FIJI'S FOOD SELF-SUFFICIENCY POLICY WITH SPECIAL REFERENCE TO RICE PRODUCTION

by

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DECLARATION

Except where otherwise indicated, this dissertation is my own work.

October, 1980 Kaliopate Tavola

TO

Helen, Mereia and Georgie

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I had intended to be all formal and conventional and to acknowledge the contributions from my supervisor. But this would be rather the traditionalist's modus operandi. Being an unconventional type myself, I prefer to depart from tradition and to reserve the praises and approbations until later when such contributions can be tangibly and meaningfully acknowledged.

For fear of being labelled cynical or ungrateful, I must make haste, therefore, to record here my sincere thanks, firstly, to Dr D.P. Chaudhri for his unstinted assistance and concern. He intervened when it really mattered and redirected the whole thrust of the thesis and rendered it scholastic acceptability. I am grateful also to all my friends in the Development Studies Centre who have assisted me during my stay at the Australian National University. I am particularly grateful to Rodney Cole who persistently pressurized me to complete the thesis and would have manhandled me over to ANU had I continued my procrastination.

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Family separation can be traumatic. I am grateful to my family for allowing me to come to ANU to complete my thesis and, therefore, be subjected to the trauma of this separation. To them I dedicate this thesis.

Finally, I must thank Australian Development Assistance Bureau and my government for making this study possible. Last but not least, I thank you, Anne Cappello, for typing.

ABSTRACT

The study first looks at Fiji's relatively high propensity to import in the context of a marginal micro-economy existing in a tenuous and dependent relationship with the metropolitan powers. The food components of Fiji's imports are particularly highlighted. Evidence presented seems to indicate a *prima facie* case for a Food Self-Sufficiency Policy particularly as it relates to rice. Certain hypotheses and impressions based on empirical observations are derived for further analyses.

For these analyses to be seen in proper perspectives, the study then discusses Fiji's rice production and marketing system and highlights such aspects as the subsistence orientation of most rice growers, areal distribution, rice irrigation, nutritional and employment aspects, etc.

Having done this, the study then focusses on the oft-quoted rice and sugar cane competitiveness and attempts at substantiating this assertion. Furthermore, it also focusses on the various factors that have contributed to increased rice imports.

Having discussed both the supply and demand aspects of rice, the study then attempts at estimating the supply and demand trends for rice and projecting these forward to 1985, *ceteris paribus*. The diverging supply and demand trends indicate that the various policies designed to achieve self-sufficiency in rice have not been effective. In analysing these policies as a package, it is concluded that it is not their design which is at fault but rather their co-ordination, organization, and a lack of any appraisal mechanism.

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CHAPTER 1

FOOD SITUATION IN FIJI AND THE ROLE OF RICE

1.1 Preamble

Fiji, like most of her Pacific neighbours and other island states in other parts of the world, may be categorized as a 'marginal micro-economy existing in a tenuous and dependent relationship with the metropolitan powers' (McGee 1975, p.7). Some of the general characteristics of such an economy are as follows:

(a) The economy is generally export-based in which the major attention of the pre-Independence government was devoted to encouraging the production of cash crops for export.

(b) Major exports may only consist of a few commodities whose prices are normally subject to great fluctuations.

(c) Domestic resources are not sufficient for the economy's development programs. Therefore, great reliance on foreign resources (imports) is generally observed. However, because of (b) above, there is a general lack of foreign exchange to pay for all these imports.

(d) General world inflation and high freight costs tend to make these imports very expensive.

(e) The multiplicity of developmental programs which the government wishes to implement in order to comply with the people's desires for modernisation etc., often have high import content and these result in a relatively high marginal propensity to import for the country.

No estimate of the marginal propensity to import is being proposed. However, indications that it is high, in terms of persistent Balance of Trade (See Appendix 1.1) and Balance of Payment deficits (see Appendix 1.2) and the still sizeable proportion of total imports vis-â-vis the

TABLE 1.1

VALUE AND PROPORTION OF FOOD IMPORTS, 1964-1977

Year	Value of Food Imports[1] (F$000)	Value of All Imports (F$000)	Percentage of Value of Food Imports to all Imports[2]
1964	10,473	55,251	19.0
1965	12,202	58,162	21.0
1966	11,684	50,545	23.1
1967	12,651	56,291	22.5
1968	13,329	68,402	19.5
1969	15,281	77,888	19.6
1970	16,884	90,502	18.7
1971	20,643	111,550	18.5
1972	25,013	131,549	19.0
1973	33,909	174,645	19.4
1974	41,302	219,331	18.8
1975	38,504	220,967	17.4
1976	43,330	238,040	18.2
1977	53,819	289,960	19.2

Notes: 1. A simple time trend analysis of these values results in a significant regression coefficient (b) = 3260.9*, r = 0.944*, r^2 = 0.891, $t_{(r)}$ = 9.905 and $t_{(b)}$ = 9.920. *indicates statistical significance at the 5% level.

2. A similar time trend analysis results in the following: b = (-)0.237*, r = (-) 0.623*, r^2 = 0.388, $t_{(r)}$ = (-) 2.759 and $t_{(b)}$ = (-) 2.755.

Sources: Current Economic Statistics, 1969-1978.

country's Gross Domestic Product (GDP)(See Appendix 1.3), are frequently stated in most government publications listed in the Bibliography.

1.2 Needs for Increasing Food Imports

Data in these publications show that of Fiji's total imports, food imports still constitute a significant porportion vis-â-vis GDP, despite a somewhat downward trend over the years (see Appendix 1.3). Other data that are available reveal an increasing trend in the value of food imports (see Table 1.1) and in the quantity of some major imported food items, e.g., fresh meat (see Table 1.2) and rice as it will be discussed later in this chapter.

Table 1.1, as indicated above, confirms the increasing trend in the value of food imports (see Note 1 in the Table) even though the percentage of food imports to all imports had shown a significant decline during the same period (see Note 2 in the same Table). The fact that this percentage has declined whilst the value of all imports has been increasing (see Table 1.1) implies that there has been a greater than proportionate increase in the importation of non-food items.

TABLE 1.2

QUANTITY OF FRESH BEEF IMPORTS

1968-1975

Year	Tonnes
1968	57
1969	39
1970	44
1971	91
1972	129
1973	67
1974	384
1975	967

Source: Current Economic Statistics, 1969-1978

Despite the somewhat downward trend of the proportion of food imports to GDP and the greater than proportionate increase in the imports of non-food items, the situations depicted above concerning food imports in general and particularly in the context of the total imports for the country, still present areas for concern. This concern is greatly magnified when considering that the needs to import, for an island state like Fiji, are numerous and would seem likely to increase, particularly in the area of food imports.

This is so for the following reasons:

(a) Increased urbanization tends to increase the number of people dependent on imported foodstuffs.

(b) Changing food tastes and increasing preferences for imported and exotic foodstuffs.

(c) Increasing demands by tourists, expatriates and a growing local elite.

(d) Irresponsiveness of local production to substitute for some of the commodities presently imported.

These points will be further elaborated on in some of the chapters to follow. At this juncture, however, it is sufficient to note that when the various points raised above are considered together, they do emphasize the concern for increasing imports; and any government would be obliged to ascertain the various alternatives designed to circumvent this problem.

1.3 Formulation of Food Self-Sufficiency Policy

The government's Sixth and Seventh Development Plans, DP6 and DP7 (Central Planning Office (CPO) 1970 and 1975) used the term "Food self-sufficiency" policy to mean the replacement of certain imported foodstuffs with locally-produced substitutes.[1] This appears to be a logical application of the term

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1 Whilst DP6 (pp.116-117) confined the term to rice only, DP7 (p.65 ff) re-emphasized the importance of rice under this policy and implicitly extended the term to include other food items.

considering what has been said in the previous two sections.

The rationale of such a policy becomes the more important when considering that out of Fiji's imports, foodstuffs are the most likely to be produced locally; and therefore should be encouraged. Furthermore, because of the expectations that food imports were likely to grow rather than decline, it certainly was considered desirable to reduce food imports by substituting some with locally-produced commodities. Considered in this context, DP7's extension of the policy to incorporate commodities other than rice, becomes meaningful.

With the knowledge that Fiji has resources and the capacity to increase its local production, the government was not therefore discouraged by the irresponsiveness of local farmers to increase production. On the contrary, this apparent irresponsiveness became an incentive for the government to institute its self-sufficiency policy to revamp the agricultural stagnation[1] that has set in, and rural development in general.

The government's other reasons for pursuing a food self-sufficiency policy, apart from those already mentioned, are not explicitly stated in either DP6 or DP7. However, they can be implied from the rhetoric of the two plans and the various objectives contained in other government literature. Some of these are as follows:

(a) Food imports were proving expensive and the costs were increasing rapidly as a result of inflationary pressures in countries of origin. These costs were making substantial demands on the limited foreign exchange which was greatly needed for capital and infrastructural developments and

---

1 This stagnation was particularly noticeable in the non-sugar agricultural production (DP7 op cit, p.2). DP7 further commented that the irresponsiveness of the agricultural sector was reflected in the level of food imports which accounted for about 10% of GDP immediately after the War, and virtually remained unchanged for many years. It will be noted that in 1965 (see Appendix 1.3), the percentage was still about the same.

welfare investment.

(b) From nutrition standpoint, it had been observed that the dietary change involved in the increased consumption of imported foods created nutritional problems. Therefore, it would be envisaged that by encouraging increased local food production, people in the urban areas in particular would be widely exposed to a wider and cheaper range of local foods which are considered nutritionally superior.

(c) Seeing the increasing dependence on imported foodstuffs, concern was expressed that this might be detrimental to the possibilities for the growth of indigenous food production for cash sale.

(d) A related concern to that in (c) above was that a persistent decline in traditional food production was likely to result in loss of skills in that productive process.

Thus far, it is clearly apparent that the food self-sufficiency policy represents a mix of policy instruments based on, inter alia, social objectives, technological constraints and external account position. The policy should, therefore, be viewed and discussed in this broad perspective.

When the policy is viewed from a restricted perspective, e.g. from a purely economic standpoint, it is likely that the policy will not be substantiated and will even be invalidated on the strength of the evidence presented. A popular economic argument against the food self-sufficiency policy is the concept of comparative advantage; and that is that if a country is already importing a certain commodity, it must be due to the fact that it costs more to produce it locally than to import it. Therefore, to decide through a food self-sufficiency policy to produce more of that

commodity locally in order to reduce import, it would cost the country a lot more than previously. This is basically an orthodox economic view. Other similar ones based on some principles of international trade etc., can also be presented.

This rather restricted view of the policy, however, is an aberration. This explains why some proponents of food self-sufficiency policy have under-emphasized economic considerations, e.g. comparative advantage within the framework of the policy (vide, e.g. Goldman 1975, p.252 and Chonchol 1975, p.59).

1.4 Role of Rice in Food Self-Sufficiency Policy

Rice imports constitute a substantial proportion of the total food import bill. Table 1.3, for example, shows that 27% of food import costs in 1972 accrued to cereals and cereal preparation of which rice has a major share.

TABLE 1.3

PER CENT OF FOOD IMPORT COSTS

BY PRINCIPAL FOOD CATEGORIES, 1972

	Food Category	%
1.	Meat & Meat Preparations	12.3
2.	Dairy Products & Eggs	9.8
3.	Fish & Fish Preparations	29.1
4.	Cereals & Cereal Preparations	27.0
5.	Fruit & Vegetables	11.9
6.	Sugar, honey, etc.	1.5
7.	Coffee, tea, cocoa, etc.	4.8
8.	Miscellaneous	3.2
	Total[1]	99.6

Note: 1. Categories of live animals and feeding stuff have been deleted from food imports.

Source: McGee, T.G., 1975.

This figure of 27% is likely to have increased since rice import has increased both in value (see Tables 1.4 and 1.5) and in quantity (see Table 1.6 and Figure 1.1) whilst the other major food import items in Table 1.3 have tended to decline due to increased local production.[1] Figure 1.1 shows that rice imports have increased considerably since 1971.

TABLE 1.4

VALUE OF RICE IMPORTS, 1967-1977

(F$000 cif)

Year	F$[1]
1967	1553
1968	1206
1969	1507
1970	1136
1971	1818
1972	1351
1973	3572
1974	5525
1975	4367
1976	3544
1977 (p)	5227

Note: 1. A simple time trend analysis of these values results in a significant upward trend; $b = 425.8^*$, $r = 0.836^*$, $r^2 = 0.699$, $t_{(r)} = 4.571$ and $t_{(b)} = 4.573$.

* indicates statistical significance at the 5% level.

p = provisional

Source: Current Economic Statistics, 1969-1978.

1. e.g. data on imports of all fish in the Trade Reports (Bureau of Statistics 1972-1977) show that imports increased at an average rate of 8.58% per year between 1968 and 1970. However, this has tended to decrease since then after the establishment of commercial fishing, the establishment of a Fisheries Division and the Pacific Fishing Company (PAFCO) at Levuka.

TABLE 1.5

CEREAL[1] IMPORT UNIT VALUE INDEX

(BASE 1972 QUARTERLY AVERAGE = 100)

Year	Index[3]
1972	100.0
1973	156.9
1974	236.1
1975	250.5
1976	247.5
1977[2]	240.8

Notes: 1. Includes rice

2. Includes index for first quarter only

3. A simple time trend analysis of the indices results in a significant upward trend; $b = 28.291^*$, $r = 0.848^*$ $r^2 = 0.720$, $t_{(r)} = 3.205$ and $t_{(b)} = 3.204$.
* indicates statistical significance at the 5% level.

Source: Current Economic Statistic, 1969-1978.

At the same time when rice imports were increasing, the local rice production was somewhat stagnant (see Table 1.7 and Figure 1.1).

The big drop in production in 1959 and 1960 was caused by the extensive outbreak of rice yellows caused by leafhopper, sogata furcifera. It can be seen from the graph that rice production fluctuated to a great extent. On closer examination of the data, it can be seen that local rice production has been subject to the hazards and the unpredictabilities of climatic and other natural conditions, e.g. the unusually wet conditions of 1954, the flood in 1965 or the drought in 1952 and the hurricane also in 1952. Taken in a longer term perspective, local rice production can be seen to be virtually static.

