipts would be seven thousand two hundred dollars ($7,200); total cost would be $5,878; and net return to land and management would be $1,321. The average cost per pound and per unit were 15 and 59 cents respectively.

Since farmers in the S.L.L.D.P. were not using the inputs suggested by the Ministry, an enterprise budget on their operations would be totally different from the one presented in Table 34.

Difference between input and ouput coefficients for Ministry and farmer

In Table 20, it was shown that 78 percent of the farmers did not use either fertilizers or pesticides. Of the 22 percent who were using fertilizers and pest and disease control methods, the application rates of these inputs were different from the rates the Ministry suggested. As a result, the output from each acre was relatively smaller than that given with the coefficients from the Ministry of Agriculture. Additionally, it was shown in Table 18 that the average number of pineapple plants on each acre was 4,697, some 5,303 plants less than what was suggested by the Ministry. Each pineapple farmer had average pineapple sales of only $812 (Table 33). This implied that if the farm gate price

[23]The cost of production using the coefficients from the Ministry of Agriculture and estimated market prices for materials and labour costs were obtained from the survey data and commercial suppliers.

Table 34. Estimated receipts, costs and net returns per acre for pineapple

Items	Rate	Times	Labour Costs	Material and Service Costs	Total $/acre
Receipts					
10,000 Units/ 4 lbs	$.18/lb				7,200.00
Variable Costs					
10,000 basal suckers	$.03/each			300.00	300.00
Clearing		1	125.00		125.00
Planting		1	400.00		400.00
Fertilizer			200.00		200.00
2000 lbs Limestone	$.25/lb	1		500.00	500.00
400 lbs 12.12.17.2	$.39/lb	1		156.00	156.00
80 lbs F.T.E.	$.15/lb	1		12.00	12.00
Pesticide		1	200.00		200.00
20,000 ozs. Phoxim	$.08/oz			1,600.00	1,600.00
Weeding	$160./acre	5	800.00		800.00
Harvesting and bagging		1	600.00		600.00
Interest (S.I.) 10% Var Costs, 2 yrs				978.60	978.60
Total Variable Cost			2,325.00	3,546.60	5,871.60
Fixed Cost					
Land Tax				2.00	2.00
Other				5.00	5.00
Total Fixed Costs				7.00	7.00
Total Costs per Acre			2,325.00	3,553.60	5,878.60
Net Return to Land and Management					1,321.40
Average Cost per Pound					.146965
Average Cost per Unit (pineapple)					.58786

Labour Cost is 40 percent of total cost
Material and Service cost is 60 percent of total cost

Input coefficients from the Ministry of Agriculture, Guyana (1979)

was 18 cents and the average size of a pineapple was 3 pounds (since incorrect fertilizing rates were used), then only 4,512 pounds of pineapples of 1,504 units were sold from each farm. Furthermore, since the average pineapple acreage was 5.911 acres per farm, this implied that only 762 pounds or 254 units were sold from each acre. The outcome of this was that while farmers planted 4,697 units of planting material on each acre, they only sold 5 percent of the crop from each acre. The remaining 95 percent or 4,443 units were either: 1) Not ripe due to the different types of planting material used on each acre (see Cultural Practices); 2) they were destroyed by pests and disease since adequate control methods were not used; 3) they were all eaten on the farm which was unlikely; or 4) a combination of these three events reduced the quantity sold. The proportion of the crop which was affected by pest and disease or consumed or destroyed on the farms were not available due to the methods used in this study.

Cost and returns per acre

Under average conditions where only 254 units or 762 pounds of pineapple from each acre were sold, farmers would have suffered a loss of $616 (Table 35). The average cost per pound and per unit at the farm gate were $.99 and $2.96 respectively. A more accurate assessment of the typical farmer's cost and returns per acre would exclude labour cost, since the farmer used family labour at a zero price. The typical farmer would also exclude all the service and fixed cost in Table 35, leaving the cost of planting material as his only out-of-pocket expense. Under this condition, the average cost per pound and per unit would have been 18 and 55 cents respectively. If the farmer sold 762 pounds from

Table 35. Estimated receipts, costs and net returns per acre for pineapples based on data in survey.

Item	Rate	Times	Labour Costs	Material and Service Costs	Total $/acre
Receipts					
254.49 units/ 3 lbs	$.18/lb				137.42
Variable Cost					
Planting Material 4,697 units	$.03/each			140.91	140.91
Clearing		1	125.00		125.00
Planting		1	150.00		150.00
Weeding	$80.00	2	160.00		160.00
Harvesting and Hauling		1	50.00		50.00
Interest	10% Var Cost, 2 yrs			125.18	125.18
Total Variable Cost			485.00	266.09	751.09
Fixed Cost					
Land Tax				2.00	2.00
Other				1.00	1.00
Total Fixed Cost				3.00	3.00
Total Cost per Acre			485.00	269.09	754.09
Net Return to Land and Management (loss)					(616.67)
Average Cost per Pound sold at farm gate					.98771
Average Cost per Unit (Pineapple)					2.96314

Labour Cost is 64 percent of total cost
Material and Service cost is 36 percent of total cost

each acre at a price of 18 cents per pound, he would have made a zero net return. Using the highest farm gate price of 22 cents per pound, he would have made a return of $30 per acre. The other two farm gate prices of 15 and 14 cents per pound would have resulted in losses of $22 and $30 per acre respectively. Including the per acre cost of $754 and the two farmers who had the highest sales (Table 33), it turned out that the average net return per acre was $51 with an average cost per pound and per unit of 17 and 51 cents respectively.

Alternative approach to pineapple profitability

The previous analysis was based on the idea that farmers sold their pineapples at the farm where they received 18 cents per pound. An alternative approach was for farmers to transport their pineapples to the Municipal Markets, where consumers did not purchase pineapple by the pound; but rather they purchased pineapples by the unit. The effect of this on the profitability of pineapples will now be analyzed.

Transportation cost and market rent

In 1979, transportation cost from the project to the municipal market and the market rent amounted to two cents per unit.

Unit price of pineapple at municipal markets, January-September 1979

The weekly average and average monthly retail unit prices for pineapples at the four Municipal Markets (Kitty, Bourda, La Penitence and Stabroek) during January 1979 to September 1979 are shown in Table 36. Since the largest quantity of pineapples are sold during May through mid-August (see effects of rain on pineapple), it is no suprise to find

Table 36. Weekly average and average monthly unit prices for pineapples at four Municipal Markets (Kitty, Bourda, Stabroek and La Penitence) during January 1979 to 14 September 1979.

Month	Date	Average Weekly Price[a]	Average Monthly Price	Month	Date	Average Weekly Price	Average Monthly Price
January	5	2.50		June	1	1.38	
	12	1.25	1.97		8	.81	
	19	2.13			15	.56	.85
	26	2.00			23	.75	
February	2	n/a			30	.75	
	9	3.00		July	6	1.00	
	16	2.00	2.58		13	.92	1.29
	22	2.75			20	1.50	
March	2	2.50			27	1.75	
	9	2.25		August	3	1.81	
	16	3.00	2.70		10	2.00	
	23	3.00			17	2.75	1.81
	30	2.75			24	2.50	
April	6	2.50			31	n/a	
	13	2.50	2.25	September	7	1.25	1.63
	20	2.25			14	2.00	
	27	1.75					
May	4	1.19					
	11	1.42	1.61				
	18	1.83					
	25	2.00					

n/a = Not available

[a]The weekly price was taken every Friday. The above price is average of four markets.

Source: Ministry of Agriculture, Guyana

that the average monthly prices during this period are lower than prices in other months when there are hardly any pineapples sold in the market. This, in other words, shows some of the forces in the market which influence supply and demand conditions.

Profitability at municipal markets

Using the farm gate price of 51 cents per pound per pineapple and adding 2 cents for transportation cost and market rent, the cost per unit at the market was 53 cents. Since the lowest and highest average monthly prices for pineapples (Table 36) were respectively 85 cents (June) and $2.70 (March), it follows that the average net returns for the two farmers with the highest sales would have been $477 at the lowest price and $3,236 at the highest price.

In Table 36 it is shown that there were only two dates (March 16 and 23) when the market prices were higher than the per unit cost at the market of $2.98 (production cost of $2.96 [Table 35] plus marketing cost of 2 cents). At all other times, the cost of production was higher than the market price and this would have resulted in losses to farmers. For the case where farmers considered only planting material costs, the cost of production at the market place was 57 cents per unit. Using the highest and lowest monthly prices from Table 36 and quantity sold of 254 units, the net return to these farmers would have been $470 at the highest price and $71 at the lowest price.

Difference between farm gate and municipal market

Whenever the market place was substituted for the farm gate, net returns per acre and profits would have increased while losses would

have been reduced. This resulted from the farm gate trade which was organized for wholesale buying and selling with prices set on a per pound basis. In the municipal market the trade was organized along retail methods with prices being set on a per unit basis. Hence, whereas a 3 pound pineapple only yielded 54 cents at the farm gate, in the municipal market a 3 pound pineapple sold for 85 cents or $2.70 depending upon the season. Under these circumstances, farmers would have opted for the market place instead of the farm gate. However, since many farmers did not have their own transportation, this option of the municipal market was closed to most of them.

Additional farm activities

Of all the farmers in the survey, only three specialized in pineapple production. These farmers were located in the Kurukururu and Madewini areas. All other farmers had other farming activities in addition to their pineapple crop. One farmer at Kurukururu had ten different activities in addition to pineapples. The largest number of farmers, however, had only three additional activities (Table 37).

Other crops, livestock and poultry

Additional activities were usually other crops where the farmer utilized, at most, one eighth of an acre to produce a wide range of crops in a diversification program suited primarily to home consumption. Of the thirty-four additional activities, twenty-eight were with the production of different crops, five on livestock and poultry and one was an agricultural based industry. The agri-based industry, which was receiving special attention from the Ministry of Energy and Natural Resources, was charcoal burning. The Ministry had established an

Table 37. Additional farm activities by farmers in survey.

Location of Farmers	Number of Farmers	Number of Activities in Addition to Pineapple Crop
Kurukururu	1	10
Kurukururu	1	8
Moblissa	1	7
Kurukururu; Long Creek; Moblissa and Haruruni	4	6
Kurukururu; Long Creek; Moblissa; Madewini and Kuru Kuru	8	5
Kurukururu; Yarowkabra; Long Creek and Moblissa	11	3
Kurukururu; Yarowkabra and Long Creek	9	2
Kurukururu; Yarowkabra and Long Creek	5	1
Kurukururu and Madewini	3	0

adequate marketing program and basic infra-structural work to dispose of this output. The most popular additional crop was banana and it was cultivated by about half of the farmers in the survey. This was followed by plantains, limes and eddoes, in that order. The farmer who had 10 additional activities cultivated banana, squash, pumpkin, pepper, papaw, lime, cucumber, plantain, tomato and cashew. The 34 additional farm activities along with the frequency of occurrence on the farms in the survey are recorded in Table 38.

Production difficulties of other crops in S.L.L.D.P.

The greatest difficulty faced by farmers when producing other crops in the S.L.L.D.P. was caused by accouchi ants. The accouchi ants

Table 38. Number of farmers in survey in other crops, livestock, poultry and agri-industry.

No.	Crop	No. of Farmers
1.	Vegetables	9
2.	Sweet Potato	7
3.	Cashew	8
4.	Black Eye Peas	2
5.	Tomato	2
6.	Almond Nut	1
7.	Cassava	9
8.	Sugar Cane	1
9.	Dasheen	3
10.	Plantain	18
11.	Eddoe	11
12.	Cucumber	1
13.	Lime	13
14.	Mango	3
15.	Papaw	8
16.	Pepper	5
17.	Pumpkin	6
18.	Squash	1
19.	Banana	25
20.	Pear	4
21.	Corn	1
22.	Yam	6
23.	Coconut	6
24.	Carambola	3
25.	Orange	5
26.	Tannia	1
27.	Coffee	1
28.	Guava	1

No.	Livestock and Poultry	No. of Farmers
29.	Poultry	6
30.	Duck	1
31.	Rabbit	1
32.	Pig	4
33.	Sheep	1

No.	Agri-Industry	No. of Farmers
34.	Charcoal	1

did not affect the pineapple plant, but it destroyed all other plants by eating all the green leaves. Past attempts by the Ministry of Agriculture to control ants as well as other pests and diseases in the S.L.L.D.P. were only partly successful. Farmers had tried various home remedies, but these had also failed to curb the ant problem which could indirectly threaten the continuation of the project. The losses resulting from this situation were severe. Successfully cultivating crops on a continous basis throughout the year could have solved some of the family consumption problems and brought a small amount of farm income during the time when farmers were awaiting the sale of the pineapple crop. At the time this study was done, this system of secondary production was in jeopardy due to pest and disease problems.