TABLE 1.6

QUANTITY OF RICE IMPORTS, 1947-1979

(tonnes) [1]

Year	Tonnes	Year	Tonnes
1947	-	1964	5,400
1948	-	1965	9,300
1949	549	1966	7,200
1950	-	1967	6,400
1951	536	1968	6,471
1952	1,009	1969	8,297
1953	438	1970	6,659
1954	663	1971	11,623
1955	607	1972	11,703
1956	3,038	1973	17,240
1957	1,916	1974	16,240
1958	4,298	1975	14,359
1959	8,221	1976	19,321
1960	5,192	1977	23,983
1961	4,200	1978	23,079
1962	3,500	1979	24,552
1963	3,900		

Note: 1. These values are graphed in Figure 1.1

Sources: 1. The Colonial Annual Reports, 1947-1973.

2. IBRD Report No. 1296-FIJ

3. Department of Agriculture Annual Reports, 1959, 1966-1972.

TABLE 1.7

LOCAL RICE PRODUCTION, 1947-1979

(tonnes)

Year	Tonnes	Year	Tonnes
1947	16,855	1964	17,983
1948	17,475	1965	14,326
1949	18,796	1966	14,326
1950	24,718	1967	14,732
1951	17,272	1968	17,577
1952	15,240	1969	17,272
1953	25,000	1970	20,320
1954	16,256	1971	17,272
1955	23,000	1972	17,272
1956	23,000[1]	1973	15,697
1957	18,000	1974	17,272
1958	24,000[2]	1975	22,964
1959	2,227[3]	1976	20,586
1960	4,422[3]	1977	17,966
1961	27,026	1978	16,015
1962	21,946	1979	18,717
1963	21,946		

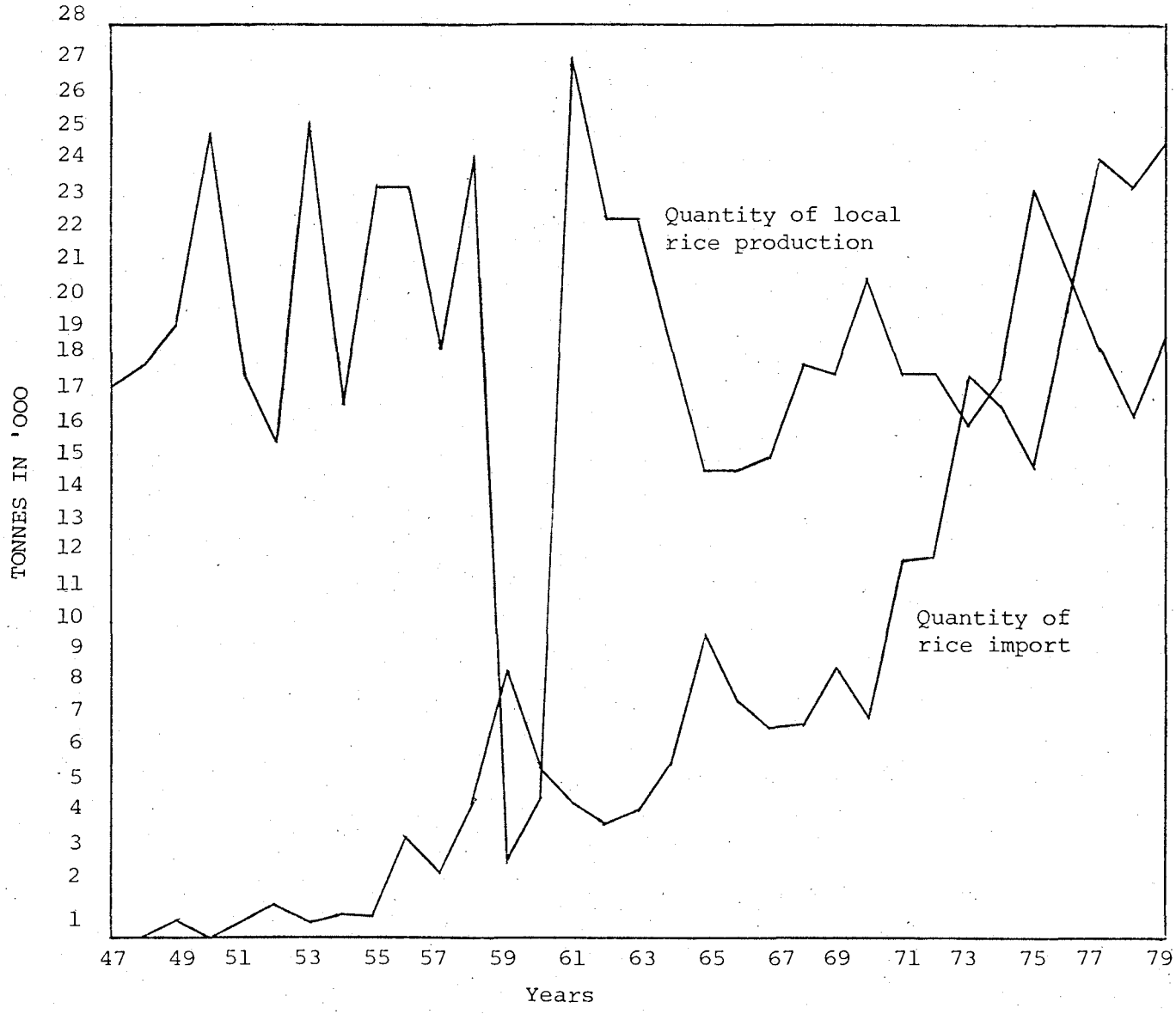
Notes:
1. Rice damage by flood was extensive. The figure appears too high.
2. Crop failure was experienced. The figure again appears too high.
3. Revised figure after accounting for the extensive leafhopper damage.

Sources:
1. Colonial Annual Reports, 1947-1973
2. IBRD Report No. 1296-FIJ
3. Department of Agriculture Annual Reports, 1959, 1966-1972.

FIGURE 1.1

GRAPHS OF RICE IMPORT AND LOCAL

RICE PRODUCTION, 1947-1979



As regards the rice area, it can be seen in Table 1.8 and Figure 1.2 that there has been a significant downward trend.[1] The popular reason for this decreasing area has been the competition from sugar cane for the same area (vide, e.g. DP 7 op cit, p. 76). However, this remark needs to be further analysed to gain credence, and this will be the subject of Chapter 3.

The rice situations depicted above created a prima facie case for a rice self-sufficiency policy for Fiji. In the light of this, therefore, DP6 first applied the policy to rice and this was reiterated in DP7. Both Plans also discussed the two major methods that the government was to encourage increased local production. These were:

(a) To increase area of double-cropped irrigated rice;

(b) To increase yields from rainfed, wetland and dryland rice cultivation.

For incentives, the government was to provide the following:

(a) Fertilizer and agro-chemical subsidies;

(b) Subsidized water rates in irrigated areas;

(c) Specialist Extension service;

(d) Concerted Research efforts;

(e) Drainage and Irrigation Division;

(f) Special marketing arrangement with the Rewa Rice Limited;

(g) Provision of certified seeds;

(h) Seed testing facilities;

(i) Non-institutionalized finance in the form of the Crop Production Loan Scheme.

---

1. The trend line equation is as follows:

$$\underline{\text{Rice Area} = 438401 - 218*T} \qquad t_{(b)} = (-)3.481$$

where $r = (-)0.56^{*}$; $t_{(r)} = (-)3.52$

$r^2 = 0.31$

TABLE 1.8

RICE AREA, 1947-1975

(hectares)

Year	Ha.	Year	Ha.
1947	10,298	1962	12,991
1948	13,952	1963	12,991
1949	14,906	1964	9,996
1950	14,775	1965	8,013
1951	13,902	1966	8,013
1952	14,260	1967	8,742
1953	14,828	1968	10,118
1954	14,151	1969	9,713
1955	14,151	1970	10,781
1956	13,962	1971	8,932
1957	14,063	1972	8,903
1958	12,627	1973	7,920
1959	3,136	1974	8,800
1960	3,136	1975	10,068
1961	12,991		

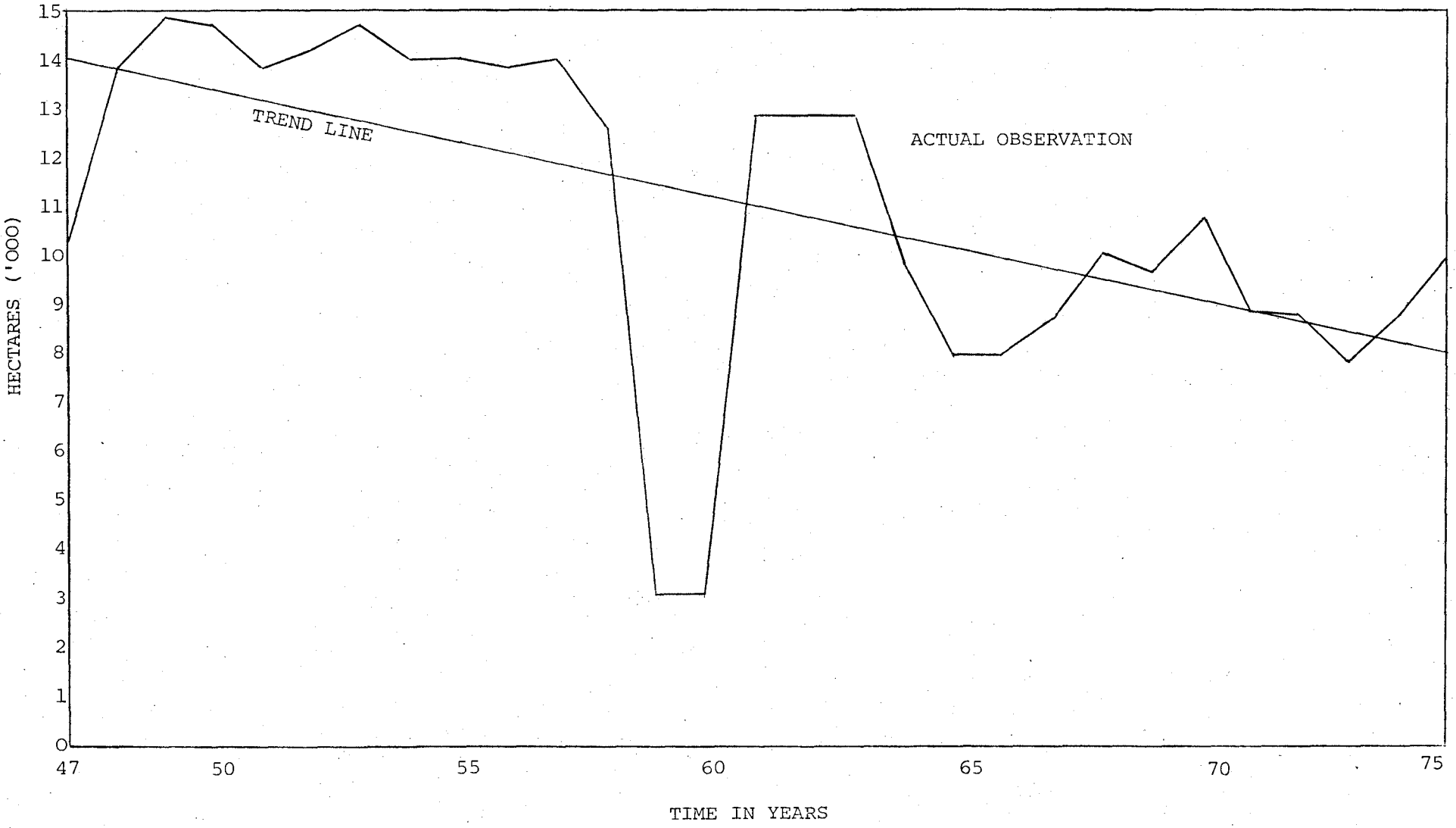
Sources: 1. Colonial Annual Reports, 1947-1973

2. IBRD Report No. 1296-FIJ

3. Department of Agriculture Annual Reports, 1959, 1966-1972

FIGURE 1.2

GRAPH OF RICE AREA, 1947-1975



As it was noted earlier, Fiji's rice industry has been somewhat stagnant and that rice imports have been increasing, particularly during the period of DP6 and DP7. Prima facie, it appears that government's objective to boost local production has been frustrated and that all the incentives enumerated above have been ineffective. This first intuitive remark is all more convincing when figures in Tables 1.9 and 1.10 are analysed.

However, it is intended to delve into this matter a little further in Chapter 6 so as to reach an understanding of how the various government policies interact, and how the numerous constraints and unforeseen circumstances can militate against any plan or projection.

1.5 Hypotheses Derived from Empirical Observations

From empirical observations, one can deduce certain hypotheses as provision explanations of observed facts. Two hypotheses, therefore, can be derived from all the empirical observations thus far. These are:

(a) That the decline in rice area may be due to competition from sugar cane.

(b) That the increase in rice imports may be due to various factors mainly prices, marketing system and rising demand from the non-agricultural sector.

Moreover, it is generally asserted that government policies have not performed as well as expected in terms of increasing the degree of self-sufficiency, particularly in the context of government rural development objectives. This question will be examined in a general way.

The above hypotheses and impressions, however, are merely unproved theories or suppositions that need to be substantiated to be credible.

1.6 Objectives of the Study

This study will attempt to examine these hypotheses. However, prior to that, it is expedient to study some background on the rice production

TABLE 1.9

EFFECTIVE RICE AREA STATISTICS

(Hectares)

	1976			1977			1978		
	DP 7	Actual	% Completion	DP 7	Actual	% Completion	DP 7	Estimated	% Completion
Irrigated	988	650	65.8	1,336	794	59.4	1,741	929	53.4
Rainfed	10,120	8,492	83.9	10,729	8,593	80.1	10,931	8,166	74.7
TOTAL	11,108	9,142	82.3	12,065	9,387	77.8	12,672	9,095	71.8

Source: DP 7 Review: Agriculture.

TABLE 1.10

PADDY PRODUCTION, TARGETS AND ACTUAL PRODUCTION

(Tonnes)

	1976			1977			1978		
	DP 7	Actual	% Completion	DP 7	Actual	% Completion	DP	Estimated	% Completion
Irrigated	3,569	2,295	64.3	4,876	2,647	54.3	6,406	2,995	46.8
Rainfed	20,145	18,370	91.2	21,930	15,420	70.3	23,200	11,370	49.0
TOTAL	23,714	20,665	87.1	26,806	18,067	82.9	29,606	14,365	48.5

Source: DP 7 Review: Agriculture.

and marketing system in Fiji. This will be the subject of Chapter 2.

Chapters 3 and 4 will subject hypotheses (a) and (b) respectively to further analyses. As it will be noted, hypothesis (a) is concerned about the supply aspect of rice whilst hypothesis (b) is concerned about its demand aspects.

Having discussed these aspects, it would be logical therefore to statistically estimate past trends in the supply and demand for rice and their projected values. Chapter 5 will attempt this analysis. This analysis is basically to ascertain the relative direction of output and consumption trends under current government policies and, moreover, the future trends given these same policies.

Chapter 6 then focuses on the stated impressions on policies, i.e. to attempt to evaluate the various government policies that operate within the framework of food self-sufficiency policy, and which tend to influence the trends that rice output and consumption would take.

Chapter 7 merely concludes the discussions and draws on some of the major implications.

1.7 Methodology

All other chapters except Chapter 5 will be basically descriptive, using simple analytical tools of simple regressions, tabulations and graphical illustrations. The approach is one of a problem-solving approach. That in Chapter 6 will adopt a less rigorous evaluative approach.

The statistical analysis in Chapter 5 uses mainly simple extrapolation techniques and some multiple regression for projection purposes. Chapter 3 also has a short section on statistical analysis.

1.8 Discussions of the Data to be Used

Secondary time-series data from various government publications are used. Apart from the statistical problems associated with time-series

data, e.g. degrees of freedom etc., the other problems of limited data availability and the quality of data, presented major constraints.

These restricted the use of multiple regression models substantially as will be apparent. For instance, all the necessary time-series data that were available for a supply analysis (i.e. 13 year time-series aggregated data), were not sufficient for a meaningful supply analysis. D.G. Johnson (1961) had recommended a 20-30 year time-series data.

Attempts at estimating demand functions were also constrained. Intriligator (1978, pp.63-64) points out that time-series data are inappropriate to analyse the interrelationships amongst the relevant variables compared to cross-sectional data. However, they would be adequate for projection in the short-run situation. The problem encountered in the estimation was getting demand equations that have coefficients whose signs and magnitudes conform to economic theories.

Another problem of time-series data is the degree of aggregation. This presents a problem of inadequate representation of the choice situations facing consumers. For example, consumers may choose between such related product as various cuts of meat, rather than between beef and mutton as products. Disaggregation on the basis of choice sets faced by consumers may produce quite different results from those based on physical commodity types.

Finally, as Wold and Jureen (1953, p. 278) pointed out when estimating demand equations from time-series data, that prices, incomes and other regressors must display fairly large variation if their effect is to be established in terms of demand elasticities.

CHAPTER 2

RICE PRODUCTION AND MARKETING SYSTEM IN FIJI

2.1 Preamble

The possibility of growing rice in the valley lands of the wet districts was first recognized in 1876 (Burn et al 1960, p. 35). Since then the rice industry has come a long way and the growing of rice, whilst still being confined generally to the valley lands, has certainly spread to other districts that are relatively dry. In fact, the majority of rice currently being grown, is concentrated mainly in the drier zones of the two main islands of Viti Levu and Vanua Levu.

The development of the rice industry since its inception has not been one of gradual escalation. As a matter of fact, when the industry is viewed in a long-term perspective as from 1947, it can be said, as noted in Chapter 1, that the industry has been rather stagnant and it partly explains government's efforts in promoting the industry in recent years.

This chapter looks at the various aspects of the rice industry, their interrelationships and how they are organized into a system. The objectives being, firstly, to study the various circumstances that are interacting within the industry in order to view the long-term trends of the various components of the industry in a better perspective. Secondly, to study the "subsistence"[1] nature of most rice growers vis-â-vis the market orientation of others.

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1 The use of "subsistence" may be misleading. The writer believes that hardly any grower is totally subsistent in the sense that he and his family consume all the rice produced on the farm. In times of urgent needs for cash or when there is a surplus crop, a rice grower would consider marketing part of his crop. This aspect will be further discussed later in the chapter. Therefore, the term "subsistence" may be replaced by a more explicit term, viz, "semi-subsistence".

2.2 Production Aspects

2.2.1 Physical Aspects

(a) Rainfall: The northern and western parts of the two main islands, which contain the majority of rice areas, are relatively dry with rainfall at around 178 cm. with a pronounced dry period from June to August/September. The rainfall in the wetter areas in the south-eastern parts of the two islands, on the other hand, averages about 305 cm and is higher inland.

(b) Area Distribution: Table 2.1 shows a breakdown of rice areas by the three rice-growing divisions in Fiji (see map overleaf) and even though the figures presented are rather outdated, the breakdown can still be regarded as representative of the current distribution of rice area in the country. It can be seen that the Western and Northern Divisions contain the majority of the rice areas in all the years shown. These two divisions also happen to be the sugar cane areas in the country.

(c) Rice Growers: Rice growers are predominantly Indians. At one time, Fijians were enthusiastic about the crop. The Colonial Annual Reports stated that in 1948, Fijian rice growers had planted about 405 hectares of rice. This area doubled in the following year. The Reports also indicated that some Europeans and part-Europeans were growing rice in 1952. However, in 1958 and 1959, the situation had changed and the Fijians had reduced their acreage and the Indians had increased theirs. Based on the figures in Burn et al (op cit, p. 35), the rice area planted by Fijians had declined to 162 hectares and that Indian growers had planted over 96% of all rice grown in 1958. This percentage had increased from about 94% in 1950.

The current estimate of the number of rice growers stands at 8,000 (IBRD 1977, p.16; ADB 1978, p.41). The 1968 estimate, on the other hand, was about 9,500 (Fiji, CPO 1970) i.e., 5,000 from the Western Division, 2,800 from the Northern Division and 1,700 from the Central Division.

TABLE 2.1

FIJI'S DISTRIBUTION OF RICE AREA BY DIVISION, 1968-1972

Year	Western		Central		Northern		Total	
	Ha.	% of Total	Ha.	% of Total	Ha.	% of Total	Ha.	%
1968	3,587	36	2,258	23	4,017	41	9,862	100
1970	3,702	34	3,038	28	4,050	38	10,790	100
1971	2,471	28	2,695	30	3,774	42	8,940	100
1972	2,533	29	2,633	30	3,715	41	8,881	100

Sources: 1. Sixth Development Plan

2. Colonial Annual Reports, 1968-1972

3. Department of Agricultural Annual Reports, 1968-1972.

The Western and Northern Divisions contribute over 82% of the total.

Rice growers are essentially smallholders. The World Bank (IBRD op cit) estimates that the national average farm area cultivated with rice is one hectare, and the current national yield stands at about 2.3 tonnes of paddy per hectare.

2.2.2 Rice Production Systems

Three rice production systems[1] can be observed, viz:

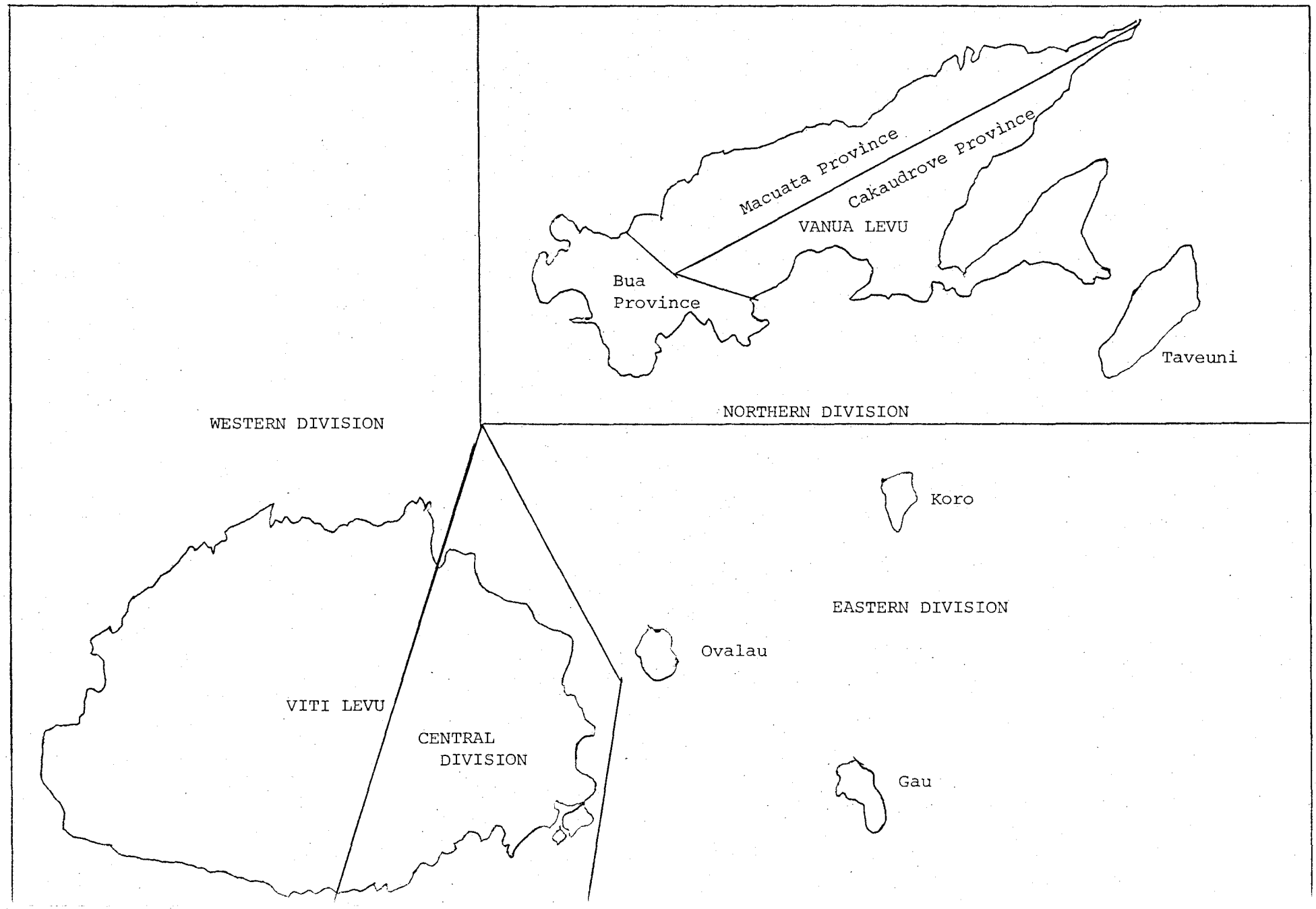
(i) Rice in the cane area. This includes both rainfed and dryland rice.

(ii) Rice outside the cane area that is almost predominantly rainfed.

(iii) Irrigated rice that is grown in specialized large-scale irrigation schemes also outside the sugar cane area.

1 The categorization is arbitrary. The objective here is to facilitate the discussions in a later chapter on the likely competition between rice and sugar cane.

MAP OF VITI LEVU AND VANUA LEVU



Most of the rice grown in Fiji falls into the first category and is actually cultivated by cane farmers (IBRD op cit, ADB op cit). Therefore, practically all the rice area in the Western Division and the majority in the Northern Division (see Table 2.1) fall into this category; and this rice would be grown by the majority of the 8,000 growers currently growing rice.

Rice in the second category is found mainly in the Central Division and parts of the Northern Division viz., Bua Province and isolated pockets in Cakaudrove in southern Vanua Levu.

The irrigated rice in the third category is located in three government-sponsored irrigation schemes, viz: Rewa and Navua in the Central Division and Dreketi in the Northern Division.

Of all the rice grown, about 90% is rainfed (IBRD op cit; ADB op cit) which is normally transplanted compared to the dryland rice which is either broadcast or drilled. Watson (1956, p.45) had earlier estimated that about 60% of all the rice grown in Fiji was transplanted. The disparity in the two percentages above may imply that transplanting might have gained popularity over the years. This would have been so since transplanted rice tends to produce better yields than non-transplanted rice, and growers would have resorted to it for increased production.

Comparative data on output and yield of each production system are not available. Those corresponding to the divisions, however, are available and would be sufficient approximation of output and yield for each system within a division. Table 2.2 shows that in 1968, 5,994 tonnes were produced in the Western Division (i.e. practically all in the cane area). The Northern Division produced 6,502 tonnes of paddy. Assuming that the majority of the Northern Division's output, say a reasonable 60% or 3,901 tonnes, was produced within the cane area, then the total of all paddy

TABLE 2.2

OUTPUT AND YIELD OF PADDY BY DIVISION, 1968

Division	Output (tonnes)	Area (hectares)	Yield (tonnes/ hectare)
Western	5,994	3,587	1.7
Central	5,080	2,258	2.2
Northern	6,502	4,017	1.6
Total or Average	17,576	9,862	1.8

Sources: 1. Colonial Annual Reports, 1968

2. Department of Agriculture Annual Reports, 1968

3. IBRD Report No. 1296-FIJ.

4. Sixth Development Plan

produced in the first production system is some 9,895 tonnes or 56% of the the total production. The yields in these two divisions, however, appear to be below the average in that particular year, as indicated in Table 2.2.

The output from the Central Division and the balance from the Northern Division would constitute the output from the second production system. No output from the third system was realized in 1968 since irrigation schemes began producing after that year.

Given the categorization of rice systems above, it is expedient to discuss the relationship between rice and other crops that are cultivated within the same locality. In the first category, it is well-documented that some competition between rice and sugar cane exists (e.g. vide Fiji. CPO 1975, p.76). This likely competition will be analysed in depth in Chapter 3. However, discussions on some general observations

may be relevant at this juncture. For example, the figures for the Western Division in Table 2.1 show that the areas for 1971 and 1972 were substantially below the 1970 area. This, according to the Department of Agriculture Annual Reports for 1971 and 1972, was due to two factors relating to sugar cane. In the first place, it was observed that sugar cane planting had increased in many areas in that Division and area for rice had declined subsequently. Secondly, the sugar cane season had protracted somewhat and this delayed the land preparation and planting of rice since growers were still involved in cane harvesting and milling. This observation implies that rice and sugar cane tend to compete both for land and manhours.