Non-farm income

Of the 18 farmers who supplied information to the question of non-farm income, two had non-farm income greater than $5000 per year. Another two had incomes of less than $1000 per year. Eight farmers had non-farm income between $1000 and $2999; while another six had non-farm income between $3000 and $5000 per year.

Full-time farmers

Sixty-seven percent of the farmers in the survey were full-time farmers with those at Long Creek, Moblissa, Haruruni, Kuru Kuru and Dora being totally dependent on farm income from pineapples and other farm activities. Only 35 percent of the farmers in the survey had another job or other source of income (Table 39).

Table 39. Full-time farmers and farmers with non-farm jobs in survey.

Location	Full-time Farmers	Part time Farmers	Farmers with No other Job	Farmers with Other Jobs
Kurukururu	17	8	15	10
Long Creek	10	0	7	3
Moblissa	5	2	5	0
Yarowkabra	3	2	3	2
Madewini	0	2	0	2
Haruruni	2	0	1	1
Kuru Kuru	1	0	1	0
Dora	1	0	1	0
TOTAL	39	12	33	18
PERCENT OF TOTAL	76	24	65	35

Disguised unemployment: Empirical analysis

The second objective of this study stated in part that there was a need to ascertain what were the current levels and use of basic inputs in the production of pineapples from the S.L.L.D.P. In this section, special attention will be given to the use of labourers in the production process.

Use of Labourers in pineapple production

Pineapple production in the S.L.L.D.P. is a labour-intensive operation with the extended family providing most of the labour in the production process (see use of family labour). As a result, it is postulated that there might be a situation where there is a surplus amount of labourers in the production of pineapples. This implies that, given

land and capital fixed at some level (certeris paribus), some small proportion of the labour force could be taken away from the production process and this will not result in a reduction in the total output. This conveys the notion that the marginal productivity of the labourer over some range is zero; and, also, it implies that the quantity of labourers used over this range is the volume of the disguised level of unemployment in the production process. Figure 6[24] shows this relationship where Y is total output; L_1 is the number of labour hours where the marginal product of labour is zero; and v_1 and v_2 are the number of labourers that are utilized to produce output Y_1.

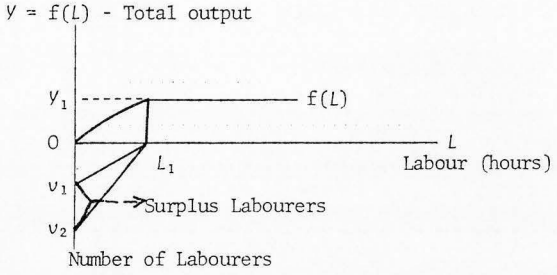

Figure 6. Extent of surplus labourers

If v_1 or v_2 units of labourers are utilized output is unchanged, despite the fact that v_2 units of labourers are larger than v_1 units of labourers. While the marginal product of labour (hours) is zero at L_1 (since farmers are rational and use the optimal number of hours for output Y_1), the marginal productivity of labourers over the range $v_2 v_1$

[24]A. K. Sen. 1968. Choice of Techniques: Aspect of the Theory of Planned Economic Development. Kelly, Fairfield, New Jersey, Chpt. 1.

is zero. This, therefore, shows that there is a surplus amount of labourers used in production to the magnitude of the difference between v_2 and v_1.

This analysis will attempt to measure this surplus, and in order to do this empirically, a production function following the productivity approach would be fitted to the data collected in the survey.

The production function

For ease of exposition and interpretation, an un-restrained Cobb-Douglas production function will be used in this analysis. The general form of this function is:

1) $Q = A\ f(T,L,K)$

Where Q is output of pineapples in pounds; A is an efficiency parameter; T is units of land where one acre is equivalent to 3 units of land; L is labour units (number of labourers producing pineapples on each farm) where 2 children equal one adult and separately are equivalent to 3 units of labour; and K is the dollar worth of hand tools that farmers utilize in the production process.

Specification of model

The specific form of the model is given by:

2) $Q = AT^{\beta_1}L^{\beta_2}K^{\beta_3}$

Where A β_1 β_2 and β_3 are fixed parameters.

Labour marginal productivity is given by:

3) $MPL = \frac{\partial Q}{\partial L} = \frac{AT^{\beta_1}L^{\beta_2}K^{\beta_3}}{L} = \beta_2 \frac{Q}{L}$

Formal Statement of the hypothesis

The hypothesis to be tested is that the marginal productivity of the labourer over some range is zero; that is:

4) H_0: $MPL = \beta \frac{Q}{L} = 0$

H_A: $MPL = \beta \frac{Q}{L} \neq 0$

If H_0: is true, the next step will be to measure the amount of surplus labour. This could be done as follows: Given a certain wage rate and invoking the marginal productivity theory, we have the value of the marginal product of the labourer equal to the wage rate; that is:

5) $Py \cdot \beta_2 \frac{\bar{Q}}{\bar{L}} = \bar{\omega}$

Where $\bar{\omega}$ is the market price for purchasing one unit of labour; $\bar{Q}$ is the geometric mean of the output and $\bar{L}$ is the geometric mean of labourers used in the production process.

The optimal quantity of labourers needed will be found by solving (5) for L; that is:

6) $L^* = Py \cdot \beta_2 \frac{\bar{Q}}{\bar{\omega}}$

The amount of surplus labour is therefore given by:

7) Surplus labourers = $\bar{L} - L^*$.

Estimation technique

Since the Cobb-Douglas function is linear in logarithms, the method of ordinary least squares with the assumptions of the classical linear regression model (Kmenta 1971) will be used to estimate the parameters in this model.

Rewriting "2" in log linear form and adding a stochastic disturbance term to account for the variation in productive capabilities

among farmers, we have:

$$8) \quad \ell n\, Q = \ell n\, A + \beta_1\, \ell n\, T + \beta_2\, \ell n\, L + \beta_3\, \ell n\, K + u_t$$

The t-test in this case is:

$$\frac{\hat{MPL} - MPL}{\text{Standard error of } \hat{MPL}} \sim t_{n-2} = \frac{\hat{\beta}_2 \frac{\bar{Q}}{\bar{L}}}{\text{S.E. of } \beta_2 \frac{\bar{Q}}{\bar{L}}}$$

The standard error of the marginal product of the labourer is estimated by multiplying $\frac{\bar{Q}}{\bar{L}}$ times the $\hat{\beta}_2$ parameter.[25]

Expected sign on the parameters

The appropriate sign on the parameters to be estimated should be positive for land ($\hat{\beta}_1$) and capital ($\hat{\beta}_3$). This implies that by using more of these two inputs, output should be expected to increase and, in turn, profit to the farmer is expected to rise. The sign on the parameter for labourers ($\hat{\beta}_2$) is expected to be negative, since if we add more labourers, output should not increase, but should remain unchanged. The result of this is that profits should decline since wages will have to be paid to the extra workers who do not make a contribution to the output produced.

Regression data

Of the 51 farmers in the survey, 45 were able to supply information on all four (4) variables (one dependent and three independent variables). After a linear transformation as set out in (1), the cross-section data of these 45 farmers are recorded in Table 40.

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[25]W. D. Hopper. 1965. Allocation Efficiency in a Traditional Indian Agriculture. Journal of Farm Economics, published by American Farm Economic Association, August.

Table 40. Output, labourers, land and capital used by 45 farmers in pineapple production in the S.L.L.D.P., 1979.

Observation Number	y Output	L Labourers	T Land	K Capital
1	3500	15.0	9.0	135.39
2	16667	24.0	7.5	110.30
3	555	15.0	10.5	100.00
4	1661	15.0	12.0	115.00
5	278	12.0	9.0	85.58
6	38000	60.0	7.5	103.48
7	4444	22.5	10.5	107.25
8	3888	33.0	30.0	260.48
9	2500	45.0	6.0	57.43
10	2700	15.0	10.5	118.59
11	2200	21.0	12.0	308.44
12	500	15.0	15.0	39.06
13	250	13.5	21.0	74.16
14	333	6.0	12.0	112.23
15	4000	24.0	9.0	176.54
16	1111	12.0	10.5	31.89
17	2000	24.0	9.0	74.43
18	5000	18.0	9.0	254.00
19	3333	45.0	12.0	116.54
20	300	12.0	4.5	137.37
21	607	6.0	12.0	49.46
22	5714	21.0	18.0	148.43
23	300	27.0	10.5	132.66
24	2400	30.0	3.0	93.59
25	600	1.5	10.5	78.66
26	190	3.0	10.5	64.81
27	2220	6.0	12.0	74.42
28	3200	21.0	3.0	38.04
29	3600	13.5	6.0	198.16
30	4400	12.0	6.0	98.81
31	833	15.0	22.5	109.52
32	1000	3.0	22.5	250.93
33	166	3.0	3.0	81.00
34	5000	6.0	9.0	137.65
35	4000	9.0	6.0	59.16
36	700	15.0	6.0	37.21
37	3000	3.0	6.0	24.71
38	1000	21.0	9.0	61.54
39	833	3.0	3.0	131.12
40	14000	30.0	10.5	93.17
41	278	3.0	10.5	105.07
42	6666	15.0	18.0	226.69
43	2700	12.0	13.5	152.23
44	4722	36.0	6.0	121.30
45	175	18.0	18.0	107.78

Regressions

Two regressions were estimated in this analysis. The first regression consisting of all 45 observations shows a picture of the total sample. The second regression consisting of the first 22 observations shows a picture of the Kurukururu area which had the largest concentration of pineapple farmers in the project and had about half of the total observations in the sample.

Result from regressions

The results from the two regression equations and the testing of the hypothesis are shown on page 89. At the 10 percent level of significance, or smaller, the results to the test showed that the marginal product of the labourers are not significantly different from zero; and this thereby supports the null hypothesis that the marginal product is equal to aero. This result implies that there is some quantity of excess labourers in the production process and that over some range the contribution to output by this surplus labourers is zero. A measurement of this surplus amount of labourers will now be made.

Wage rate

Farmers in the S.L.L.D.P. hire labourers on the basis of "job-work;" that is, a contractor agrees with the farmer to do a certain amount of work for a specific amount of money. Payment is therefore not made by the hour, but rather by a "piece-rate." Referring to Table 35, the wage needed to produce one acre of pineapple is $485.00. The labour cost for one unit of labour is $161.67 since 3 units of labour is required to produce one acre of pineapple.

Regression Data for Project

$$Q = 4.25601 + .733489 \log T - .387564 \log L + .461185 \log K$$

S.E. = (1.44114) (.202289) (.331269) (.319083)

T - statistic = (2.95323)(3.62643) (-1.16994) (1.44535)

$R^2 = .3007$; $\bar{R}^2 = .2674$; $D \cdot \omega = 2.2663$ $N = 45$; $F = 5.8759$.

$Q_{G^{45}} = 1616$; $L_{G^{45}} = 9$

$$\hat{MPL}_{45} = \hat{\beta}_2 \left[\frac{\bar{Q}}{\bar{L}}\right] = .387564 \left[\frac{1616}{9}\right] = 69.59$$

Standard Error of $\hat{MPL}_{45} = .331269 \left[\frac{1616}{9}\right] = 59.48$

$$t = \frac{69.59 - 0}{59.48} = 1.17$$

Regression Data for Kurukururu

$$\tilde{Q} = 1.36776 + 1.56174 \log T - .253158 \log L + .49629 \log K$$

S.E. = (2.10818) (.371345) (.513932) (.373703)

T- statistic = (.648789)(4.20505) (-.49259) (1.27452)

$R^2 = .5750$; $\bar{R}^2 = .5145$; $D \cdot \omega = 2.0855$ $N = 22$; $F = 8.11754$

$\tilde{Q}_{G^{22}} = 1868$; $\bar{L}_{G^{22}} = 11$

$$\hat{MPL}_{22} = \hat{\beta}_2 \left[\frac{\tilde{Q}}{\bar{L}}\right] = .253155 \left[\frac{1868}{11}\right] = 42.99$$

Standard Error of $\hat{MPL}_{21} = \frac{1868}{11} (.513932) = 87.27$

$$t = \frac{42.99 - 0}{87.27} = 0.49$$

Measure of surplus labourers

Given that one unit of labour costs $161.67 and using the marginal productivity theory as shown in "5" and "6" we have for the regression of 45 observations:

9) $L^* = \frac{\$.18\ (.387564)(1616)}{\$161.67} = .70$

10) Surplus labourers = 9 - .70 = 8.30 labour units

For the regression of 22 observations we have:

11) $L^{**} = \frac{\$.18\ (.253158)(1868)}{\$161.67} = .53$

12) Surplus labourers = 11 - .53 = 10.47 labour units

Given the average quantities sold for the project and for Kurukururu, it turned out that less than one labourer would be required to produce this output. However, since labourers cannot be bought in parts (not continuous), one labourer per average acreage cultivated on each farm would be optimal for the project and Kurukururu. The project, therefore, has on the average 2 surplus labourers on each pineapple farm $\left(\frac{7.30}{3} = 2.43\right)$; while the Kurukururu area has on the average 3 surplus labourers on each farm $\left(\frac{9.47}{3} = 3.16\right)$.

Policy implications

The classical recommendation states that surplus labourers should be moved to other areas of employment where these surplus labourers could make a positive contribution to output. In the case of the S.L.L.D.P. where farmers were not utilizing all their land (only 33 and 35 percent of land were utilized in 1978 and 1979, see Table 22), efforts should be made to encourage farmers to increase output by providing a profitable market for farm output.

Marketing

Marketing channel

In Guyana, the marketing channel for agricultural produce, excluding rice and sugar cane, is still to be developed to the point where bottleneck situations do not inpinge upon the smooth movement of produce from farms to fresh and processed markets. Usually, farmers are not only exposed to transportation and distribution problems, but they are also hindered in the market due to the inadequate use of non-existence of the following facilities:

1) Limited storage and processing facilities;
2) Lack of standardization and product differentiation;
3) Poor market intelligence; and
4) Institutions for risk bearing and financing hardly ever conduct business with farmers who produce crops other than rice and sugar cane.

Spoilage reaches astronomical proportions during the peak marketing season, since there are hardly any facilities to level out the seasonal variation in supply and thereby making it more responsive to market demand. One result is that there are severe gluts/shortages which lead to relatively low/high market prices at times when farmers cannot respond in an optimal manner to the market demand conditions. Pineapple farmers in the S.L.L.D.P. are no exception to this bottleneck situation in the marketing channel, although the degree to which it affects these farmers is more acute for some than for others.

Market channel for pineapple from the S.L.L.D.P.

Pineapple farmers have at least two different ways to introduce their pineapples into the marketing channel. They can either sell at the farm gate or transport their pineapples to the main consuming and processing areas.

Buying and selling at farm gate

The type of buyers who purchased pineapples at the farm gate were wholesalers, mainly processors. Also, there were a small number of consumers who bought a few units under retail conditions. Wholesalers purchased pineapples on a per pound basis; while consumers purchased pineapple on a price per unit basis. Most of the trading at the farm gate took place at open air buying points along the highway or at precise locations within the project. The farm gate buying points, which were established by farmers and Guyana Marketing Corporation (G.M.C.) purchasers, were located in the following areas:

--At Kurukururu: G.M.C. had one buying point and it was located in the project administration compound.

--At Long Creek: G.M.C. had three buying points along the portion of the highway in the Long Creek area.

--At Kuru Kuru: The G.M.C. buying point was at the Kuru Kuru College which was one-quarter of a mile off the highway.

Private purchasers also used some of these buying points when the G.M.C. purchasers were not using them.

Alternative farm gate buying points were at the farm residence of the pineapple farmer or on the highway, a location the farmer chose himself. Those purchasers who went to the farm were generally private

purchasers, while those who purchased from farmers on the highway were consumers traveling to Linden or Georgetown.

Buying and selling in consuming areas

In the consuming areas, Linden and Georgetown for example, farmers sold to hucksters or market vendors under wholesale conditions; and they, in turn, sold at retail per unit prices to consumers. Also some farmers sold directly to consumers. Most trading between farmers and hucksters, farmers and consumers, and hucksters and consumers were staged in the municipal markets. Farmers and hucksters also sold their pineapples to processors in municipal markets or at processing plants of processors.

Role of G.M.C. with pineapple farmers in S.L.L.D.P.

Although the G.M.C. was no longer responsible for purchasing pineapples from the S.L.L.D.P. (Guyana Pharmaceutical Corporation [G.P.C.] had become the marketing agent in February, 1979), the marketing channel and its problems could only be analyzed if the contribution the G.M.C. made were included in this discussion. The G.M.C. was responsible for marketing pineapple as well as other crops produced in the project from the time the S.L.L.D.P. was inaugurated in 1968.

Problems in marketing channel

In the initial stages of the project, the G.M.C. might have had an adequate marketing system to meet the needs of all farmers in the S.L.L.D.P. However, as the total output of pineapples began to increase (Table 41) farmers in the project became dissatisfied with the marketing services offered by the G.M.C., and although 41 percent of the farmers in the survey sold some of their pineapples to G.M.C., many had at least

Table 41. Annual production of pineapples in Guyana; percent of annual production purchased by G.M.C. and average prices paid by G.M.C. for period 1974-1978.

Item	1974	1975	1976	1977	1978	1979
Total Production in Guyana (Pounds)	3,001,500	3,001,500	3,901,500	4,198,500	3,600,000	N.A.
Purchases[a] By G.M.C.	403,191	852,702	710,593	1,221,492	469,388	56,457[b]
Percent of Purchases by G.M.C.	13	28	18	29	13	N.A.
Value of Purchases by G.M.C.	$40,824.49	$100,291.06	$86,577.00	$143,796.00	$58,353.90	$7,903.98
Average Price Paid to Farmers (per pound)	$0.10	$0.12	$0.12	$0.12	$0.12	$0.14

Source: Ministry of Agriculture and G.M.C., Guyana

[a]Purchases by G.M.C. includes production from the S.L.L.D.P. as well as from other areas in the country.

[b]Purchases in 1979 were for period May through June; after June, the G.M.C. did not buy pineapples from the S.L.L.D.P. any more; G.P.C. took over. The G.M.C. still, however, bought from other areas.

one additional outlet either in the municipal markets[26] or with private buyers. Some of the more frequently advanced reasons for not wanting to trade with the G.M.C. were:

1) The G.M.C. purchasers were not dependable since on many occasions they never came to buy the pineapples and farmers were left stranded on the highway.

2) The price the G.M.C. paid was too low. In 1979, the farm gate price paid by G.M.C. was 14 cents. The cost of production for the typical farmer was 18 cents at the farm gate. In light of this situation, farmers preferred to sell first of all to private processors, since they (farmers) were able to make a net return of 4 cents per pound. (Private buyers paid 22 cents per pound of pineapple at the farm gate).

3) The G.M.C. payment process was slow. Farmers complained of waiting 2 to 3 weeks before payment was made. The competitors of G.M.C. paid for the pineapples at the time of sale.

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[26]The four municipal markets of concern are the La Penitence Market which is approximately 26 miles from the project, the Stabroek Market which is about one mile from the La Penitence Market, the Bourda Market which is about eight-tenths of one mile from the Stabroek Market, and the Kitty Market which is about three miles from Bourda Market. At Bourda Market, a farmer using a market stall 4 feet by 4 feet pays 60 cents per day plus for every ten dozen of agricultural produce, a charge of 10 cents is added. This additional charge is determined not by weighing the produce, but by on-sight assessment by the market constable who collects the rent. Farmers who have a daily stall at the market are charged a weekly rate of $2.54.

Bourda Market, which was built in 1860 to relieve the congestion caused during the re-building of Stabroek Market, got its name from a Frenchman, Joseph Bourda, who lived and died in Guyana in 1798. The market opens Sunday--6 A.M. to 8 A.M., weekdays--7 A.M. to 4 P.M., and on public holidays--7 A.M. to 10 A.M. Pineapple farmers do not sell from within the market, but from the adjacent areas around the market and especially on the "Bourda Green," an open area of about 202,500 square feet. Similar conditions hold for the other municipal markets except that they do not have adjacent to them large open spaces like the Bourda Green.

4) The G.M.C. rejected too many pineapples due to the grading system that was used up until 1978. Also, the G.M.C. did not buy damaged or ripe pineapples. Private buyers accepted all pineapples since they did not use a grading system. G.P.C., on the other hand, had a 10 percent limit for ripe pineapples in the quantity they purchased from each farmer. If a farmer persisted in trying to sell G.P.C. ripe pineapples, G.P.C. had promised to stop purchasing pineapples from that farmer. The optimal marketing time for G.P.C. was that the pineapples should be available within 3 to 4 days after harvesting; otherwise, the pineapples might be rejected since ripe pineapples were not suited for processing.

5) The G.M.C. did not want to buy pineapples that were larger than 4 pounds since the cups on the processing equipment were damaged whenever these pineapples were placed on the product line. G.M.C. competitors, on the other hand, did not have this problem.

6) The G.M.C. did not have enough trucks nor a marketing program suited to the needs of pineapple farmers. For example, G.M.C. used one truck which could carry only 15,000 pounds of pineapples. The average farmer in the survey had approximately 5.911 acres cultivated with pineapples and from each acre sold 762 pounds. Given that G.M.C. only made four trips per week (two on Monday and two on Wednesday) at least 37 farmers in the survey would have had to seek alternative means of transportation or they would have incurred losses since the truck had a total capacity of 60,000 pounds per week. Also,

the pineapples which were acceptable on Wednesday, but were not purchased by G.M.C., turned ripe by the following Monday and became rejects according to the G.M.C. standards.

A basic need of a marketing system

A crucial service needed by any marketing system is knowing what quantities to expect on the market prior to harvesting. Market information on the total supply in any season before harvesting begins, allows processors to organize their processing capacities as well as to arrange the optimal number of transport vehicles that will be needed to move the crop off the farm and into the market. In the sugar and rice industries in Guyana, this service is provided for both of these crops. In other agriculture, however, this service is still to be developed. Therefore, the G.M.C., as a major purchaser of pineapples from the S.L.L.D.P., could not arrange an appropriate transportation program. In consequence, the market intelligence on the timing and expected total crop in the season was poor and, therefore, the marketing channel was forced into bottleneck situations. This in turn caused heavy spoilage and wide fluctuations in market prices over the season. The average monthly prices between March and June (4 months) changed downwards by as much as 31 percent during the peak in the marketing season (Table 36). This implied that the average price in March ($2.70 per unit) was more than 3 times higher than the unit price in June ($.85 per unit).

Selling preference by farmers and vertical integration

In the survey, 21 farmers said they sold their pineapples to G.M.C. Fifteen others preferred hucksters while another 11 preferred G.P.C.

One farmer in the survey not only had his own transportation but also had his own outlet. This made his farm operations totally integrated since he had control of all the activities from the farm to the time he sold to the consumer in the fresh fruit market. To be totally integrated, however, all a farmer needed was to have his own transportation. Only 14 percent of the farmers in the survey had their own transportation. Of these, five of them sold directly to consumers in the fresh markets, while two others sold to G.P.C. and G.M.C. as well as in the municipal markets. The other farmers in the survey, who did not have their own transportation (86 percent), spread themselves among varying combinations in the market. The most popular combination was the G.M.C. buying point in the project, and private hucksters who also came to the project area (Table 42). Combinations in the market could be seen as farmers wanting to maximize their revenue as supply and price changed in the market. It is interesting to note that one farmer who had his own transportation

Table 42. Location preference in marketing combinations by farmers in survey.

Location Preferences	No. of Farmers
1) G.M.C. buying point and Hucksters buying at Farm	4
2) G.M.C. and Highway	1
3) G.M.C. and G.P.C.	2
4) G.M.C. and Bourda Market	2
5) G.P.C. and Bourda Market	1
6) G.P.C. and Berbice area	1
7) G.M.C., G.P.C. and Stabroek Market	1
8) G.M.C., G.P.C. and Hucksters	1

went as far as Berbice, about 100 miles from the S.L.L.D.P., to sell his pineapples.

The farmer, who was from this area, said that the normal distribution of pineapples did not reach this far, since most of the pineapples were sold in Georgetown and Linden. As a consequence, the other towns, New Amsterdam, Rosehall and Corriverton, were left out of the distribution pattern. The population in these five towns is shown in Table 43.

Table 43. Population in five towns, Guyana, 1973.