In the second category of rice production system, little competition is observed.[1] Generally speaking, rice here and as well as in the irrigation schemes for that matter, tends to be land-specific. One obvious reason for this land specificity is that constructing bunds and water canals are labour- and time-intensive activities and the former, in particular, requires machine work which may not be easily acquired. Therefore, growers would tend to maintain their rice fields rather than ploughing them up for other crops.

Production inputs into the first and second categories of rice system tend to be relatively low. Tenureship of the land can be either Native Lease,[2] Crown Lease or Freehold. The labour used is essentially family labour, though some landlords outside the cane area do hire non-

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1 Some crop rotation usually with pulses is practised, and some mixed cropping with dryland rice.

2 The fear of land insecurity that had discouraged some rice improvement work in some areas including the cane areas, appeared to have been allayed by the provisions of the Agricultural Landlord and Tenant (Amendment) Act of 1976 which legislated for a 30-year lease rather than 10 years.

family labour for rice work. The use of fertilizer is minimal.[1] However, the use of agro-chemicals is more popular probably due to the high incidence of rice diseases and pest infestation. Mechanization is restricted. However, the use of sprayers is becoming increasingly popular and some growers use seed drills.[2]

Production inputs into irrigated rice, on the other hand, are relatively greater and mechanization level is higher. For example, in 1969, combine harvesters were first introduced in the Rewa Irrigation Scheme for a trial run.

To boost rice production, the government has been involved in the subsidization of some of these inputs viz, fertilizer, agro-chemicals, irrigation water, certified rice seeds and credit. Of these, only two are rice-specific, i.e. irrigation water in government sponsored irrigation schemes and certified rice seeds.[3]

Despite these subsidies, costs of production have been noted to have increased.[4] Tables 2.3 and 2.4 show results of two exercises on Gross Margins. The variable costs in Table 2.3 do not take labour into account, whereas those in Table 2.4 do. Therefore, if we assumed a relatively high 50% labour cost in Table 2.3, this would increase the variable costs to

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1 The 1950 Colonial Annual Report of Fiji stated that fertilizer was largely confined to the sugar cane industry. Furthermore, the World Bank in 1977 (IBRD op cit, p.19) estimated that less than 10% of the fertilizer available in Fiji is being used for crops other than sugar.

2 The 1970 Department of Agriculture Annual Report stated that about 405 hectares of rice were drilled every year in the Northern Division.

3 A Seed Testing Laboratory was first established in Nausori in 1971. However, a new building with better facilities, was completed in 1977 to replace the former (DP7 Review: Agriculture).

4 A substantial proportion of the costs are non-cash. Costs, therefore, could be viewed from the standpoint of opportunity costs or opportunities foregone.

TABLE 2.3

RICE - GROSS MARGINS[1], 1975

	$	
	5 ac	1 ac
Gross Return	540.00	108.00
Variable Costs	124.00	24.80
Gross Margins		83.20

Note: 1 Based on a 5 acre rice farm, producing a single crop @ 0.6 tons/acre and selling at $180/ton. Family labour costs are not accounted for.

Source: FAO/IBRD Report No. 29/75 FIJI 5.

TABLE 2.4

RICE - GROSS MARGINS, 1978

	$			
	Irrigated[1]		Rain-fed[2]	
	Optimum	Average	Optimum	Average
Gross return/ac/crop	252.00	225.00	216.00	162.00
Variable costs/ac/crop	149.00	149.00	145.00	113.00
∴ Gross Margins	103.00	76.00	71.00	49.00

Notes: 1 The optimum farm produces 1.4 tons/acre/crop. Whilst the corresponding figure for the average farm is 1.25 tons.

2 Corresponding figures for the rainfed farms are 1.2 tons and 0.9 tons respectively. Labour is costed at $3.00 per 8 hour day, although with family labour this does not involve a cash outlay. The price per ton of paddy is $180.00

Source: Ministry of Agriculture and Fisheries.

$37.20/acre and reduce the Gross Margins to $70.80. It can be seen that the 1975 (i.e. in Table 2.3) variable costs with labour costs included, are still lower than those in 1978 (i.e. in Table 2.4). For a fair comparison, the new variable costs (i.e. $37.20) of Table 2.3 should be compared with those in the last column of Table 2.4., i.e. $113.00 since the rice conditions in the representative farms being studied tend to be similar. This would then allow one to conclude in general terms that costs have increased over the years.

The cost data and Gross Margins of Table 2.3 and those in the last two columns of Table 2.4 tend to reflect to a large extent the situation in the first two categories of rice production system. In the absence of comparative costs of individual items, it is difficult to establish vigorously the cost inflation that has taken place. The situation is exacerbated by the fact that farm costs are not reflected in the Consumer Price Index. However, price control has been imposed on these farm inputs since 1976 and this is indicative of the general high prices that had prevailed.

The corresponding costs and gross margins for irrigated farm in Table 2.4 represent the situation in the third category of rice production system. A detailed costing exercise of items required under this production system for the year 1979 is done in Table 2.5. The total cost of $129.20, however, should not be compared to that of $149.10 in Table 2.4 for ascertaining cost differential due to inflation since details of specific cost components of Table 2.4 are not available. Nevertheless, the Table serves to establish the various cost items and some ideas about manpower requirements.

One specific cost that contributes to the variable costs is labour, particularly on irrigated farms, and it can be demonstrated to a reasonable

TABLE 2.5

PRODUCTION COSTS FOR IRRIGATED RICE SYSTEM,

LAKENA IRRIGATION SCHEME (1979)[1]

Operation		Cost/ac./crop
		($)
Provided by Management		
Land preparation		20.00
Land rates - $1/ac/6 month season		1.00
Water rates		8.00
Seeds - 30 Kg.		7.20
Fertilizer		12.00
Insecticides		15.00
Weedicides		5.00
Provided by Farmer		
Soaking/incubating	15 min/day for 2 days @ $4/day	0.25
Furrowing	2 hr/ac for 1 man	1.00
Sowing (broadcast)	1 hr/ac for 1 man	0.50
Spraying - weedicide	2 hr/ac for 1 man (2 spraying)	1.00
- MCA	1/2 hr/ac for 1 man	0.25
- insecticide	2 hr/ac for 1 man (5 spraying)	5.00
Hand harvesting	8 hr/ac for 10 men	40.00
Threshing	1 hr/ac	12.00
Miscellaneous		1.00
	TOTAL	$129.20

Note: 1 The costing is based on an average irrigated unit on the Rewa Irrigation Scheme, when no rice harvester is provided. Where a harvester is provided, it would cost the farmer $25/acre, but of course, the farmer saves on costs of hand harvesting and threshing.

Source: Farm Manager, Lakena (Rewa) Irrigation Scheme.

degree of accuracy that it has increased. Table 2.6 shows the daily mean wages of wage earners in the agricultural sector. If we assumed that these represent the wages paid to farm labourers, then it could be concluded that these have increased over the years. From the Table, it can be seen that the daily mean wages increased at a rate of 10.74% per year between 1965

TABLE 2.6

DAILY MEAN WAGES OF WAGE EARNERS

IN AGRICULTURE, 1965-1976 (Current Prices)

Year	Fijian Dollars
1965	1.48
1966	1.61
1967	1.62
1968	1.58
1969	1.78
1970	1.97
1971	2.13
1972	2.39
1973	3.12
1974	4.49
1975	4.98
1976	5.03
Av. growth rate p.a. =	10.74%[1]

Note: 1 Derived from H.P. Brown's Growth Rate Tables 1965.

Source: Current Economic Statistics, 1969-1978.

and 1976.[1]

2.2.3 Large-scale Irrigation of Rice

Apart from inputs subsidization and the provisions of other farm inputs like Research, Extension Services[2] etc., the government is also involved in large-scale irrigation work. This, however, is relatively a new phenomenon in Fiji. Large-scale irrigation of rice properly started in 1966 with a Pre-Investment Survey and a pilot project in Rewa and Navua. The former was a combined UNDP/Fiji Government project. The year 1968 saw the completion of the Rewa Scheme and the first harvest from it in the following year realized about 287 tonnes from about 94 hectares. The best yield obtained was about 4.7 tonnes per hectare (Fiji Colonial Office 1969).

Other related developments ensued. In 1972, a Drainage and Irrigation Division of the Ministry of Agriculture and Fisheries was established and took over management of the Rewa Scheme in the same year. At the same time a United Nations engineer was appointed to start on the irrigation work in Dreketi in Vanua Levu, and an agricultural engineer to start work on small drainage schemes in Bua also in Vanua Levu. To provide a guaranteed market for rice being produced on the Rewa Scheme, the government bought the Rewa Rice Industry from the Colonial Sugar Refining Company Limited based in Nausori and adjacent to the Scheme.

Table 2.7 shows that the area achieved under irrigation had increased to 700 hectares by 1975. The achievements for part of the Seventh Development Plan period are also shown. It can be seen from the Table that the yields of irrigated rice are quite high compared to those of rainfed rice. Furthermore, the Table also shows that the proportion of the area

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1 In 1965 the Colonial Annual Report stated that high labour costs had discouraged other than family rice production units.

2 An analysis of the performance of government policies will be discussed in Chapter 6.

TABLE 2.7

GROWTH OF PADDY PRODUCTION, 1970-1978

	YEARS				
	1970	1975	1976	1977	1978[1]
Harvested Area (Ha)	10,656	10,068	9,142	9,387	9,095
Irrigated	-[2]	700	650	794	929
Rainfed	10,656	9,368	8,492	8,593	8,166
Paddy Production (tonnes)	20,320	22,964	20,665	18,067	14,365
Irrigated	-	2,625	2,295	2,647	2,995
Rainfed	20,320	20,339	18,370	15,420	11,370
Yield (tonnes/hectare)					
Irrigated	-	3.75	3.53	3.33	3.22
Rainfed	1.91	2.17	2.16	1.79	1.39
Proportion of irrigated area to total area (%)	-	7.0	7.1	8.4	10.2
Proportion of irrigated paddy production to total production (%)	-	11.4	11.1	14.7	20.8

Note: 1 Estimated

2 The Colonial Annual Reports stated that 194 hectares were harvested in the Rewa Scheme in 1970 and 202 hectares in 1971. These, however, were grown as part of the pilot project.

Sources: 1. IBRD Report No. 1296-FIJ

2. DP 7 Review: Agriculture.

under irrigated rice is increasing and as well as the proportion of irrigated rice production relative to the total production.

The irrigation work in Rewa and Navua is now finished. Irrigation construction is now in progress in the Dreketi Scheme in Vanua Levu. At the completion of the Rewa Scheme, the area of irrigated rice was 316 hectares. The corresponding figure for Navua was 57 hectares. At the end of 1977, 75 hectares were producing irrigated rice at Dreketi and this area was projected to increase by 40 hectares per year up to 1980 (DP 7 Review: Agriculture).

2.2.4 Subsistence or Market Orientation of Rice Growers

The predominance of subsistence rice production over commercial production is well-documented (e.g. vide IBRD op cit, p.16; ADB op cit, p.41). These documents also suggest that the majority of these subsistence rice growers are cane farmers in the Northern and Western Divisions as noted earlier. A substantial proportion of the paddy production in the two Divisions shown in Table 2.1 would, therefore, be for subsistence. The magnitude of the subsistence rice vis-â-vis the marketable surplus cannot be accurately determined for two reasons. Firstly, for lack of data, and secondly, because of the variability of the marketable surplus[1] which is subject to farmers' decisions on whether to market their produce or to retain it. As briefly mentioned earlier, these rice growers do market some of their rice from their "subsistence" stock when the needs arise.

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1 The quantity harvested may directly determine the size of this marketable surplus. In 1955 extremely good harvests were realized. The Colonial Annual Report for that year stated that some growers experienced temporary difficulties in disposing of their crop. The reverse when harvests were poor and paddy (and rice seeds also) sale declined, was observed in the Western Division in 1972. (Fiji Department of Agriculture 1972).

However, some estimates can be derived by studying the 1972 Northern Division rice harvest data contained in the Annual Report of the Department of Agriculture. The report stated that of the 5,385 tonnes of paddy produced in that Division, about 66% was retained for subsistence use and for seeds. The balance, 34%, was to be marketed locally within the Division. The Northern Division's harvest included paddy from farmers in Bua who are generally more market-oriented compared to rice growers in the cane area in Macuata province. These Bua farmers and others like them are the likely main contributors to the 34% of paddy that is marketed.

Comparative figures for the Western Division are not available. However, it can be said that rice growers in this Division are essentially cane growers unlike their counterparts in Bua for example. Therefore, their main preoccupation would be sugar cane being their cash crop, and they would tend to be more subsistence oriented as far as rice is concerned. It would be expected, therefore, that their proportion of subsistence rice production would be relatively greater than that of the Northern Division rice farmers.

The corresponding proportion in the Central Division which includes the irrigated rice farmers, would be expected to be lowest, i.e. their proportion of marketable surplus would be highest.

Considering the national situation, it can be seen from Table 2.7 that the paddy production for irrigated rice farms constituted some 11.4% of the total paddy output in 1975 and estimated to be 20.8% in 1978. This proportion of the total output in addition to a small proportion of marketable surplus from rainfed paddy production represents the commercial sale of paddy in Fiji. The irrigated paddy production from the Rewa Irrigation Scheme, in particular, is purchased by the Rewa Rice Limited which processes it for distribution to wholesalers.

2.2.5 Nutritional Aspects of Rice

Rice is the main staple food for Indians both in the rural and urban areas (Chandra 1978, p.321). Table 2.8 shows that rice, apart from roti (made from wheat flour) provides the cereal component of a rural Indian diet. The diet component of rural Fijians are also shown for comparison. In recent nutritional surveys, Fijians are observed to be increasingly consuming rice (Parkinson 1973, p.86). This is true for both rural and urban Fijians.[1]

Table 2.9 shows an attempt to quantify the per capita intake of calories and protein for the country as a whole. The contribution of local rice would feature most in the vegetables food type, and as can be seen, its contributions to national calories and protein intakes are quite substantial.