Towns	Population
Georgetown	167,078
New Amsterdam	18,199
Linden	29,000
Rosehall	8,000
Corriverton	17,000

Source: Ministry of Information: Guyana in Brief, July 1973, p. 3.

A distribution pattern that included these towns would certainly decentralize the supply and prevent the wide fluctuations in prices during the glut period in the market.

Location of largest sales

Thirteen farmers sold their largest quantity at the farm while ten others had their largest sales at the G.M.C. buying point (Table 44).

Mechanical damage to pineapples

Pineapple is a very bulky and perishable commodity. Any rough or

Table 44. Location of largest sales by farmers in survey.

Largest Sales at:	No. of Farmers
Farms	13
G.M.C. Buying Points	10
G.P.C.	8
Bourda Market	5
Highway	3
Linden	2
Stabroek Market	2
Own Outlet	1
New Amsterdam	1
No Sales Yet	6
TOTAL	51

excessive handling would cause some degree of mechanical damage to the fruit. The packaging technique used by farmers in the S.L.L.D.P. caused a great amount of mechanical damage to the pineapple fruit after it had entered the marketing channel. No data were available on the extent of mechanical damage in the marketing channel, but it would appear that pineapples transported in vans, open trailers and truck trays, reached the market in much better condition than pineapples transported in jute bags and baskets.

Packaging of pineapples

Jute bags, which are associated with the rice industry, were used by farmers to package the pineapple fruit for the market. In the survey, 76 percent of the farmers used jute bags and baskets, while the remaining 24 percent used open trailers, truck trays and vans. On the farms where

jute bags were used, approximately 30 pineapples, weighing about 100 pounds, were packaged in a jute bag. Each bag was then stacked one on top of the other in an open trailer or truck and taken to the fresh market where the pineapples were sold.

The result from this packaging system was that many pineapples were crushed before they reached the market. This caused the crushed fruit to lose its aesthetic appeal to consumers on the fresh market, and, in turn, a loss of income to the farmer who had to either reduce his price or, as in many instances, had to throw away the crushed pineapples. This was, indeed, a waste of resources. Wooden boxes were tried, but the cost and maintenance expenses were relatively high and this alternative had to be shelved.

Lack of storage facilities and its effects

Mention was made previously to the unavailability of storage facilities suitable for pineapples. G.M.C., private purchasers and farmers in the S.L.L.D.P. did not have any refrigeration facilities suitable for pineapple storage. Consequently, when G.M.C. bought pineapples, their main objective was to have the pineapples sold as quickly as possible. A portion of the pineapples were sold to the hucksters and consumers through the G.M.C. outlets. Some were sold in bulk to large buyers like hospitals, police departments and the Guyana Defence Force. And, at times of a good harvest, some of the pineapples were sold in areas just outside Georgetown.

The major weakness of this program was that since storage was not available, the quantity supplied in the fresh market was never really reduced, and this caused further pressure to be put on market prices.

Refrigeration facilities would allow the pineapple to store relatively well from two to six weeks, once the temperature and relative humidity were kept constant over the period. Refrigeration facilities would certainly stabilize prices in the fresh market and, this in turn, would give more control over the glut period in the market.

Contracting and selling time

Eighty-six percent of the farmers were interested in contractual agreements, but hastened to add that the price they would accept must be at a level where they could cover their cost of production and make a profit; otherwise, the contracts would be rejected. At the time the survey was made, there were oral agreements between private buyers and farmers. Not every farmer had to meet the buyer; only one or two farmers arranged the time and price of sale with the buyer. These two farmers then informed the others, and if interested, they brought their pineapples to a central location and the purchase was completed. The buyer received the pineapples and the farmers their cash.

Also included among the group who were willing to contract their pineapples were farmers who sold in the municipal markets and on the highway. One benefit of contracting would be a reduction in the level of uncertainty in the marketing channel as well as a reduction in time and effort utilized to sell a few pineapples. Half of the farmers in the survey completed their sale in one day (about 8 hours). Another 8 percent took about one hour to sell their pineapples to private buyers.

Farmers selling in the municipal markets (8 percent) in the retail trade took about 3 days to complete this activity. Usually, these farmers would travel by bus on Thursday to the market and would return

on Saturday to the S.L.L.D.P. The weekend period, Thursday through Saturday, was the most active time in the municipal markets. Many farmers brought their produce to sell and they traded with a relatively large number of consumers, who, if they could bargin well, ended up being better off than the farmers who had no facilities in the fresh market to store their produce for long periods. Over the whole marketing season, however, this type of market-play was the closest the fresh market came to perfect competition.

Farmers, who used the bus to travel to the Municipal Market, could sell at most four bags or 160 pineapples. At an average price of 85 cents, total income was $136. Given that transportation, production, and labour costs (selling time) had to be deducted from this amount, most of the farmers who could not arrange their own transportation were considering contracting as the next best alternative.

Farmers who sold on the highway were worse off than other farmers in terms of the time they utilized to sell a small quantity of pineapples to travelers passing on the highway. No data were available for this activity but it would appear that the costs would have been greater than the benefits to farmers using the highway as a market.

Farmers not in favor of contracting

Those farmers who were not interested in contracting (14 percent) had their own transportation and disposed of their pineapples efficiently. They wanted no dealings with a third party, since the direct contact with consumers gave them larger profits.

Processing Market

The processing of agricultural produce has rendered the following

services for agriculture:

First: It has extended the marketing life of many perishable commodities, and it has reduced the range over which agricultural produce would have become unpalatable under normal marketing conditions.

Second: Agricultural produce in its raw state is a homogenous commodity with very limited uses for consumers. Processing has changed this mainly through product differentiation, and this in turn has resulted in a wide range of consumer goods.

Third: Processing has allowed agricultural produce to be transported to locations where resource endowments in those areas did not allow the production of certain kinds of agricultural produce.

Keeping in mind these three services to agriculture, processing could therefore be viewed as part of the economic concepts related to providing time, form and place utilities.

Agricultural processing in Guyana

A cursory look at agricultural processing in Guyana would show that time, form and place utilities have been created. However, the extent to which they are utilized in the marketing channel have a lot of scope for further development.

Resulting from the traditional approach to agriculture, the processing of many types of agricultural produce were, and still, to some extent, carried out mainly in the home.

If processing did not take place in the home, and if processed agricultural produce were not imported into the country, then the probability of obtaining it from the market place was nearly zero since there was hardly any commercial processing done in the domestic market.

This approach caused the fresh market to become the primary market, supplying fresh produce for immediate use and home processing.

What this implied was that no distinction was made at the farm level to separate the fresh market from the processed market. The marketing of pineapples had a similar system and it was on this basis that this analysis was made.

Pineapple processing in Guyana

Prior to the establishment of the S.L.L.D.P. several attempts at processing pineapples were made by both public agencies and private firms from as early as 1947. For the period 1949-1953, more investigations were carried out to determine if it would be feasible to process pineapples. These early attempts were all terminated before any progress was made.[27]

In the late seventies, more studies were made and construction began on a pineapple processing plant in the Soesdyke/Linden area. This construction, however, was stopped and only the facilities at G.M.C., a few private firms and home processors carried on the work in the processing section of the market. As the output of pineapples from the S.L.L.D.P. began to increase, the fresh and processed markets, which were highly localized, lacked the dimensional magnitudes of time, form and place utilities. Spoilage reached astronomical proportions despite the presence of a few pineapple processing plants in the marketing system. Because processing required a certain quality of produce, some farmers were unwilling to leave the fresh market since rigid standards

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[27]"Technical Report on Pineapples." Ministry of Agriculture, Guyana (Memo).

did not make up a significant part of the trade between consumers and farmers in the fresh market. In consequence, pineapples that processors rejected in the wholesale trade were still acceptable to some consumers at lower prices in the retail trade. Under these circumstances, the typical farmer often chose the fresh market since the chances of selling all of his pineapples was much greater there than in the processed market. While the retail trade still offered a price for damaged pineapples, processors, on the other hand, gave no value to damaged pineapples. An interesting case occurred when G.M.C., which was charged with the responsibility of buying pineapples and other produce at guaranteed prices (fixed by government), found that it purchased most of its pineapples during the glut period, or when the pineapples were nearly ripe. The implication of this was that some farmers opted for the G.M.C. price only when the price consumers were willing to pay was lower than the price offered by G.M.C. Farmers were therefore trying to maximize their total revenue by shifting between the uncontrolled market price and the G.M.C. fixed price as the market demand and supply conditions changed over the season. The result of this was that G.M.C. was a last resort buyer who had no control over the supply it received. Private processors also had no control over the supply; but unlike the G.M.C., they could wait for the glut period and low market prices and then make purchases in a buyer's market.

Supply problems and its effects

Because processors had no control over the supply of pineapples, their processing operations could not be planned in an efficient manner. The result was that processing was carried out on flexible production

lines, which had a relatively small amount of specialized capital equipment combined with a high proportion of labour-intensive inputs. Because of the uncertainty in pineapple supplies, processors had operations set to process a variety of farm produce as the seasonal supply of the different crops came on the market. Flexibility, under these circumstances, justifiifed the type of operations that processors utilized. However, a major setback with this was that the "Marketing Margins" on processed pineapple products were relatively high while the farmer's share of the consumer dollar was relatively low. The "marketing margin" on two pineapple products will be measured in the next section.

Definition of marketing margin. "Marketing margin" is defined as the difference between the amount consumers pay for the final product and the amount producers receive. This margin includes all the cost of moving the product from the point of production (farm gate) to the point of consumption.[28]

Measure of pineapple marketing margin

The marketing margin and farmer's share of the consumer dollar on a per pound basis on two products (pineapple juice and pineapple jam) are shown in Table 45. It was assumed that the cost per pound of pineapples at the farm gate was 18 cents.

The marketing margin on pineapple juice was $2.77 per pound while the farmer's share was 6 percent of the consumer dollar. On pineapple jam, the marketing margin was $3.25 per pound and the farmer's share was 5 percent of the consumer dollar. What this implied was that farmers

[28]Kohls and Downey, p. 100, 104.

Table 45. Estimate of marketing margin and farmer's share of consumer dollar on pineapple products in Guyana, 1979.

Items	Size		Retail Price
	ozs.	lbs.	Dollars
Pineapple Juice	19	1.1875	3.50
Price per lb.	16	1.00	2.95
Farm gate price	16	1.00	.18
Marketing Margin per lb.			2.77
Farmer's share of consumer dollar (percent			6
	ozs.	lbs.	Dollars
Pineapple Jam	21	1.3125	4.50
Price per lb.	16	1.00	3.43
Farm gate price	16	1.00	.18
Marketing Margin per lb.			3.25
Farmer's share of consumer dollar (percent)			5

Source: Derived from data supplied by G.P.C. 1979

only received 21 cents on every 19 ounce tin of pineapple juice purchased by the consumer while the marketing margin was $3.29, and on pineapple jam weighing 21 ounces, the farmer received 23 cents with the marketing margin being $4.27. What proportion of the marketing margin went to the different processing activities were not known. However, it would appear that labour cost and processing waste would have been high since the peeling of pineapples was done manually. Also, the cost of containers, transportation and packaging material as well as energy cost could have made up a substantial part of the marketing margin.

Contracting pineapple supplies so that better capacity planning and capital inputs could be used would reduce the wage bill and waste caused by manual processing methods. Also, instead of using disposable containers, more use could be made of containers that could be returned to processors after passage in the marketing channel. Adopting these methods would reduce the marketing margin, increase the farmer's share of the consumer dollar, and greater efficiency could be attained in the marketing channel. In Table 46, it is shown that there appears to be an inverse relationship between the different sizes of containers and the ex-factory price. As the size of the container increases, the average cost per ounce appears to decrease. If this is truly representative of current operations, then larger containers will indeed make a contribution towards reducing the marketing margin. However, the extent to which the size of the containers could be expanded would be limited by the magnitude of the retail prices and the price elasticity of demand for these products.

Table 46. Average cost per ounce of pineapple products, Guyana 1979.

Pineapple Product	Size	Ex-Factory Price	Average Cost per ounce
	Ounces	Dollars	Dollars
Juice	14	2.23	.16
Juice	19	2.65	.14
Jam	12	2.91	.24
Jam	16	3.09	.19
Jam	21	3.41	.16
Jelly	12	2.28	.19
Jelly	16	2.42	.15
Jelly	20	3.00	.15

Source: Derived from data supplied by G.P.C., 1979

Competition

Processing at the present time is carried out by private business and public corporations. The majority of private processors worked under commercial conditions while the remainder were made up of home-processors. The relative shares of each group in the market was not known; but it could be expected that the commercial operators would have a greater proportion of the total market. On the other hand, home-processors, who hardly used commercial standards, produced the same kinds of products at cheaper prices than their commercial competitors and were also able to maintain the traditional style and home-made taste in their products.