Considered in this regard, it can be said that although rice is predominantly a subsistence crop, its contributions to national calories and protein intake are sufficient to warrant some importance in any national food policy.

2.2.6 Income to Household[2]

Income generation in the rural sector to reduce the income disparity between rural and urban levels is high in the government's priority. Table 2.10 shows that income levels in the agricultural sector are lowest compared to those in the other sectors. The Subsistence Agriculture category in the Table constitutes mainly Fijians. The rice growers would fall in between this category and the Commercial Agriculture category, but

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1 Chapter 4 will discuss this issue further.

2 Having established the predominantly subsistence nature of rice growing it may seem illogical to discuss the income accruing to rice farmers. Nevertheless, it is considered a prudent exercise particularly considering that commercial rice production from irrigated farms is improving (see Table 2.7). Moreover, it does help in analysing the income rice growers are saving by not having to buy their own rice.

TABLE 2.8

TRADITIONAL RURAL DIETS

Food Type	Items Commonly Eaten by Fijians	Items Commonly Eaten by Indians
Animal Products	Fish[1], incl. shellfish	Fish[2]
	Beef	Mutton[2]
	Pork	Chicken[2]
		Eggs[2]
Cereals		Rice
		Roti
Pulses		Dhal
Root Vegetables	Dalo (Taro)	Potato
	Cassava	
	Sweet Potato	
Green Vegetables	Rourou (Taro Leaves)	Okra
	Bele	Egg Plant
		Beans
		Cabbage
Other Vegetables	Tomato	Tomato
	Cucumber	Cucumber
Fruit	Bananas	Bananas
	Pineapple	Pawpaw
	Pawpaw	Oranges
		Lemons
Other	Tea	Tea
	Coconut Milk	Ghee
	Margarine or dripping	Vegetable oil
	Sugar	Spices
		Sugar

Notes: 1 Traditionally fresh, but now canned fish is more common
2 In small quantity

Source: Seventh Development Plan

TABLE 2.9

SUMMARY OF AGGREGATE NATIONAL NUTRITIONAL INTAKE, 1973-1974[1]

Food Type	Calories (billion)			Protein (million grams)		
	Local Production less exports	Imports less re-exports	Local Consumption	Local Production less exports	Imports less re-exports	Local Consumption
Meat	10.9	6.3	17.2	719.5	438.4	1,157.9
Fish	2.1	6.4	8.5	335.4	653.9	989.3
Dairy Products	7.4	16.3	23.7	244.0	428.1	672.1
Cereals imported	-	152.1	152.1	-	4,088.1	4,088.1
Fruit	13.8	3.3	17.1	218.5	41.1	259.6
Vegetables[2]	125.4	12.3	137.7	1,749.7	668.3	2,418.0
Sugar Products	88.5	2.2	90.7	79.0	3.1	82.1
Alcohol	-	5.8	5.8	-	30.1	30.1
Coffee, Tea, Chocolate, Spices[3] etc.	-	1.6	1.6	-	2,726.3	2,726.3
Miscellaneous	-	3.2	3.2	-	67.2	67.2
TOTAL	248.1	209.5	457.6	3,346.1	9,144.6	12,490.7
Av. daily per capita intake[4]	2,275 calories			62 grams (of which 14 g. animal protein)		

Notes: 1 The method used carries with it the possibility of considerable errors. For example, no stock carry over is accounted for and estimates of predominantly subsistence crops may be open to question.

2 Including locally produced rice and pulses.

3 In particular, spices used in curry powders which are a significant source of protein amongst the Indian community.

4 Including tourists' intake.

Source: Seventh Development Plan.

tending more to the latter. In this regard, the Asian Development Bank (op cit, p.10) states that general observations tend to indicate that the incomes in outer islands and the interior of Viti Levu and Vanua Levu are far smaller than in the sugar growing areas.

The above constitutes a general view of the situation. To study specifically some income estimates derived from rice production, the Gross Margins of Tables 2.3 and 2.4 can be of some use. The new Gross Margins of Table 2.3 when labour is accounted for is $70.80. These Gross Margins and the ones in the last two columns of Table 2.4, i.e. $71.00 and $49.00 represent, as established before, the returns to rice growers in the first and second categories of rice production system.. These Gross Margins represent the returns on fixed costs to the growers in these two categories. And it appears that these returns have decreased for the average rice farms, i.e. $70.80 in 1975 to $49.00 in 1978. The returns on fixed costs on a rainfed rice farm with optimum conditions in 1978 is almost identical to the returns to an average farm three years previously.

Table 2.11 shows the net returns to various rice farms under different conditions when a fixed cost, i.e. a reasonable land rent of $7.50 per acre, is accounted for. Again the net returns for a rainfed rice farm with average conditions seem to have declined over the years. Conclusions of similar comparative nature for ther farm types in Table 2.11 cannot be reached for lack of earlier estimates.

Taking the average farm size of one hectare, it could be calculated from Table 2.11 that the total net returns or total profit for a rainfed farm was about $156.00 in 1975. By 1978 this had somewhat declined for a farm with average conditions, i.e. it declined to about $102.00 per farm. For a farm with optimum conditions, the total profit in 1978 was about $157.00.

TABLE 2.10

INCOMES OF LABOUR FORCE GROUPS, 1975

	Income F$m	Employment (1000)	Income per worker (F$)	Income per capita (F$)
Subsistence Agriculture[1]	42	27.1	1,500	400
Commercial Agriculture	72	38.2	1,890	490
Non-Agricultural wage & salary earners	155	68.8	2,250	590
Non-Agricultural entrepreneurial incomes	141	16.8	8,390	2,180
Total or Average	410	150.9	2,720	710

Note: 1 It is not possible to make a comparable estimate for earlier years since 1975 is the only year for which an estimate of subsistence income and employment is available.

Source: IBRD Report No. 1296-FIJ

The total profit estimates for irrigated farms in 1978 ranged from about $169.00 for average condition to about $236.00 per farm for optimum conditions.

2.2.7 Employment Aspect

Non-irrigated rice units in the cane area and those outside it almost always use family labour for these units are essentially smallholders. Even on irrigated units, family labour provides a sizeable proportion of the manpower requirement.

The number of rice growers in the country has somewhat declined, as noted earlier in Subsection 2.2.1. This decline reflects the general decline of the labour force in agriculture since 1956 as Table 2.12 demonstrates.

TABLE 2.11

RETURNS PER ACRE ON FIXED COSTS AND NET RETURNS, 1975, 1978[1]

Farm Type	Gross Margins or Returns on Fixed Costs ($)			Fixed Costs ($)	Net Returns ($)		
	1975	1978	+/-		1975	1978	+/-
Rainfed:							
average conditions	70.80	49.00	-21.80	7.50	63.30	41.50	-21.80
optimum conditions	70.80	71.00	+ 0.20	7.50	63.30	63.50	+ 0.20
Irrigated:							
average conditions	-	76.00	-	7.50	-	68.50	-
optimum conditions	-	103.00	-	7.50	-	95.50	-

Note: 1 The figures in this Table are derived from Tables 2.3 and 2.4 and from discussions based on them. They are, therefore on a per acre basis.

As regards the employment content of a unit area of rice, Table 2.5 does provide some information on manpower requirement on an irrigated rice farm. The total number of hours required of the farmer for a 6-month crop can be calculated from Table 2.5 and this amounts to 99 hours. Assuming a yield of 3.22 tonnes/ha (1.3 tons/ac) - see Table 2.7, and a price of $200/ton, it can be calculated that the gross proceed equals $260/ac, i.e. a net proceed of $130.80/ac. Expressed on a monthly basis, this is equivalent to $21.80 per acre per month.

If, on the other hand, the farmer were to be employed on a wage basis, he could earn in 99 hours (about 12.4 work days or 0.6 month) the equivalent of $62.37, i.e. assuming a Daily Mean Wage of $5.03 (see Table 2.6). Expressed on a monthly basis, this is equivalent to $104/month. Even if a relatively high 50% of this accounts for expenses, it can be seen that

TABLE 2.12

LABOUR FORCE IN AGRICULTURE,[1]

1956, 1966, 1973 and 1975

Class of Agriculture	1956		1966		1973		1975	
	'000	%	'000	%	'000	%	'000	%
Mainly cash	28.1	30.5	41.8	34.7	38.4	26.8	38.2	25
Mainly Subsistence	25.2	27.3	26.3	21.8	26.3	18.4	27.1	18
TOTAL	53.3	57.8	68.1	56.5	64.7	45.2	65.3	43

Note: 1 Includes forestry and fisheries

Source: IBRD Report No. 1296-FIJ

wage employment would still be the more lucrative.

This simple arithmetic highlights the situation that is so common on the two irrigation schemes in Rewa and Navua. That is, that farmers tend to be part-timers or absentee farmers who are employed elsewhere. Consequently, the management of their rice farms is affected. In the Western Division where tourism offers easy money, labour shortages which affect rice and sugar activities, have resulted (IBRD op cit, p.26).

2.3 Other Marketing Aspects

Subsistence rice still has to be milled and this is carried out in about 200 small mills that are dotted throughout the rice growing areas. These mills are owned by farmers and traders. The 1953 Colonial Annual report stated that these mills operated under capacity and produced substandard products. It is believed that the situation has not improved since then.

These mills do not have a constant throughput to allow economic operation. This is because rice growers keep paddy on their respective farms and only have them milled when required. The miller/trader may buy both paddy and milled rice which he sells from his store. Other middlemen, on the other hand, may buy both from the farmer and the miller.

There are three commercially-operated large mills - two of which are in Nausori and one in Lautoka. The presence of many small rice mills, apart from the general subsistence nature of the crop, tends to constrain any attempt at rationalization of rice marketing in Fiji.

The marketing margins represent the price spreads between producers and consumers. Table 2.13 shows these margins for the years in which both price series were available.

From the Table, it can be seen that the proportion of returns to producers has been improving. However, the magnitude of the marketing

TABLE 2.13

RICE MARKETING MARGINS,

1968, 1969, 1975, 1977 and 1978

Year	Producer Price		Retail Price ($/tonne)	Marketing Margins ($/tonne)
	$/tonne	%[1]		
1968	63.00	22	284.00	221.00
1969	98.00	34	291.00	193.00
1975	177.00	41	437.00	260.00
1977	177.00	49	364.00	187.00
1978	177.00	47	377.00	200.00

Note: 1 Percentage of producer price to Retail Price

Sources: 1 Ministry of Agriculture and Fisheries

2 Bureau of Statistics

margins seems to have no reflection at all of the simple marketing channel and the processes that actually take place between the producers and consumers

CHAPTER 3

ANALYSIS OF RICE AND SUGAR CANE COMPETITIVENESS

3.1 Preamble

The hypothesis from Chapter 1 that the decline in rice area may be due to competition from sugar cane needs substantiation.[1]

This hypothesis has been popularly accepted over the years and is based on the following premises:

(a) That the majority of rice farmers are also cane farmers as mentioned in the previous chapter.

(b) That the majority of rice grown in Fiji is in the cane area as the same chapter reveals also.

Occasions when this hypothesis has been cited or alluded to are numerous. Some of these are as follows:

(a) The Colonial Annual Report (1958) commented that the relatively high import of rice in that year was partly ascribed to a marked increase in land planted in cane over the last previous years in some areas where rice was grown before.[2]

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1 This, however, does not necessarily preclude other factors that may contribute to the decline of the rice area.

2 A somewhat reverse situation was observed between 1959 and 1962. Rice imports during this period declined (see Table 1.6), and this was partly due to a tariff imposition designed to offer protection to the local rice industry and to facilitate the establishment of a rice mill at Nausori. Whether the protection promoted both output and area of rice cannot be determined accurately (although data in Tables 1.7 and 1.8 respectively indicate increases) because of substantial losses due to rice yellow in 1959 and 1960 as mentioned in Chapter 1. Furthermore, it is also difficult to determine accurately whether the promotion of rice actually affected the sugar cane area which generally declined in the Western Division as will be seen in Table 3.1

(b) The Department of Agriculture Annual Reports (1959, 1971 and 1972) all mentioned the fact that when sugar cane harvesting season was prolonged, rice planting etc. by cane farmers would be delayed with consequent drop in rice area and production of rice from the cane area. This actually points out that the two commodities do not only compete for land, they also complete for the farmers' time on some occasions.

(c) The Report of the Commission of Inquiry into the Natural Resources and Population Trends of the Colony of Fiji 1959 (Burn et al op cit) noted that cane had replaced rice on some of the better land. The report added that between 1956 and 1958, cane acreage increased by some 13,200 acres, much of which formerly grew rice.

(d) DP 7 (op cit, p.76) agreed that there is competition and remarked that a result of a healthy cane industry is the depressed state in the rice industry.

3.2 Testing the Hypothesis

3.2.1 Expectation of Inverse Relationship

For two commodities to compete for limited resources, one must be finally favoured to the detriment of the other. In the case of rice and sugar cane, it is usually assumed that they compete for land initially. Therefore, if cane for instance is favoured, its area will increase and that of rice will decrease. A priori, this is the inverse relationship that is expected between these two variables in both the Northern and Western Divisions.

3.2.2 Limitations of Data

Essential data to establish this inverse relationship, however, are not complete as Table 3.1 and Figure 3.1 show. The data that are missing

TABLE 3.1

AREAS OF RICE AND SUGAR CANE,

NORTHERN AND WESTERN DIVISIONS (ha)

Year	Northern		Western		Year	Northern		Western	
	Cane	Rice	Cane	Rice		Cane	Rice	Cane	Rice
1952	6,723	NA	33,309	NA	1967	11,383	NA	50,454	NA
1953	7,328	NA	33,777	NA	1968	11,403	4,017	50,606	3,587
1954	7,932	NA	35,046	NA	1969	11,417	NA	50,632	NA
1955	8,164	NA	35,675	NA	1970	11,716	4,050	53,507	3,702
1956	8,387	NA	37,239	NA	1971	11,721	3,774	53,530	2,471
1957	8,894	NA	40,047	NA	1972	11,798	3,715	53,781	2,533
1958	9,141	NA	41,770	NA	1973	11,872	4,810	53,951	2,190
1959	9,621	NA	44,681	NA	1974	12,791	4,600	55,031	2,290
1960	9,672	NA	40,812	NA	1975	15,957	4,698	57,753	2,760
1961	9,754	NA	41,040	NA	1976	16,204	4,124	58,117	2,486
1962	9,878	NA	42,391	NA	1977	17,212	4,080	60,150	2,300
1963	9,961	NA	42,174	NA	1978	18,443	NA	60,489	NA
1964	11,118	NA	42,345	NA	1979	19,201	NA	61,126	3,482
1965	10,802	NA	47,390	NA	1980	21,168	NA	64,230	NA
1966	11,370	NA	49,910	NA					

Notes: NA = Not Available

Sources: 1. Fiji Sugar Corporation Limited

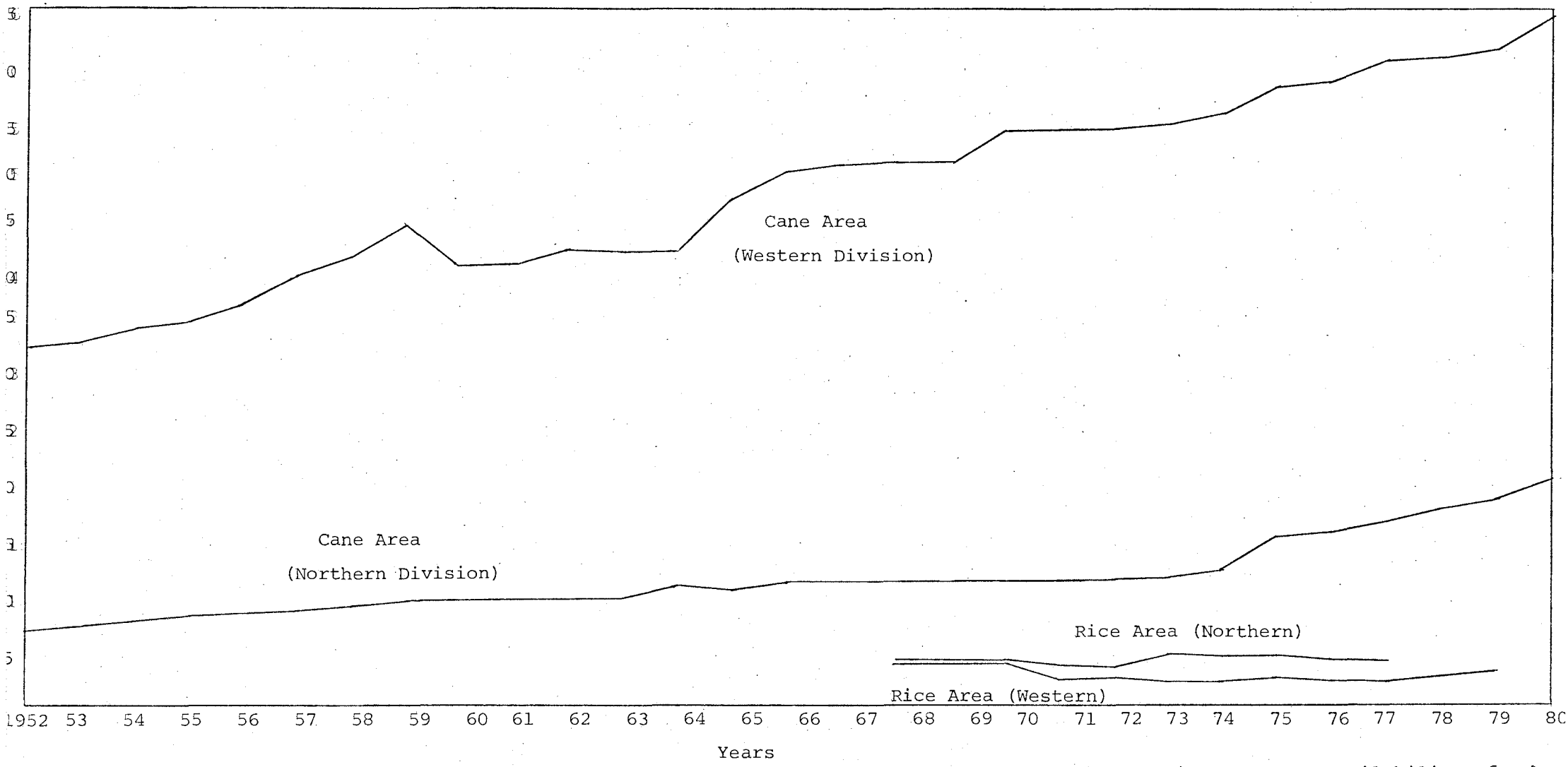
2 Ministry of Agriculture and Fisheries.

FIGURE 3.1

GRAPHS OF RICE AND CANE AREAS

IN NORTHERN AND WESTERN DIVISIONS

1952-1980[1]



Note: 1. Graphs of rice areas in Northern and Western Divisions are not complete for the period studied due to unavailability of data.

are the rice areas that are considered most critical, i.e. those of the 1950s and a substantial part of the 1960s that are likely to display a decline in values for that relatively longer period. Instead, we have the rice areas as from 1968. The late 1960s and the early 1970s are really the tail end of the period that we need to study in order to establish the inverse relationship. Moreover, the mid to late 1970s is really the period when some of government's efforts to increase the rice areas were being felt.

The graphical revelation that was intended to conclusively establish this inverse relationship has, therefore, proved abortive. One has to resort to other means.

3.2.3 Justification of the Inverse Relationship

(a) The inverse relationship exists between the country's total rice areas and the country's sugar cane areas whether by division or by the total of the two divisions. Superimposition of Figures 1.2 and 3.1 will verify this. It can be implied, therefore, that taking the country as a whole, an increase in the cane area is certainly associated with a decline in the rice area.

No casual relationship, however, can be established. Nevertheless, considering that the majority of rice is grown in the cane area by cane farmers, and that land is a limited resource amongst cane growers or in any other sector of agriculture for that matter, it can be said that if cane is planted more extensively, then it may follow that rice has to be sacrificed.

(b) From Table 1.8, it can be seen that the country's total rice area in 1968 was 10,118 hectares. Of these, the Northern Division had contributed about 40% and the Western Division 35% (see Table 3.1). Assuming that these respective proportions existed a decade earlier also, it may be said that the Northern Division's rice area in 1958 was 5,051 hectares (i.e. 0.4 x 12,627). Similarly, it can be said that the Western Division's rice area in the same year was 4,419 hectares (i.e. 0.35 x 12,627). If these two values are then plotted on Figure 3.1, we may be able to depict the declining trend that characterized the rice areas during this period. When these downward trends of the rice area are, in turn, compared to those upward graphs of the cane area already in Figure 3.1, we may then see the inverse relationship between the two commodities.

(c) The essence of the historical observations discussed in Section 3.1 is that some of the increase in cane area was actually being planted on previous rice land. Since the cane areas have increased (see Table 3.1 and Figure 3.1) it can be inferred that some of this increase would have been planted on rice land, and since there were no new rice schemes within the cane area, it can only be concluded that there would be an overall decline in rice area within the cane belt.

3.3 Factors Contributing to the Inverse Relationship

A factor that definitely played a role to induce the inverse relationship between areas of rice and sugar cane was the farmer's economic rationalization. He has his major cash crop in sugar cane which would account for most of his productive inputs and he would tend to grow the

maximum area allowable under his cane contract.[1] He would only grow sufficient rice, therefore, for his subsistence use. Any likely marketable surplus that is realized may only be incidental.

The farmer's economic rationalization would make him respond positively to sugar cane prices. Table 3.2 shows that cane producer prices have tended to increase. Assuming price responsiveness, therefore, it can be said that growers would adjust their relative crop areas accordingly with the likely increase in sugar cane area vis-â-vis rice area.

TABLE 3.2

SUGAR CANE PRODUCER PRICES, 1958-1975

Year	F$/tonne	Year	F$/tonne
1958	6.80	1967	6.23
1959	6.33	1968	6.40
1960	7.20	1969	6.62
1961	6.31	1970	7.62
1962	6.88	1971	7.95
1963	9.64	1972	9.90
1964	7.08	1973	9.76
1965	6.59	1974	20.57
1966	6.39	1975	31.60

Source: Current Economic Statistics, 1969-1978.

1 Cane growers and the Fiji Sugar Corporation, FSC, have 10-year contracts to cover each other's interests and, inter alia, the contract provides for a formula of sharing of proceeds. Independent arbitrators who have set the contract terms in the past are Britain's Sir Malcolm Eve (later Lord Silsoe) and a British judge, Lord Denning. Cane growers are essentially smallholders. The system of smallholder cane farming started after 1916 when the indenture system ended. Prior to that, Fiji's sugar cane was grown on the plantation system.

It may be argued that farmer's economic rationalization may actually phase out subsistence rice. This is valid where the farmer has an alternative source of relatively cheap rice; and some growers do in fact have access to an alternative source, as will be apparent below. Generally speaking, however, growers tend to retain an area of their land for subsistence cropping for whatever economic or non-economic reasons they feel are important. Moreover, farmers are cognizant of the savings that accrue to them when they grow their staple food which they would otherwise buy from elsewhere.

This apparent saving is really what the farmers perceive and associate with rice. In other words, they do not associate the commodity with relative profitability of rice and sugar cane cultivation. Even if they do, they are likely to see that rice farming is less profitable vis-â-vis sugar cane cultivation. For instance an average sugar cane farmer producing 35 tons of cane and selling at the current $25/ton will gross $875/acre and net $525/acre i.e. assuming a reasonable 40% production costs. For a 12-month season, the net profit is equivalent to $43.75/month. The same farmer may grow an acre of rice and he is likely to gross about $140 in a 6-month season, i.e. assuming a yield of 0.7 ton/ac (equivalent to 1.7 tonnes/ha from Table 2.2) and a price at the current level of $200/ton.[1] On a monthly basis, this gross proceed is equivalent to about $23.33; and even this estimate of the gross proceed does not compare well to the estimate of the net proceed from the same area of sugar cane.

Apart from this intrinsic rationalization of the farmer, there are extrinsic influences that tend to militate against expansion of rice and

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1 If he were to forego growing rice completely and expect to buy all his rice requirements then he would certainly pay more than this after marketing margins have been taken into account (see Table 2.13).

have therefore contributed to its areal decline. These are:

(a) The sugar industry's existing infrastructures in the forms of mills, extension service, transport network, guaranteed outlet, prices/returns certainties, provisions of inputs, contractual arrangements etc., all contribute to the attractiveness of sugar cane farming. These in themselves, however, do not necessarily militate against rice farming. What does militate against rice is really the relative absence of these similar infrastructures in the rice industry. Had they been available, rice farming would have been increasingly commercialized and its area might have actually increased or remained constant rather than decreased.

(b) The Fiji Sugar Corporation (FSC) and its predecessors have always maintained and promoted monoculture. Rice in particular was not encouraged. This, however, was not implemented directly in that farmers were not told to grow rice. Instead, FSC instituted a scheme whereby cheap rice was sold to cane farmers and this replaced what farmers would have grown themselves.

In this capacity, the Colonial Sugar Refining Company Ltd. (CSR), as FSC was then, established the Rewa Rice Ltd to provide this role. The Rewa Rice Ltd is now an independent government agency but it is still continuing this role apart from its other roles to the other sectors of the economy. However, its role to the cane farmers may not be as extensive as it used to be.

(c) "Backyard" sugar cane farming was promoted from about 1975 to 1979. This was done to boost sugar production which was declining at that time and farms less than 15 acres, which would normally be excluded for contractual arrangements, were given contracts to grow cane. Some of these small farms within the cane area that would normally have rice were subsequently planted to sugar cane.[1] The rice areas both in the Western and Northern Divisions experienced marked declines in 1976 and 1977, as can be seen in Table 3.1.

With the termination of this scheme on 31st March, 1979, it would be reasonable to assume that rice area may increase again within the cane belt.[2] However, the possibilities of this reversing the long-term trend as depicted in Figure 1.2 are uncertain.

3.4 Rice Acreage Response Study

The inconclusiveness of the graphical method to establish the inverse relationship between areas of rice and cane lends validity and justification for this approach. However, the results below are based on poor data and tenuous assumptions and care must be exercised in deriving implications from such results.

Single and multivariate regression models are used here and, essentially, the objective is to study the rice acreage response in relation to some of the major variables including the area of sugar cane.

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1 Between 1976 and 1979, 1,040 backyard contracts involving 5,544 acres and 79,210 tonnes were issued (Fiji Sugar Industry Annual Report for 1979 Season, p.7).

2 Obviously, there would be a delay of three or four years for all cane ratoons to be harvested before there is any relatively marked increase in the rice area.

3.4.1 The Model

The model to be estimated is as follows:

$$A_r = f(A_c, P_c, P_r) \qquad (3.1)$$

where, A_r = rice area

A_c = cane area

P_c = price of cane

P_r = price of rice

The regressand, A_r, has been declining as we see in Table 1.8 and Figure 1.2. The first regressor, A_c, is considered the most important since we are attempting to establish the competition between rice and cane. Its significantly-increasing values from 1947 to 1975[1] are contained in Table 3.3.

The values of the next regressor, P_c, is also shown in the Table. A proxy is being used instead of producer prices for three reasons. Firstly, the producer price series in Table 3.2 was not complete. Secondly, the proxy is considered quite appropriate because of its high correlation to the producer price series of Table 3.2 - where r = (+) 0.95. Thirdly, the proxy is also considered appropriate since Fiji exports most of her raw sugar to UK. It is expected that cane farmers who are rice farmers also would be price responsive as far as price of cane is concerned.

The third regressor, P_r, is included to complete the model. Again a proxy is used for lack of rice producer prices. On a priori grounds, the expected relationship between A_r and P_r is uncertain since farmers are not quite commercial rice producers and the rationale for production may include non-economic considerations.