Imports and substitutes and exports of pineapple products

Demand in the market could also be influenced by imports of the same kinds of products or by substitutes produced in the domestic or

foreign markets. Over the last decade imports of pineapple products and substitutes peaked at G$2.3 million in 1976 and has since been declining due to import restrictions resulting from foreign exchange difficulties (Table 47). In spite of this shortfall in supply in the domestic market, producers were not able to take advantage of this situation because they were not properly organized. Part of the export market was lost due to supply problems and marketing difficulties. The decline in exports from 1974 to 1976 are recorded in Table 48. More than 80 percent of these exports were to the Caricom[29] group of countries and the remainder mainly to the United Kingdom and the United States.

By-products

There are several opportunities for the use of by-products from pineapple waste. For example, pineapple bran could be made from the wet pulp after the pineapple juice has been extracted. This by-product, which could be fed to dairy cows, pigs and chickens, could replace part of the grain intake by these animals.[30] Some of the larger producers in other countries have experimented with the making of sugar-syrup from mill-juice, and have made alcohol by using a fermentation process. Biogas, another by-product, could be made from the stems, leaves and other waste material. Presently in Guyana, waste material is not utilized because of the scale of processing operations and the uncertainty in

[29]Caricom was formed in 1973. Some of the member countries are: Barbados, Belize, Guyana, Jamaica, Trinidad and Tobago, Antigua, Dominica, Grenada, Montserrat, St. Kitt's, St. Lucia and St. Vincent. A main objective is to strengthen and coordinate economic made relations among member states; and to achieve greater measures of economic independence.

[30]R. W. Stanley, S. M. Ishizaki and F. Sumintawidjaja. 1976. "Local By-Products as Feeds for Dairy Cattle." Research report 232, University of Hawaii.

Table 47. Imports of fruit and vegetable juices and preserved fruits and vegetables, Guyana, 1974-1978.

Commodity	1974		1975		1976		1977		1978	
	Quantity	Value G$	Quantity	Value G$	Quantity	Value G$	Quantity	Value G$	Quantity	Value G$
Grapefruit Juice	7,353gal	$35,994	17,320gal	$93,260	23,545gal	$135,593	--	--	--	--
Orange Juice	53,914gal	$270,761	49,029gal	$472,571	80,633gal	$924,688	3,020gal	$39,048	55gal	$1,668
Other fruit Juice	61,420gal	$477,453	98,902gal	$725,564	84,580gal	$964,592	136,562gal	$758,736	15,878gal	$152,677
Tomato Juice	36,313gal	$233,251	34,143gal	$240,574	18,368gal	$175,546	121,781gal	$371,990	5,320gal	$13,530
Other Vegetable Juices	4,677gal	$26,225	442gal	$3,760	--	--	5,003gal	$15,422	N.A.	$2,103
Preserved Pineapples	2,850gal	$3,674	1,500lbs	$2,156	--	--	801bs	$300	--	--
Other Preserved Fruits	--	--	4,193lbs	$16,136	11,742lbs	$49,442	100lbs	$328	--	--
Jam, Jellies and other Fruits	--	--	122,750lbs	$51,484	13,770lbs	$19,368	18,503lbs	$51,675	--	--
TOTAL		$1,047,358		$1,605,505		$2,269,229		$1,237,499		$169,978

N.A.- Not available

Source: Statistical Abstract, Ministry of Economic Development, 1974-1978.

Table 48. Exports and re-exports of pineapple products, Guyana 1974-1976

Commodity	1974 Quantity/Value G$	1975 Quantity/Value G$	1976 Quantity/Value G$
Pineapple Products	50,585lbs $27,017	36,999lbs $16,819	2,042lbs $1,273

Source: Statistical Abstract, Ministry of Economic Development, 1974-1976.

pineapple supplies to processors. In the survey, however, about 8 percent of the farmers were making vinegar and pineapple wine for home use.

Pineapple bran would seem to have a ready domestic market as a compliment to the regular farm feeds since there always seem to be a shortage of feeds for livestock and poultry.

International production and marketing of pineapples

Objective three in this study was to compare the production and marketing techniques of pineapple farming in the S.L.L.D.P. with the production and marketing techniques from other locations. Since Guyanese pineapple producers used labour intensive techniques, it was necessary to look at production techniques in other countries.

Production and marketing in other countries[31]

Production techniques in many of the leading producing countries were highly capital intensive and automated. In some countries, such as the U.S.A. (Hawaii), Taiwan, Kenya and Thailand, production was

[31]United Nations. 1976. "Recent Trends in Canned Pineapple Market." Monthly Bullentin of Agricultural Economics and Statistics, F.A.O. of the U.N., volume 25, May, p. 24-30.

standardized and farmers cultivated only the smooth Cayenne variety which had advantages in processing and acceptability in all of the international markets. Instead of seasonal production practices, production and processing were carried out simultaneously due to utilization of irrigation systems and induced flowering techniques. This allowed a rotation practice which in turn gave a constant flow of pineapples to the processing plant throughout the year.

Unlike Malaysia, where production was organized through family type farms, production was usually organized along plantation style operations, utilizing extensive cultivation practices (Hawaii). Ownership and management practices were exercised through national subsidiaries (in the Philippines, for example), or production was contracted (Kenya) so that international quality specifications were maintained. In Malaysia pineapple production has been declining over the last decade due to some pineapple farmers switching to more profitable crops or moving to urban areas and forgetting farming entirely.

In some countries, production was geared mainly for export. Countries in this group were the Philippines, Thailand, Malaysia, Taiwan, Ivory Coast, Kenya, Mexico and South Africa. Exports from some of the major producing countries are shown in Table 49. In other countries, Australia, for example, production was geared for use in the domestic market. One reason for this was that producers in Australia could not compete in the international market because there were some elements of monopolistic competition.

Producers in some countries had guaranteed markets. Examples of these were Martinique and Guadeloupe, two French colonies. Most of the pineapples were sold through outlets in France. Some of the

Table 49. World exports of canned pineapple products,[a] by region and main producing countries, 1966-1969 average and 1970-1975.

Region Country	1966-68 Average	1970	1971	1972	1973	1974	1975 (preliminary)
	Metric tons						
NORTH AND CENTRAL AMERICA	62,216	64,825	62,161	61,698	64,507	46,624	36,000
France (Martinique)	7,710	10,778	7,247	7,202	8,060	7,944	8,000
Mexico	22,570	22,933	26,192	22,150	20,720	18,470	13,000
United States (Hawaii)[b]	31,936	31,114	28,722	32,346	35,727	20,210	15,000
ASIA	232,306	260,980	274,757	259,837	230,621	256,670	235,000
China[c]	80,076	79,195	84,587	74,427	69,408	45,500	35,000
Malaysia and Singapore	63,457	69,980	62,930	64,500	56,280	55,670	40,000
Philippines	77,145	98,165	116,770	108,274	90,923	125,000	125,000
Thailand	11,628	13,640	10,470	12,636	14,010	29,500	35,000
AFRICA	77,655	82,110	92,151	110,634	112,223	117,300	129,000
Ivory Coast	22,074	27,276	36,346	44,800	51,670	59,500	65,000
Kenya	6,379	7,465	10,805	9,734	13,353	15,000	20,000
South Africa	49,202	47,369	45,000	56,100	47,200	42,800	44,000
OCEANA							
Australia	9,772	6,589	5,284	3,670	3,760	2,880	2,600
TOTAL	381,949	414,504	434,353	435,839	411,111	423,474	402,600

[a]Excluding juice

[b]Excluding internal shipments

[c]Including Taiwan Province

Source: Monthly Bulletin of Agricultural Economics and Statistics, F.A.O. of the U.N., May 1976.

importing countries, like those in the European Economic Community (E.E.C.), had quotas on the type of pineapple products that were imported. The largest producing country in the mid-nineteen seventies was the U.S.A. (Hawaii). The second largest was the Philippines. Since that time, these two countries had reversed position since some producers in Hawaii were shifting to the Philippines, Thailand and Kenya. The shift by some producers in Hawaii resulted from increasing labour and land costs. The largest importer was the Federal Republic of Germany which averaged 60,613 metric tons for 1966-1969 and for period 1970-1975 averaged 75,523 metric tons per year.

Production and marketing of fresh pineapples: A special case study

It was pointed out earlier that production practices were very capital intensive. A description of this will now be given by looking at a specific farming operation in Hawaii.

Assumptions of case study. Phillips and Baker (1975) did a cost of production study on fresh pineapples for the Maunaloa Company on Molokai, a Hawaiian Island. The main assumptions of the study were:

1) Production occurred on 600 acres of land on a 3 year production cycle; and that an even amount of fresh pineapples could be produced and marketed each year.

2) Twenty-three thousand plants were planted on each acre and the expected yields were 40 tons for the plant crop and 30 tons for the ratoon crop giving a total of 70 tons. From this total of 70 tons, 52.5 tons were harvested; the rest was assumed to be damaged. In the packing stage, another

2.5 tons was discarded as unfit for the fresh market, thus leaving 50 tons for sale on the fresh market.

Farm management practices and processing capacity. Table 50 contains a schematic presentation of the calendar operations. The first 20 acres (P_1) were planted in October 1975 and the last 20 acres (P_{30}) were planted in August 1976. Over the period October 1975 to August 1976, 30 plantings of 20 acres each were made, giving a total of 600 acres. Harvesting of the first 20 acres (P_1) now shown as H_1 occurred 18 months after in May 1977. Thirteen months later, the ratoon crop (R_1) which grew upon P_1 was harvested. This same pattern holds for the other plots over the 3 year cycle. In the area of processing, full capacity was set at 40 acres or 2000 tons per month. This was made up of 20 acres of plant crop and 20 acres of ratoon crop. The first full capacity operations ($H_{12}R_1$) occurred in June 1978. Before June 1978, only 20 acres were processed every month since no ratoon crop was ready for harvesting.

Cost of production and marketing

The production and marketing cost of 50 tons of pineapples from one acre of land are shown in Table 51. The cost per acre was set at $6,402 or $128 per ton. The most expensive operations were packing and harvesting. These two activities contributed more than 69 percent of the total cost per acre.

Differences in the use of inputs

Apart from the service costs that were listed in Table 51 (Activities 10 to 12 and 14 to 16), the most important inputs which influence production were not used by farmers in the S.L.L.D.P. Pineapple farmers

Table 50. Calendar of planting and harvesting of plant crop and ratoon crop of Maunaloa Company, October 1975 through April 1981.

Month	1975	1976	1977		1978			1979				1980		1981		
Jan.		P_4	P_{14}		P_{24}	H_8		P_4'	H_{18}	R_7	P_{14}'	H_{28}	R_{17}	P_{24}'	H_8'	R_{27}
Feb.		P_5	P_{15}		P_{25}	H_9		P_5'	H_{19}	R_8	P_{15}'	H_{29}	R_{18}	P_{25}'	H_9'	R_{28}
Mar.						H_{10}			H_{20}	R_9		H_{30}	R_{19}		H_{10}'	R_{29}
Apr.		P_6	P_{16}		P_{26}			P_6'		R_{10}	P_{16}		R_{20}	P_{26}'		R_{30}
May		P_7	P_{17}	H_1	P_{27}	H_{11}		P_7'	H_{21}		P_{17}	H_1'				
June		P_8	P_{18}	H_2	P_{28}	H_{12}	R_1	P_8'	H_{22}	R_{11}	P_{18}	H_2'	R_{21}			
July		P_9	P_{19}	H_3	P_{29}	H_{13}	R_2	P_9'	H_{23}	R_{12}	P_{19}	H_3'	R_{22}			
Aug.		P_{10}	P_{20}	H_4	P_{30}	H_{14}	R_3	P_{10}'	H_{24}	R_{13}	P_{20}	H_4'	R_{23}			
Sept.				H_5		H_{15}	R_4		H_{25}	R_{14}		H_5'	R_{24}			
Oct.	P_1	P_{11}	P_{21}		P_1'		R_5	P_{11}'		R_{15}	P_{21}		R_{25}			
Nov.	P_2	P_{12}	P_{22}	H_6	P_2'	H_{16}		P_{12}'	H_{26}		P_{22}	H_6'				
Dec.	P_3	P_{13}	P_{23}	H_7	P_3'	H_{17}	R_6	P_{13}'	H_{27}	R_{16}	P_{23}	H_7'	R_{26}			

NOTE: Table shows timing of planting consecutively for the first time all 30 fields of 20 acres each over a period of 35 months. It also presents the time table of at least one complete 3-year cycle of planting and of harvesting a plant crop and a ratoon crop from all fields.