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1 A simple time trend analysis results in the following:
$A_c = -2371383 + 1226^{*} T$ where T = Time, $r^2 = 0.93$.
It should be noted also that national data are being used rather than divisional data which would be more appropriate, but were, unfortunately, not complete for the period to be studied.

TABLE 3.3

VALUES OF THE REGRESSORS USED IN THE

RICE ACREAGE RESPONSE STUDY

Year	Cane Area[1] (ha)	Price of cane[3] (US¢/Kg)	Price of rice[5] (US¢/Kg)	Year	Cane Area (ha)	Price of cane (US¢/Kg)	Price of rice (US¢/Kg)
1947	16,949	6.3(E)	17.4(E)	1962	31,347	12.6	15.3
1948	18,000	7.0(E)	15.0(E)	1963	31,347	12.7	14.4
1949	18,000	7.7(E)	12.6	1964	34,992	12.7	13.7
1950	18,176	8.4	10.2	1965	36,693	11.6	13.7
1951	16,930	9.1	10.0	1966	43,000	12.0	16.6
1952	21,360	10.6	10.7	1967	45,000	11.8	22.2
1953	24,672	11.7	9.9	1968	46,000	10.3	20.3
1954	23,586	11.3	15.9	1969	47,000	10.3	18.4
1955	24,762	11.2	14.1	1970	46,000	10.3	14.3
1956	23,420	11.6	13.8	1971	47,000	10.6	12.9
1957	25,735	11.6	13.9	1972	44,000	12.2	14.8
1958	31,119	12.1	14.8	1973	46,000	12.1	29.9
1959	35,518	12.4	13.3	1974	45,000	32.5[4]	53.4
1960	30,861[2]	12.2	12.5	1975	45,000	35.0	54.1
1961	31,104	12.4	13.7				

Notes:
1 Area harvested
2 The 1960-1965 area series has been revised to account for unharvested cane
3 UK Import Price of raw sugar
4 The 1974 and 1975 sugar prices shown are derived from Fiji export unit value
5 Thailand Export prices of milled rice
E Extrapolated values

Sources:
1 Current Economic Statistics, 1969-1978
2 Colonial Annual Reports, 1947-1973
3 IBRD Report No. 1296-FIJ
4 Annual Statistical Abstract, 1969-1971
5 Department of Agriculture Annual Reports, 1959, 1966-1972
6 Burn et al (1960)
7 FAO Production Yearbook
8 FAO Trade Yearbook
9 FAO Rice Reports
10 FAO Commodity Reports

3.4.2 Results of Estimation

Simple Linear and Simple Logarithmic Regressions were carried out at first. An additional regressor in the form of the relative price of rice to cane, P_r/P_c, was included in the regressions in the event that this might have more impact on the regressand vis-â-vis the absolute prices.

The results show that of all the regressors, only A_c (area of cane) had regression coefficients that were statistically significant in both regressions, e.g.,

Simple Linear Regression

The model estimated was:

$$A_r = a_i + b_i X_i \qquad (3.2)$$

where, a_i = constant

b_i = regression coefficient

X_i = represents each of the regressors in model 3.1, including P_r/P_c the relative price regressor

i = 1,2,3,4.

Significant Regressor = A_c (area of cane)

b_1 = -0.19*

SE = 0.05

r^2 = 0.39

F = 17.22*

DW = 1.18

Simple Logarithmic Regression

The model estimated was:

$$A_r = a_i + b_i \ln X_i \qquad (3.3)$$

where, a_i = constant

b_i = regression coefficient

X_i = represents each of the regressors in model 3.1, including P_r/P_c the relative price regressor

i = 1,2,3,4.

Significant Regressor = A_c (area of cane)

b_1 = -0.53*

SE = 0.19

r^2 = 0.23

F = 7.85*

DW = 1.22

The coefficients have the expected sign i.e. indicating an inverse relationship. The Linear Regression coefficient implies that if there is a 1% increase in the area of cane, there would be a 0.19% decrease in the area of rice, ceteris paribus. The elasticity of such a response is about 0.53 as indicated by the Logarithmic Regression coefficient.

The test for autocorrelation, however, remains inconclusive as indicated by the Durbin-Watson Statistics (DW). This in itself indicates the need for more observations.

Because of the ceteris paribus assumptions inherent in the two regressions above, the results may not reflect the true situation. The results of a multivariate regressions (see below) attempt to depict the true situation, e.g.

Results of the Step-wise Multiple Linear Regression

The models estimated were:

$$A_r = a_1 + b_1 A_c + b_2 P_c + b_3 P_r \quad (3.4)$$

$$A_r = a_2 + b_4 A_c = b_5 P_r \quad (3.5)$$

$$A_r = a_3 + b_6 A_c + b_7 P_r / P_c \quad (3.6)$$

where, a_1, a_2, a_3 are constants

$b_1 - b_7$ are regression coefficients whose values with their respective standard errors (in parentheses) are tabulated below:

	A_c	P_c	P_r	P_r/P_c	R^2	F	DW
1.	-0.20* (0.05)	8.8 (194)	15.9 (114)		0.39	5.39*	1.18
2.	-0.20* (0.05)		20.4 (53)		0.39	8.41*	1.18
3.	-0.19* (0.05)			309 (1111)	0.39	8.36*	1.18

The signs of the significant regression coefficients of A_c are as expected and are consistent. The magnitude seems consistent also. The R^2 (0.39) did not improve compared to the r^2 obtained for the Simple Linear Regression, when A_c was the only regressor. This implies that the addition of other regressors to the regression did not perceptibly add to the variation of the regressand. This may underline the dominance of the cane area as a factor in the variation of the rice area.

There were no statistically significant regressions for the step-wise Multiple Logarithmic version of the regression. However, the A_c coefficients (elasticities) themselves were significant, they had the expected signs and were consistent in magnitude. The three estimates obtained were -0.60(0.24), -0.60 (0.23) and -0.53(0.19).

The severity of multicollinearity was gradually reduced as the stepwise regression progressed. The problem was still too severe to be neglected. This was demonstrated by either the R^2 being less than the correlation coefficient (r) of any two regressors in the same regression, or by the standard error (SE) being greater than its corresponding regression coefficient. Given this situation, therefore, it can be said that the estimates of the regression coefficient and the elasticity are inefficient i.e. the estimates obtained by applying the OLS regression process to different samples would differ from one another by a smaller amount than the estimates produced by other methods.

The test for autocorrelation still remains inconclusive indicating again the need for more observations.

Despite these statistical inconsistencies, we may still arrive at the statement that the cane area appears to be a major factor in the variation of the rice area; and if the cane area is increased, it appears that the rice area will decrease as a result.

CHAPTER 4

ANALYSIS OF INCREASING RICE IMPORTS

4.1 Preamble

The rationale for imports in Fiji's context and how rice featured in the import figures were discussed in Chapter 1. This chapter looks at the past trend of rice import statistics and discusses some of the salient factors that have contributed to this trend.

4.2 Empirical Observation

Table 1.6 and Figure 1.1, as noted previously, show that the quantity of rice imports has tended to increase since 1948. The increase, however, has not been one of continuous upward escalation. Nevertheless, a simple time trend analysis of import data from 1948 to 1975 shows that there had been a significant upward trend. The result of the simple time trend analysis is as follows:

$$\text{Rice Import} = -1042787 + 535^{*} T$$

where $r^2 = 0.82$

T = Time variable.

4.3 Factors That Bring About Increasing Rice Imports

4.3.1 Stagnation of Local Rice Production

The stagnation of local agricultural production, with the exception of sugar cane was discussed in Chapter 1. The stagnation of local rice production is depicted in Figure 1.1 also. This particular figure shows that the graphs depicting local rice production and imported rice have tended to converge over the years and have actually crossed path. In other words, whilst prior to the 1970s the quantity of imported rice used to be less than local rice production, during the 1970s and particularly in the second half of the decade, the situation had reversed.

Two other observations can be derived from this same diagram. The first is of a short-term nature whilst the other is of a long-term one.

In the short-term, if annual data are analysed, it can be seen that in some years the quantity of rice imports varies inversely as the quantity of local rice produced e.g. in 1951, 1952, 1953 etc.
The year 1951 was unusually dry, and this delayed rice planting. Consequently, rice production fell and rice imports increased. Rice production was further depressed the following year due both to drought and to hurricane damage. This further increased the quantity of rice imports. However, in 1953 Fiji realized a good harvest and the quantity of imported rice consequently fell.

In some other years, this inverse relationship was absent. Apart from a delayed response in the demand for rice imports, a factor that may explain such absence, it can also be implied that there are other factors that may need to be considered to explain the increase in the quantity of rice imports.

The long-term observation that can be derived from Figure 1.1 tends to confirm the existence of other factors. The fact that the two graphs are not diametrically opposed to each other establishes that the relationship between the two variables is not one of a complete inverse and that other factors must be considered to produce the relationship so depicted in the diagram.

4.3.2 Increasing Population and Urbanization[1]

Population and increased urbanization may be two of these factors. The population statistics in Table 4.1 depict increases both in the total and in the racial components of the population. The total population data

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1 These two factors are treated jointly here because of their similar effects on demand for rice. Whilst the former affects the total demand for rice, the latter affects especially the demand for imported rice. This, however, will become more apparent later.

TABLE 4.1

FIJI POPULATION AND MAIN RACIAL COMPONENTS, 1947-1976[1]

Year	Fijian ('000)	Indian ('000)	Others ('000)	Total ('000)
1947				269
1948				277
1949				285
1950				289
1951				302
1952				313
1953				321
1954				333
1955				345
1956	148	169	29	346
1957				361
1958				374
1959				388
1960				394
1961				407
1962				421
1963				435
1964				449
1965				464
1966	202	241	35	478
1967				490
1968				495
1969				506
1970				521
1971				533
1972				544
1973				556
1974				565
1975				576
1976	260	293	35	588

Note: 1 Years that have population figures for the main population components are the population census years.

Sources:
1. Current Economic Statistics, 1969-1978
2. Annual Statistical Abstract, 1969-1971
3. Colonial Office Annual Reports, 1947-1973
4. Report on the Census of the Population 1976, Volume 1.

have a high positive correlation r = + 0.91) with rice import data (vide Figure 4.1). That is that high rice import requirement is associated with high population figure and vice versa. Any causal relationship, however, can only be implied.

That increased population may be causing increased demand for imported rice may be better analysed if the racial components of Fiji's population are studied.

The Indian population, be they rural or urban, are the main rice eaters (vide Subsection 2.1.5). Their number has been increasing as shown in Table 4.1 and Figure 4.1. It can be assumed, therefore, that their demands for rice have also increased proportionately. However, it remains to be seen whether this increased demand would actually increase the demand for imported rice.

It is proposed here that the increase both in the Indian and Fijian population has contributed to the increased demand for imported rice for the following reasons:

(a) Fiji's urban population has been increasing (vide Table 4.2 below).

FIGURE 4.1

GRAPHS OF RICE IMPORTS AND

TOTAL POPULATION, 1947-1979

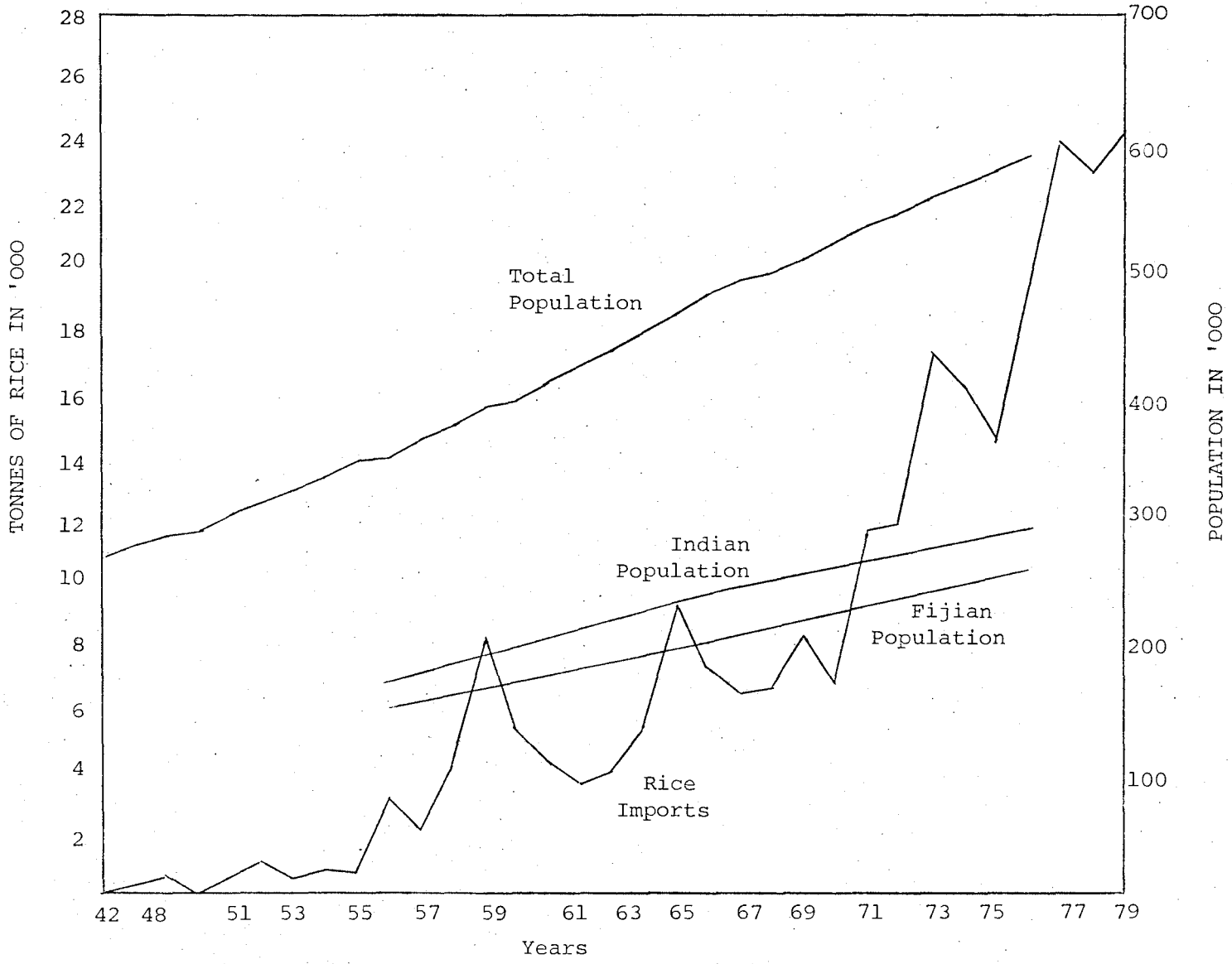

TABLE 4.2

RURAL/URBAN POPULATION DISTRIBUTION, 1966 and 1976

('000)

Class of Population	1966		1976		AGR (%)
	No.	%	No.	%	1966-76
Rural	317.5	66.6	370.0	62.8	1.5
Urban	159.3	33.4	218.5	37.2	3.2
TOTAL[1]	476.8	100	588.5	100	2.1

Note: 1 Subject to rounding error

Source: Country Review Paper, 1978.