P to P represents planting of the first to the thirtieth field of 20 acres each in the first cycle.
P to P represents planting the same fields during the second cycle.
H to H represents plant-crop harvesting of fields 1 to 30 in the first cycle.
H to H represents plant-crop harvesting of fields 1 to 10 in the second cycle.
R to R represents ratoon-crop harvesting of fields 1 to 30 in the first cycle.

Source: Cost of Production of Fresh Pineapple on Molokai by F. Philipp and Harold L. Baker, University of Hawaii, 1975; p. 4.

Table 51. Summary of costs per 3-year crop cycle, Maunaloa Company, 1977-1980

	Operation	Dollars per acre	Dollars per ton (net)[a]	Percentage of Total
1)	Land preparation[b]	102.00	2.04	1.59
2)	Plastic laying, soil fumigation, and initial fertilization	333,98	6.68	5.22
3)	Plants and planting	384.46	7.69	6.00
4)	Irrigation	252.17	5.04	3.94
5)	Spraying and weeding	295.43	5.91	4.61
6)	Harvesting	1,233,18	24.66	19.26
7)	Packing	3,200.43	64.01	50.00
8)	Transportation to dock	115.00	2.30	1.80
9)	Other Costs	485.64	9.71	7.58
10)	Repair facility	132.04	2.64	2.06
11)	Office personnel and equipment	48.00	.96	.75
12)	Supervisory-force vehicles	12.50	.25	.20
13)	Rent	99.90	2.00	1.56
14)	Property Taxes	14.85	.30	.23
15)	Interest on operating capital for 3 months	48.35	.97	.75
16)	Miscellaneous	130.00	2.60	2.03
	TOTAL	6,402.29	128.05	100.00

NOTE: Calculations based on following assumptions: use of used equipment; lease of existing buildings at Maunaloa; farm unit 600 net acres planted to pineapple; and operation in full production.

[a]Gross field yield 70 tons of fruit per crop cycle; net pack 50 tons per acre.

[b]Includes road grading.

Source: Cost of Production of Fresh Pineapples on Molokai, F. Phillip and H. L. Barker, University of Hawaii, 1975, p. 23.

did not cultivate 23,000 plants per acre, nor did they use commercially produced fertilizers or any type of irrigation practice. These three inputs were crucial in determining the quantity of output from each acre and, in the case of using an irrigation practice, this made production independent of the seasonal production patterns that were normally influenced by the rain. More importantly, these three inputs contributed a great deal in determing the average cost per acre.

A relative comparison of efficiency

Given the relative cost of inputs from Table 52 how did the pineapple farmers in the S.L.L.D.P. compare with the production operations at Maunaloa? Or what should be the relative cost per pound of pineapples and the desired output from each acre in the S.L.L.D.P.? In order to answer these questions, the following assumptions were adopted:

1) That the exchange rate of U.S. $1 = G$ 2.55;
2) That 1 ton = 2000 lbs; and
3) That the remaining inputs used by farmers in the S.L.L.D.P. and at the Maunaloa Company were being used in an efficient manner.

Using assumptions 1) and 2), the equivalent cost in Guyana dollars was 16 cents per pound.

By subtracting the relative shares in total cost on the activities (#2, 4, 7, 8, 10 11, 12, 14, 15) which were not performed by pineapple farmers in Guyana and multiplying by 16 cents, the relative average cost was 6 cents per pound.

It was shown previously that the typical farmer in the S.L.L.D.P. had an average cost of 18 cents per pound of pineapple sold at the farm

gate. Comparing this 18 cents to the relative cost of 6 cents per pound, shows that, on a comparative basis, farmers in the S.L.L.D.P. were not as efficient as the operations at Maunaloa. To achieve a cost of 6 cents, pineapple farmers needed to produce and sell at least 12,568 pounds or 4,189 units from each acre.

Farmers in the S.L.L.D.P. could have produced 4,189 units from each acre since, as it was shown in Table 18, pineapple farmers had an average of 4,697 units on each acre. Instead of selling only 254 units from each acre, the farmer should have sold an additional 3,935 units. A cost of 6 cents (or 2 cents per unit) implied that from an acre of 4,697 units, 89 percent of the crop should be sold. The remaining 11 percent would be the proportion that is used and/or destroyed on the farm.

Infra-Structure

The inauguration of the S.L.L.D.P. in 1968 could be described as a pioneering attempt by the government of Guyana to open up new lands under a directed land settlement scheme. The infra-structure, such as roads, water supply, electricity, extension and research was provided by the government through the Ministry of Agriculture (Land Development) and other public agencies. In this section, the emphasis will be placed on the availability of these services to residents in the project and to the pineapple farmers in the survey.

Administration of S.L.L.D.P.[32]

The S.L.L.D.P. is administered by the Land Development Department

[32]Downer, et al.

of the Ministry of Agriculture through a resident project manager stationed at Kurukururu. Five administrative centers were planned for the project and would have been located in Kurukururu, Yarowkabra, Yarowkabra Extension, Long Creek, Clemwood and Moblissa. An example of the administrative structure is shown in Figure 7 and the recurrent and capital allocations for period 1975-1978 are shown in Table 52. There was a steady decline in the capital allocation from $3.3 million in 1975 to $.5 million in 1977, and although the capital and recurrent allocations were increased to $.8 million in 1978, this was still $2.5 million short of the allocation in 1976.

The decreasing budget allocations for the 1975-1978 period caused many of the basic infra-structural work and services to be half completed by the end of the decade. Examples of this were unfinished roads in the project, partially completed water supply systems and electrical installations, poorly maintained public communications systems such as telephones, and unserviceable equipment and transport vehicles.

Transportation in the S.L.L.D.P.

The project had the responsibility of providing transportation free of charge to all residents in the S.L.L.D.P. This transportation system was to:

1) Move farm produce to the buying club or G.M.C. buying points within the project;
2) Move inputs and building material in the project; and
3) Transport children to and from schools at Long Creek, Kurukururu and/or Georgetown.

In 1976, there were eleven land rovers, six trucks, eight

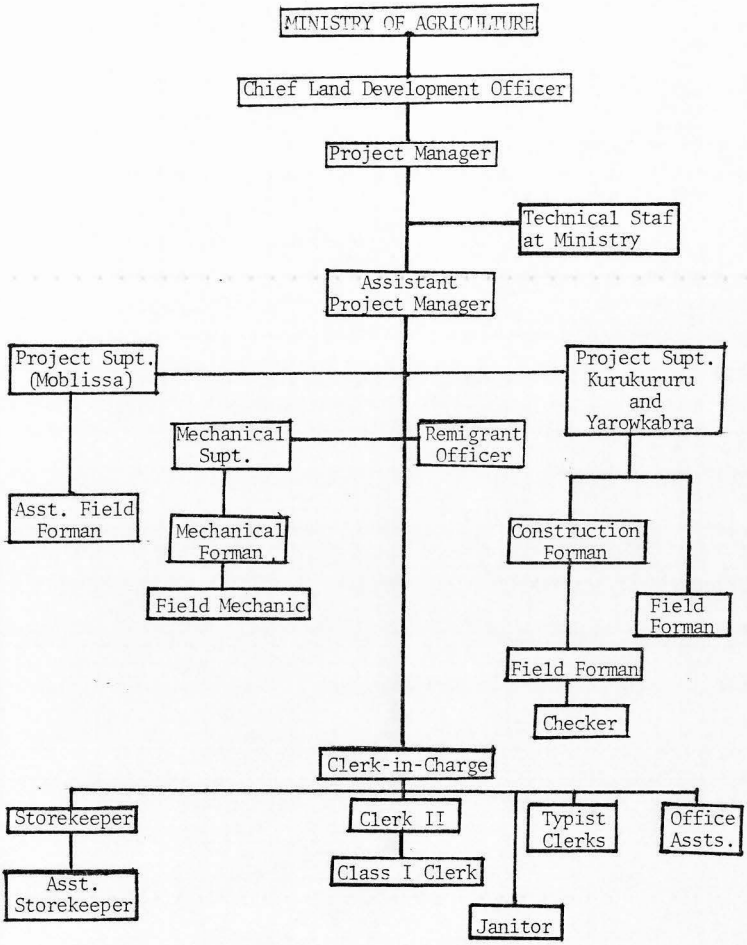

Figure 7. Administrative structure in S.L.L.D.P. 1976

Table 52. Recurrent and capital allocations for S.L.L.D.P. 1975-1978.

Item	1978	1977	1976	1975
Recurrent Allocation	$184,488.00	0	0	0
Capital Allocation	$650,000.00	$555,000.00	$1,720,469.00	$3,329,106.00
TOTAL	$834,488.00	$555,000.00	$1,720,469.00	$3,329,106.00

Source: Estimates of Government expenditures, 1978.

tractor/trailers and one mini-bus to provide this service. Of this grouping, however, four vehicles were either unserviceable or under repair, one other was on loan to another department, and for another 14 vehicles, no information with respect to their working condition was available (Table 53).[33]

At the time the data in this study were collected, no inventory information on transportation vehicles was available. Most farmers felt that passenger transportation had improved since there was a public transport system conveying residents to and from the project to Georgetown or Linden. On the other hand, when farmers referred to transportation used to market farm produce, especially during the harvesting season, farm transportation provided by the project was inadequate and had gotten worse. Although there was still free transportation within the project, it was difficult for farmers to obtain the use of the two or three vehicles that were still in working condition. Most of the other vehicles were under repair and, in many cases, the mechanical

[33]Ibid., p. 125.

Table 53. Transport vehicles and other equipment in the S.L.L.D.P. 1976

Quantity	Item	Total value	Number new and working	Number loaned out	Number unserviceable	Number in need of parts and repair	Number of equipment on which no information was given
1	Mini-bus	$23,000	--	--	1	--	--
11	Land Rovers	$160,500	5	--	1	1	4
6	Trucks	$104,000	2	1	1	--	2
8	Tractor/trailers	$128,300	--	--	--	--	8
26	TOTAL TRANSPORT VEHICLES	$415,800	7	1	3	1	14
11	Bulldozers	$1,119,000	4	3	--	1	3
6	Generators or lighting plants	$52,300	1	--	1	3	1
9	Power saws	$6,000	6	--	--	3	--
6	Weeders	$3,000	--	--	1	1	4
6	Water pumps	$7,400	--	--	--	--	6
2	Tenders	$9,295	--	--	--	--	2
2	Welding plants	$4,000	--	--	--	--	2
2	Motor Blowers	$2,000	2	--	--	--	--
70	TOTAL	$1,618,795	20	4	5	9	32

Source: A Program for the Development of the Soesdyke/Linden Region, 1976.

superintendent was awaiting the arrival of spare parts. The long delays in obtaining spare parts resulted from the general shortage of foreign exchange and the reduced budget allocations to the project. The outcome, therefore, was that maintenance programs on most of the capital equipment was poor, and on many occasions, parts were transferred between and among vehicles so as to have a few vehicles in some semblance of working order. As oil prices continued to rise, it became necessary for the project to cut back on transportation within the project and, at the same time, it also became necessary to introduce transportation charges for any traveling outside of the project. The rates were: 1) Tractor/trailer - $16.23 per hour; 2) Truck or lorry - $1.76 per mile. The major shortfall was that even if pineapple farmers had the ability to pay, there were not enough vehicles in the project to provide this service, especially during the harvesting and marketing season.

Transportation difficulties of pineapple farmers

With the exception of 14 percent of the farmers in the survey who had their own transportation, the remaining 86 percent had a similar transport problem but the degree to which it affected them was more acute for some than for others. The average distance a farmer had to travel to the G.M.C. buying point was 2.94 miles while the largest distance was some 12 miles. If a farmer lived close to the highway or G.M.C. buying point, his transportation problems were less severe than for the farmer who had no transportation and was living more than 2 miles from the buying point or highway. For the farmer who lived near the buying point or highway, he would pack his pineapples in a jute bag and would sometimes carry the bag on his head and walk to the buying point or highway. For

those farmers who lived further away, they would also carry out the same exercise despite a longer walking distance and a much harder task.

Roads in the S.L.L.D.P.

The farm transportation problem was made more difficult since most of the harvesting and marketing was carried out during part of the rainy season. Given that the roads within the project were not all-weather roads (most were made of white and brown sands or red laterite dust), traversing these pathways during the rainy season was an arduous task even for the residents who carried no additional weight with them.

Extension program

The extension program for the S.L.L.D.P. was organized through the Extension and Education Division in the Ministry of Agriculture and was made operational by an agricultural officer, field assistants and other staff members stationed at Kurukururu.

This service was partly supported by a nursery at Soesdyke and two research stations, one at Long Creek and another at Kairuni on the highway.

Visits by extension staff to pineapple farms

Twenty-seven percent of the farmers reported that no extension staff members visited their farm. Another 42 percent said the extension staff came to their farm at least once in every 3 months (Table 54).

Apart from the normal field demonstrations carried on at some farms in the project, the extension service was supposed to treat pest and disease problems on all farms in the project. This program was hindered because of the relative size of the project and the

Table 54. Number of farmers in survey visited by extension staff

Location	Never visit	Once a Month	Every 2 or 3 months	Longer than 3 months	Total
Kurukururu	11	5	3	6	25
Long Creek	1	2	2	5	10
Moblissa	1	1	1	2	5
Yarowkabra	1	1	1	2	5
Madewini	0	1	0	1	2
Haruruni	0	1	1	0	2
Kuru Kuru	0	0	1	0	1
Dora	0	1	0	0	1
TOTAL	14	12	9	16	51
PERCENT OF TOTAL	27	24	18	31	--

Soesdyke/Linden Region, the lack of adequate transportation and a shortage of staff. Because of these difficulties, some farms were sprayed for pests and diseases while others were not. During the time this survey was carried out, two technicians were being trained specifically to treat pest and disease problems affecting the pineapple crop. For this program to be successful, however, some measures would have to be taken to reduce the chequered allocation of lands and abandoned fields from between pineapple farms; otherwise, pests and disease would shift temporarily to other uncultivated lands and later make their re-appearance among the pineapple crop.

Visits by farmers to extension office

Forty-nine percent of the farmers visited with agricultural officers at the extension office once in every three months to collect

ant bait and other farm inputs. Another 18 percent did not visit the extension office because of poor public relations (Table 56).

Farmers were asked what they would like to have changed or improved so that the Ministry of Agriculture could be of better service to their farming needs. The answers to this question ranged from having better roads, marketing, transportation and credit, to having better pest and disease control methods, water and fertilizers. It was also suggested by a few farmers that since the nursery at Soesdyke was not able to produce enough plants for farmers in the Soesdyke/Linden area, the Ministry should introduce a contracting system with farmers. Under this system, the Ministry would supply the planting material and farmers would cultivate the seedlings for which they would be paid a fee on delivery of the plants to the Ministry.

Table 55. Number of farmers in survey visiting extension office in the project.

Location	Never Visit	Once a Month	Every 2 or 3 months	Longer than 3 months	Total
Kurukururu	6	5	11	3	25
Long Creek	0	3	7	0	10
Moblissa	0	1	4	0	5
Yarowkabra	1	2	2	0	5
Madewini	0	1	0	1	2
Haruruni	1	1	0	0	2
Kuru Kuru	0	0	1	0	1
Dora	1	0	0	0	1
TOTAL	9	13	25	4	51
PERCENT OF TOTAL	18	25	49	8	--

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary and Conclusions

Farm Production

Pineapple farmers in the S.L.L.D.P. were under utilizing at least two basic resources. First, with an average farm size of 16.92 acres, pineapple farmers were utilizing only 35 percent of this amount (5.911 acres per farm) to cultivate pineapples in 1979. Except for an average of one-eighth of an acre planted to other crops, the remaining land was still under brush. Secondly, it was determined that there was surplus labour on these family farms which were not making any significant contribution to production. Since the typical farmer considered planting material cost as his only out-of-pocket expense, he made a positive net return. However, for farmers who included all costs, both implicit and explicit, pineapple farming was an unprofitable venture. This unprofitability resulted from the following conditions. Farmers planted only 4,697 plants on each acre and sold approximately 254 units (762 pounds) from each acre. The difference (4,443 units or 12,329 pounds) was partly consumed by the farm family, destroyed by pests and diseases, or spoiled between the harvest period and time of sale. Only 5 percent of the crop entered the commercial trade and farmers did not receive any revenue from 95 percent of their production. The major outcome of this was the relatively high cost of production of 18 cents a pound.

Non-standardized methods of planting caused harvesting to be spread out over different periods. High harvesting cost caused a proportion of the crop to be given to relatives and friends or left to spoil on the farms. Farmers should be encouraged to cultivate the optimum number of pineapple plants on each acre and they should use planting material which bear pineapples that mature at the same time.

Incorrect applications of fertilizers and pesticides contributed to low productivity. In spite of the production difficulties, 73 percent of the farmers in the survey were still planning to increase production by using another 194 acres. This could increase the total land in pineapples to 495.5 acres or just over half of the total acres allotted to these 51 farmers.

In order to increase production, however, farmers would need credit to pay for labour and material costs. To double their production (another 5.911 acres), farmers would need a cash flow of approximately $3,700 ($2,867 for labour and $833 for material cost). If farmers had individual land titles, their chances of obtaining credit would be greatly enhanced. Ninety-two percent of the farmers kept no written farm records. Records were usually stored in the memory of farmers. Many of them could recall farm information for only two years. Given that farmers had about 4.6 years experience in pineapple production (one main crop and two ratoon crops), two years of data had already been forgotten by farmers. Eighty-eight percent of the farmers wanted to keep better records. Some of the remaining 12 percent were going out of farming and others were only interested if the information was not to be used for income tax purposes.

Seventy-six percent of the farmers were full-time farmers and only 35 percent of the farmers in the sample had another source of income. In view of this situation, secondary crops, particularly cash crops, were consumed on the farm by the farm family or were sold in the cash crop trade in the project. Most of the secondary crops, however, were destroyed by pests and diseases which were indirectly encouraged through the chequered allocation of lands in the project. Farmers in the survey identified pests and diseases as the most serious problem affecting farm production.

Agricultural co-operatives

There were 35 agricultural production co-operatives in the Soesdyke/Linden Region. They had severe management problems and staff shortages which affected the efficient allocation of resources. Since many farmers did not have their own transportation and there were problems in obtaining farm equipment, it would appear that a marketing co-operative would be useful for the project. However, this type of co-operative would be dependent upon its effectiveness in attracting a relatively large number of producers in the project. Without this large support, the co-operative might not be economically feasible.

Transportation and marketing

Eighty-six percent of the farmers did not have their own transportation and they were largely dependent upon wholesale purchasers who came to buy pineapples from the project. A few farmers were able to sell their pineapples in the municipal markets by utilizing the limited transportation facilities provided by the Guyana Transport Service which had bus routes between the project and Georgetown/Linden. The remaining

14 percent of the farmers had vertically integrated organizations since they had their own transportation to the municipal markets. The average price per unit in the markets was nearly 5 times as high as the farm gate price. This higher price in the municipal markets allowed profits to be relatively larger than the profits derived from the farm gate trade. In light of this situation, 86 percent of the farmers in the survey wanted to contract their sales to buyers who could pay a price that reflected the average monthly price in the fresh market.

Distribution to other fresh markets

Consumers who were resident in locations that were 100 miles away from the project did not receive a steady supply of pineapples, although there was an adequate demand and all-weather roads to transport the pineapples to these areas. The poor distribution system to these markets, especially during the peak marketing season when the supply of pineapples was high, resulted in gluts in the Georgetown and Linden markets which in turn caused prices to vary as much as 31 percent. Extending distribution to additional markets in areas away from the traditional buying and selling locations would reduce the downward pressure on prices and strengthen the marketing system. Every effort should be made to recapture the export market which provided a source of foreign exchange during the mid-nineteen seventies.

Processing

The unspecialized nature of the processing sector resulted in margins which were relatively high. Farmers received only 6 and 5 percent of the consumer's dollar from pineapple juice and pineapple jam. Uncertainty in the supply of pineapples to processors and the lack of

marketing information on the size of the pineapple crop prior to the harvesting season contributed to high cost and low margins. Capacity planning could not be effectively organized under these conditions. Reducing the level of uncertainty by contracting a supply of pineapples to the processing plants would allow a greater degree of capacity planning, and this would result in better operational and pricing efficiency. One other benefit of capacity planning would be the processing of by-products. Waste and costs could be reduced and at the same time, the range of products available for sale would be increased.

It would appear that cost could be reduced by using larger containers for processed products. However, the extent of this would be limited by the absolute level of prices and the price elasticity of demand (intuitively, this should be highly elastic for these products).

Infra-structure

All-weather roads in the project were not finished, thus hindering the smooth movement of produce in the marketing channel. Also, the water supply system was only partially completed. An irrigation system would indirectly ensure an all-year supply of pineapples. It would also enable the processing plant to be in operation the entire year, and this, in turn, would level out the seasonal variation in supply as well as reduce the wide range in price fluctuations over the marketing season. The use of an irrigation system would be dependent upon its potential to generate enough additional income to cover the cost of using the irrigation system.

Extension and education

Viewed against the number of trained Extension staff in the

project, the availability of transportation, and the relative size of the project, the effectiveness of the extension program was very limited. The two pineapple technicians would indeed make a positive contribution to reducing the problems caused by pests and diseases; but the success of the extension program would depend to a large extent on the availability of transportation to take the technicians to all the pineapple farms. Success would also depend upon the availability and financing of inputs needed to treat pests and diseases.

Recommendations

In order to streamline the activities associated with pineapple farming in the S.L.L.D.P., the following recommendations are advanced:

1) Farmers should be issued with individual titles to their land so that a credit program could be arranged. Efforts should be made to minimize the chequered allocation of lands in the project.

2) In considering the infra-structure for the project, access roads, linking the various settlements with the Soesdyke/Linden Highway should be completed. More resources should be directed into the research and extension program as well as into the transportation system used to market farm produce from the project. Since government funding in the project was limited, external assistance from international agencies could be sought so that these services could be made operational once they have been found to be economically feasible.

3) A cost/benefit study as well as a review of what has been achieved versus the stated objectives should be made to

determine the effectiveness of this project and its contribution to increasing the welfare in society.

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APPENDICES

Appendix 1

"PRODUCTION AND MARKETING OF PINEAPPLES IN GUYANA"

QUESTIONAIRE

JULY, 1979.

Dear Farmer,

In order to complete the requirements for the Masters of Science in Agriculture Economics at Utah State University in the U.S.A., I am undertaking this survey on the "Production and Marketing of Pineapples in Guyana" with the permission and co-operation of the Ministry of Agriculture.

I am hoping to gather information from most of the farmers who are involved with pineapple production; and I want to assure you that your name will not be used in any way and that all answers will be kept strictly confidential.

Thanks very much for your time and co-operation.

Yours sincerely,

KENRICK HUNTE,
Student

SECTION "A"--Management

(1) Location of farm:

(2) What is the size of your farm:

(3) Who owns the farm: Yourself ( ); Family ( ); Partners ( );
Co-operatives ( ); Company ( ).

(4) Who manages the farm: Owner ( ); Members of co-ops ( );
Hired manager ( ).

/2...

(5) What is the value of your land:

(6) (a) Total farm sales for last crop: Did you make more than $500 YES ( ); NO ( ).

(a.1) If yes, was it between $500-$700 ( ); $701-$1000 ( ); greater than $1001 ( ).

(a.2) If no, was it between $300-$499 ( ); $1-$299 ( ).

(7) (a) Are you a full-time farmer: YES ( ): NO ( ).

(b) Do you live on your farm: YES ( ): NO ( ).

(b.1) If no, how far do you travel to get to your farm: 1-5 miles ( ); 6-10 miles ( ); 11-25 miles ( ); greater than 26 miles ( ).

(8) (a) Do you have another job or other source of income: YES ( ); NO ( ) - if no, go to Q9.

(a.1) If yes, do you make more than $3,000 per year: YES ( ); NO ( ).

(a.2) If yes, is it between $3,001-$5,000 ( ); greater than $5000 ( ).

(a.3) If no, is it between $1,000-$3,000 ( ); less than $1,000 ( ).

(9) (a) Do you have any paid labourer doing agricultural work on your farm: YES ( ); NO ( ) - if no, go to Q10.

(b) If yes, what areas of work did they supply: Clearing ( ); Planting ( ); Harvesting ( ); Hauling ( ); Other ( ).

(c) (c.1) How many hours or days did they work: Hours: Days:

(c.2) What is your rate/hr: or dollars/day:

(10) (a) Do you use family labour: YES ( ); NO ( ).

/3...

(b) If yes, how many members of your family work on the farm:

SECTION "B"--Input Use and Production

(11) What variety of pineapples do you grow: Montserrat ( ); Black Antigua ( ); Smooth Cayenne ( ); Other ( ).

(12) In addition to Pineapples, what else do you cultivate or rear? (Name)

(13) (a) Which activity brings the most revenue: Pineapples ( ); Other ( ).

(b) How much did you make from Pineapples: $

Other: $

(14) How long have you been cultivating pineapples: 0-2 years ( ); 3-8 years ( ); 9-12 years ( ); 13 years and over ( ).

(15) How many acres in Pineapples did you cultivate for the following years:

ITEM	1976	1977	1978	1979
Pineapple (acres)				

(16) What quantities were sold in the following years: (Use units if not sold by lbs.)

ITEM	1976	1977	1978	1979
Grade A Pine-apples (lbs.)				
Grade B Pine-apples (lbs.)				
Total Units				

(17) (a) Do you have a second crop at year end: YES ( ); NO ( ).

(b) If yes, what quantity do you expect to harvest: Pounds ( ) Units ( ).

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(18) Which method of propagation do you use: Basal Suckers ( );
Side Shoots ( ); Crown Slips ( ).

(19) How many planted per acre:

(20) How many ratoons do you grow:

(21) What is your average cost (include per/unit transport cost to farm) per basal sucker: or Side Shoot:
or Crown Slip:

(22) (a) Do you use fertilizers: YES ( ); NO ( ).

(b) If yes, which of the following do you use:

Name	Quantity/ Acre	Time(s)	Cost	Labour/ Hour	Power Machinery
1) Sulphate of Ammonia Lbs/ acre					
2) Triple super Phosphate Lbs/ acre					
3) Fritted Trace Elements (181/ ozs/plant)					
4) Urea					
5) Potash					
6) Limestone					
7) Chick-Manure					
8) Other					

(23) (a) Do you use pest and disease control methods: YES ( ): NO ( ).

(b) If yes, which of the following do you use:

Name	Quantity/ Acre	Time(s)	Cost	Labour/ Hour	Power Machinery
1) Gesaprin					
2) Folimat					
3) Phoxin					
4) Other					

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COST OF THESE ACTIVITIES

(24) Clearing:

(25) Planting:

(26) Harvesting:

(27) Bagging:

(28) Hauling:

(29) Cost of Watering (dry season)

(30) Total Taxes/year:

(31) Other:

(32) (a) VALUE OF MACHINERY AND EQUIPMENT

Name	Quantity	Value	Age
1) Tractor			
2) Tractor Implements			
3) Hoe			
4) Cutlass			
5) Other			

(b) Did you use any fuel on your farm in 1979: YES ( ); NO ( ).

(b.1) If yes, how much did you use: Gals: Cost $

(c) Did you have any maintenance and repair expenses for 1979: YES ( ); NO ( ).

(c.1) If yes, how much: Maintenance $ Repairs $

(33) (a) Do you expect to increase your pineapple production next season: YES ( ); NO ( ).

(b) If no, why not:

(c) If an increase is expected, how many acres or units or pounds do you hope to add: Acres: Units: Pounds:

/6...

(34) (a) On what date(s) did you plant:

(b) On what date(s) did you harvest:

(35) (a) Would you be willing to keep better production and financial records: YES ( ); NO ( ).

(b) If no, why not:

SECTION "C"--Policy and Finance

(36) (a) Are you satisfied with the service offered by the Ministry: YES ( ); NO ( ).

(b) If no, state what you would like to be changed or improved:

(37) How often do the Agriculture Officer and Agriculture Field Assistants visit your farm: Never ( ); once a month ( ); every 2 or 3 months ( ); longer than 3 months ( ).

(38) (a) Do you try to communicate with the Ministry: YES ( ); NO ( ).

(b) If yes, how often: Never ( ); once a month ( ); every 2 or 3 months ( ); longer than 3 months ( ).

(39) (a) Have you borrowed any money to finance your pineapple production: YES ( ); NO ( ).

(b) If yes, which of the following provided the credit: Money lender ( ); Pawnbroker ( ); Shopkeeper ( ); Ministry of Agriculture ( ); Agri. Bank ( ); Commercial Bank ( ); Relatives and friends ( ); Co-op Bank ( ); Other ( ).

(c) Did you borrow the money to finance the purchase of fertilizers ( ); pesticides ( ); harvesting costs ( ); planting costs ( ); clearing costs ( ); other ( ).

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(d) How much did you borrow:

ITEMS	1976	1977	1978	1979
Loan				
Interest rate				
Length of Loan				

(e) How long did it take before a loan was granted: Between 1 week and one month ( ); 2 months to 4 months ( ); longer than 4 months ( ).

(40) What would you like to see changed to speed up the extension of credit:

(41) Of the following activities, which do you think give the greatest problem: Rank your answer

	PLACE						
ACTIVITY	1st	2nd	3rd	4th	5th	6th	7th
Pest & Disease control							
Harvesting							
Obtaining Credit							
Marketing							
Other							

SECTION "D"--Marketing and Pricing

(42) (a) Where do you sell your pineapples: G.M.C. ( ); Stabroek Market ( ); Bourda Market ( ); La Penitence ( ); G.P.C. ( ); Hucksters ( ); Other ( ).

(b) If you do not sell to the G.M.C., why not:

(c) Do you have your own transportation to take your pineapples to

/8...

the market or G.M.C.: YES ( ); NO ( ).

(d) Your largest quantity in 1979 ( )lbs. was sold to (at):

(43) What was the average price per lb. or per unit paid for pineapples during the following years: Use unit if not sold by lbs.

ITEM	1976	1977	1978	1979
Grade A Pineapple				
Grade B Pineapple				
Unit				

(44) (a) Do you contract any part of your sales to buyers: YES ( ); NO ( ).

(b) If no, do you make oral agreements: YES ( ); NO ( ).

(45) (a) Would you agree to make contractual agreements for a portion or all future sales of pineapples: YES ( ); NO ( ).

(b) If no, why not:

(46) How early do you know the quantity and price that you will be able to sell: Is it at the time of sale ( ); two days before sale ( ); 4 days before sale ( ); longer than 4 days ( ).

(47) If you do not sell your pineapples to consumers directly, do you communicate before hand with your buyers: YES ( ); NO ( ).

(48) During the marketing season, how many hours per week does it take for you to sell your pineapples: Hours:

(49) How far do you have to travel while moving your pineapples from the farm to the G.M.C. buying point:

(50) What type of container do you use to transport your pineapples to the buying point: Wooden boxes ( ); Jute bags ( ); Open Trailer ( ); Other ( ).

Appendix 2

(copy)

Ministry of Agriculture
P.O. Box 1001
Georgetown, Guyana

19 July 1979

Mr. Dindyal Singh
Project Manager
Soesdyke/Linden Land Development Project
Kuru Kururu
Soesdyke Linden
Highway

Dear Mr. Singh,

This will introduce Mr. C. K. Hunte, a Guyanese graduate student of Utah State University who is gathering material in Guyana for his M.SC. Thesis in Agricultural Economics. The subject of his paper is the pineapple industry and in pursuance of his study he wishes to visit and interview farmers who are cultivating pineapples in the Soesdyke/Linden Land Settlement. I would be grateful if you would be so kind as to assist him in this exercise wherever possible.

Thank you.

Yours co-operatively

/s/ I. F. Telfer
I. F. Telfer
Deputy Chief Agricultural Officer

cc. Chief Land Dev. Officer
Lands and Surveys Div.
Min. of Agric. (Att. Cde. E.A. Patterson)

Appendix 3. Summary of input/output co-efficients for pineapple farmers in the survey.

	Activities	Total	Average per Unit/Farm	Highest per Unit/Farm	Lowest per Unit/Farm	Percent of Total
1.	Number of farms in survey	51	--	--	--	--
2.	Number of acres in survey	863	16.92	70	10	--
3.	Acres in pineapple production in 1978	284.50	5.580	20	1	33
4.	Acres in pineapple production in 1979	301.50	5.911	21	1	35
5.	Expected increases in pineapple acreage 1979/80 (37 Farmers)	194.00	5.24	20	1	--
6.	Average maximum/minimum temperature 1974-1978 (F°)	--	90/68	96	66	--
7.	Average annual rainfall Soesdyke/Linden 1974-1978 (inches)	--	98	115	89	--
8.	"Best" and "Second Best" soils most suited for pineapple production	52,053	--	--	--	--
9.	Largest/smallest quantities of "Best" and "Second Best" soils - Mobilssa/Badarima (acres)	--	--	18,520	1,534	36/3
10.	Years in pineapple production	234.5	4.6	13	0	--
11.	Number of adults involved with pineapple production	103	2.02	4	1	--
12.	Number of children involved with pineapple production	138	2.71	13	0	--
13.	Number of farms using family labour	46	--	--	--	90
14.	Number of farms using hired labour	31	--	--	--	61

Appendix 3. Continued

	Activities	Total	Average per Unit/Farm	Highest per Unit/Farm	Lowest per Unit/Farm	Percent of Total
15.	Number of surplus labour in project/Kurukururu	--	2/3	--	--	--
16.	Number of full-time farmers	39	--	--	--	76
17.	Number of farmers who never borrowed money to finance their pineapple production	50	--	--	--	98
18.	Number of farmers with non-farm income	16	--	--	--	31
19.	Number of farmers with no transportation	44	--	--	--	86
20.	Number of farmers in favor of contracting pineapple sales	44	--	--	--	86
21.	Number of farmers using both fertilizers and pesticides/weedicides simultaneously	11	--	--	--	22
22.	Number of ratoons cultivated by 25 farmers	--	2	4	1	--
23.	Number of plants on each acre (16 farmers)	75,150	4,697	20,000	400	--
24.	Estimated weight of a pineapple (pounds)	--	4	5	3	--
25.	Forecast of output (pounds) Dec. 1979/Feb. 1980 (for 16 farmers)	84,710	5,294	21,000	400	--
26.	Production of pineapples by 45 farmers in 1979 (pounds)	171,412	3,809	38,888	166	--
27.	Estimated quantity sold (pounds)	207,591	4,513	38,888	166	--
28.	Volume of pineapple sales by 46 farmers May-Aug. 1979 (estimated)	$37,366.37	$812.31	$7,000	$30.00	--

Appendix 3. Continued.

	Activities	Total	Average per Unit/Farm	Highest per Unit/Farm	Lowest per Unit/Farm	Percent of Total
29.	Estimated quantity used and/or destroyed at the farm per acre (pounds)	13,327	--	--	--	--
30.	Estimated quantity sold per acre (pounds)	763.47	--	--	--	100
31.	Total labour cost per acre	$485.00	--	--	--	64
32.	Total material cost per acre	$269.09	--	--	--	36
33.	Total service cost per acre	$128.18	--	--	--	--
34.	Total cost per acre	$754.09	--	--	--	--
35.	Estimated sales per acre	$137.42	--	--	--	--
36.	Net return to land and management (loss)	($616.67)	--	--	--	--
37.	Average cost per pound (farm gate)	$.99	--	--	--	--
38.	Average cost per unit (farm gate)	$2.96	--	--	--	--
39.	Transportation cost and market rent per unit 1979	$.02	--	--	--	--
40.	Average cost per pound (farm gate for typical farmer in survey)	$.18	--	--	--	--
41.	Average cost per unit (farm gate for typical farmer in survey)	$.55	--	--	--	--
42.	Average cost per pound based on a relative comparison of efficiency (farm gate)	$.06	--	--	--	--
43.	Value of farm tools	$5,608.27	$109.97	$308.44	$30.00	--
44.	Farmer's share of consumer dollar on pineapple jam/juice	--	--	--	--	5/6

Appendix 3. Continued.

Activities	Total	Average per Unit/Farm	Highest per Unit/Farm	Lowest per Unit/Farm	Percent of Total
45. Number of agricultural cooperatives in Soesdyke/ Linden Region	35	--	--	--	--
46. Number of farms with no visits by Extension Staff	14	--	--	--	27
47. Number of farms visited at least once a 3 month period	21	--	--	--	41
48. Number of farmers who visited the extension office at least once in 3 months	25	--	--	--	49
49. Number of farmers who never visited the extension office	9	--	--	--	18