It can be reasonably assumed, therefore, that both Indian and Fijian urban population are increasing proportionately. Moreover, it is generally believed that urban dwellers prefer polished, imported rice to local, unpolished rice.[1] Therefore, it can be concluded that increased Indian urban population has contributed to increased demand for imported rice.

(b) Fijians also have developed a taste for rice (vide Parkinson op cit, p.86). In Table 4.3, it can be seen that urban Fijian consumption of cereal products, which admittedly included bread, is not very far behind the corresponding figure for Indians.

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1 Two major reasons for this preference are known. Firstly, urban consumers tend to develop sophisticated tastes for "better" quality and imported commodities. Secondly, local rice is relatively less available in urban areas since the majority of the rice grown in Fiji is for subsistence (vide Chapter 2) and, therefore, does not get to markets.

TABLE 4.3

FORTNIGHTLY URBAN EXPENDITURE ON RICE AND ROOTCROPS[1] IN PERCENTAGES BY RACE

	Fijian	Indian	Chinese	European
Bakery products, cereals	5.4	6.1	9.1[2]	4.8
Root Crops	4.4	0.8	0.7	1.5

Notes: 1 Corresponding figures for rootcrops are included for comparison

2 This figure seems high. It is most likely that rice purchases by some restauranteurs are included.

Source: Report on the Urban Household Income and Expenditure Survey in Fiji, 1972.

An urban Fijian would also buy more imported rice than local rice, like his Indian counterpart, for reasons stated earlier.

A rural Fijian is likely to be consuming more rice also. Parkinson (ibid, p.89) explains that a subsistence Fijian farmer turned cash cropper, a trend that is increasing, does not have time to grow enough food for subsistence use. He, therefore, would buy the available convenience foods (e.g. rice) since he has the cash. Despite his rural setting, it would be reasonable to assume that he would be buying imported rice increasingly.

There are two major reasons for this. Firstly, the store where he would purchase his rice, would be obtaining its stock from an urban centre. Therefore, there would be more likelihood for imported rice to be stocked in lieu

of local rice. Secondly, since the majority of rice farmers are Indians (vide Chapter 2), a rural Fijian consumer would be less accessible to local rice vis-â-vis his Indian counterpart.

(c) Per capita rice consumption has been increasing over the years. Table 4.4 shows this trend. Since the figures shown are urban-biased, it could be implied that the consumption so estimated would be based mainly on imported rice.

TABLE 4.4

ESTIMATED RICE CONSUMPTION PER HEAD OF POPULATION, 1968-1977[1]

Year	Kilograms
1968	49
1969	50
1970	52
1971	54
1972	54
1973	59
1974	72
1975	56
1976	54
1977	64

Note: 1 Stock fluctuation is not accounted for. Therefore data reflect only apparent consumption.

Source: Current Economic Statistics, 1969-1978.

4.3.3 Increasing Per Capita Income

Table 4.5 shows that per capita income has certainly been increasing over the years. It appears, therefore, that per capita income and per capita rice consumption in Table 4.4 have a high positive correlation i.e. high per capita income is associated with high per capita rice consumption. Without resorting to a rigorous statistical test for causation of this relationship, it can be implied, ceteris paribus, that rice is far from an inferior good. The fact that urban Indians and Fijians, who are relatively wealthy vis-â-vis their rural counterparts, are still consuming rice increasingly, may verify this remark.

TABLE 4.5

PER CAPITA GROSS DOMESTIC PRODUCT, 1968-1977

Year	GDP (F$m) (current prices)	GDP/head ($) (current prices)	General CPI Base Year Jan'74=100	GDP/head ($) (constant prices)
1968	129.6	262	62.6	419
1969	140.5	278	64.9	428
1970	168.9	324	67.6	479
1971	184.7	347	72.0	482
1972	230.5	424	78.6	539
1973	300.6	541	87.4	619
1974	400.0	708	108.6	652
1975	502.4	872	122.8	710
1976	558.5	955	136.8	698
1977	636.2	1067	146.4	729

Source: Current Economic Statistics, 1969-1978.

The observation above is based on time-series data contained in Tables 4.4 and 4.5. The results derived from cross-sectional data (see Table 4.6)

and their implications on rice consumption habits are indeed very interesting.

The Table implies that in Fiji society, at any point in time, less wealthy persons will spend proportionately more of their income on rice vis-â-vis their more affluent counterparts.

Assuming that this consumption pattern is valid and, furthermore, that rice per capita consumption is also increasing, then it can be implied that a substantial proportion of Fiji's urban rice consumers are in the lower income group. Table 4.7 gives an example of income distribution in Fiji's context.

TABLE 4.6

EXPENDITURE ON RICE AND ROOTCROPS IN PERCENTAGES BY QUARTILE INCOME GROUPS[1]

	1st	2nd	3rd	4th
Bakery products, cereals (rice)	7.7	6.8	6.9	5.2
Rootcrops	3.5	2.5	1.8	1.5

Note: 1 Corresponding figures for rootcrops are included for comparison.

Source: Report on the Urban Household Income and Expenditure Survey in Fiji, 1972.

TABLE 4.7

INCOME GROUPS BY QUARTILES BY RACE[1]

	Q1	Q2	Q3	Q4
Indians	66(24)	69(25)	77(28)	65(23)
Fijians	36(32)	35(31)	24(21)	18(16)
Chinese	4(24)	3(18)	5(29)	5(29)
Europeans	4(11)	4(11)	5(13)	25(65)

Notes: 1 Figures outside parenthesis refer to number of income earners. Those in parenthesis represent their respective percentages to the total of earners in each race.

Source: Report on the Urban Household Income and Expenditure Survey in Fiji, 1972.

4.3.4 Domestic Supply and Demand Conditions

Prices of local rice are invariably higher than those of imported rice (see Table 4.8). On the subject of the usually inflated prices Fiji farmers tend to demand, Burn said that

> "..... it is our view that many farmers have an inflated idea as to the prices they should receive for their produce ...."

(Burn et al op cit, p.50). This situation has somewhat persisted ever since.

Given such a situation where prices of imported rice are cheaper relative to those of local rice, in addition to the special preference for imported rice in the urban areas, it is conceivable that demands for imported rice would increase.

4.3.5 International Supply and Demand Conditions

Fiji is a price taker in the world rice market. Import price of rice on its own, therefore, is not a major factor in the decision to import. Thailand export price of milled rice is taken as a proxy for Fiji's price of imported rice. Its values are tabulated in Table 4.9 and graphed in Figure

TABLE 4.8

RETAIL PRICES OF IMPORTED AND LOCAL RICE, SUVA MARKET[1]

(¢/Kg)

Date	Imported	Local
28/1/79	55	51
21/3/79	48-55	51-59
18/4/79	48-55	51-55
2/5/79	48-55	51-62
6/6/79	48-55	55-62
4/7/79	44-48	51-59
8/8/79	44-51	53-62
12/9/79	44-51	55-62
10/10/79	44-51	55
28/11/79	48	44
5/12/79	48	44
30/1/80	55	60
6/2/80	55	60
30/4/80	55-57	60
7/5/80	55-57	60
9/7/80	55-57	60
6/8/80	55-57	60

Note: 1 The situation that imported rice has been cheaper vis-â-vis local rice has been the case for years. For instance, the situation existed in 1975 and 1976, and it was one of the reasons that motivated the Ministry of Agriculture and Fisheries (MAF) to propose for a rice tariff which Cabinet refused. However, MAF persisted in its efforts to protect the local rice industry and was rewarded in 1978 to impose rice import licensing.

Source: Department of Agriculture Weekly Market News, 1979-1980.

TABLE 4.9

PRICES OF IMPORTED RICE 1949-1975

Year	US¢/Kg [1]	Year	US¢/Kg
1949	12.6	1963	14.4
1950	10.2	1964	13.7
1951	10.0	1965	13.7
1952	10.7	1966	16.6
1953	9.9	1967	22.2
1954	15.9	1968	20.3
1955	14.1	1969	18.4
1956	13.8	1970	14.3
1957	13.9	1971	12.9
1958	14.8	1972	14.8
1959	13.3	1973	29.9
1960	12.5	1974	53.4
1961	13.7	1975	54.1
1962	15.3		

Note: 1 Thailand Export price of milled rice is taken as a representative import price.

Source: FAO Production Yearbook (nd)

4.2. If this figure is superimposed on Figure 4.1, it will be noted that the quantity of imported rice would tend to increase as its prices increase. This only establishes the fact that when Fiji needs to import rice, it will do so despite the relatively high prices that may be prevailing at that time.

4.3.6 Fiji's Exchange Rate

The increased prices of imports in the latter part of the period studied in Figure 4.2 have contributed to increased values of imports. The real value of imports can be expressed in a function such as:

$$Z = Z\ (Y,\ p,\ \Pi)$$

where, Z = real value of imports

Y = domestic income

p = price level (commodity price level in this case)

Π = exchange rate

That is, the real value of imports is assumed to be an increasing function of domestic income and the price level, and a decreasing function of the exchange rate. Discussions on the effects of Y and p have been done in subsections 4.3.3 and 4.3.4 respectively.

As regards Π, this would have to appear to decrease for import demand to increase, i.e. imports cost less in local currency than previously. This constitutes an overvaluation of the exchange rate. And if there is no devaluation of the local currency demand for imports will tend to increase.

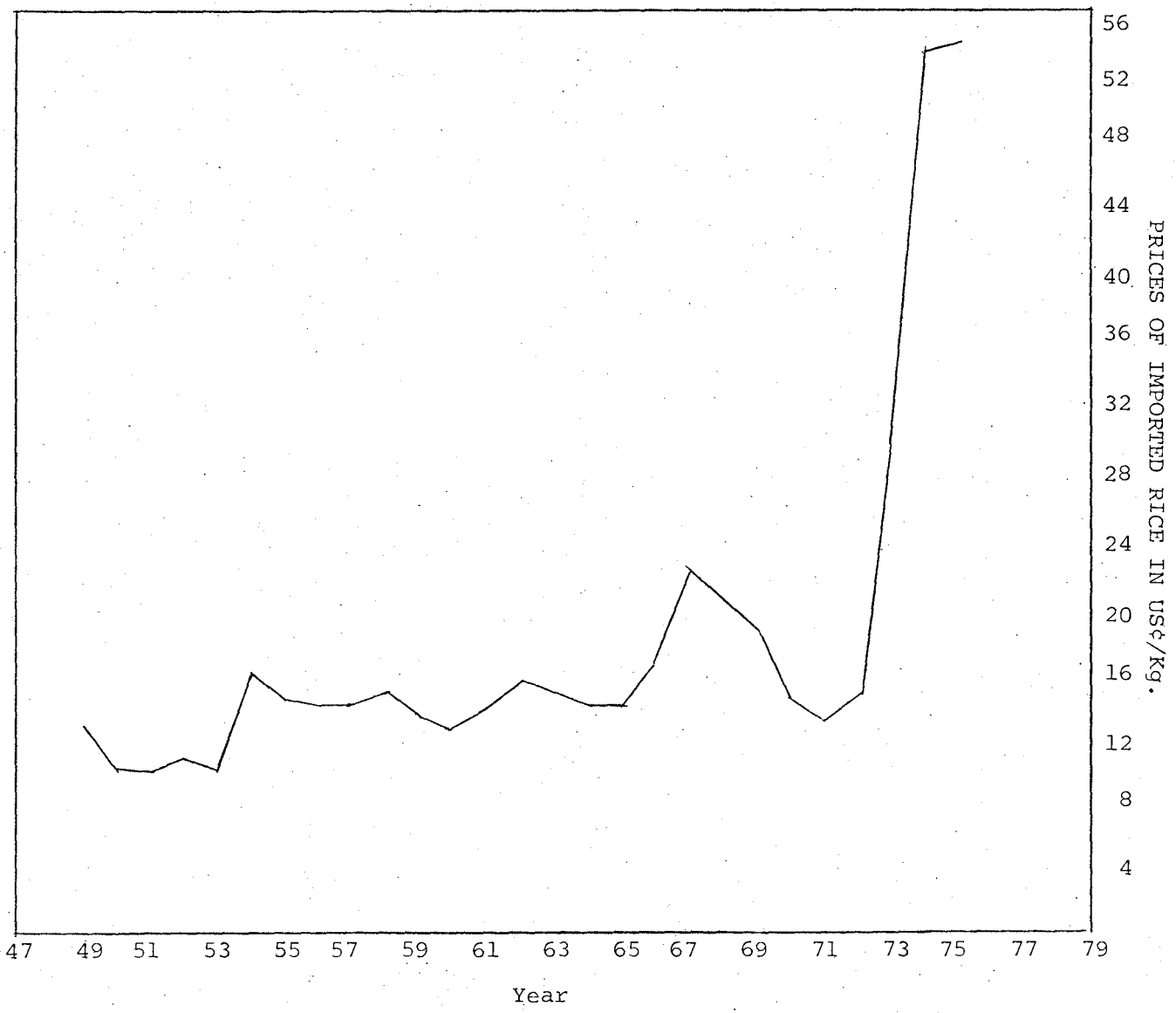
4.3.7 State Intervention

In most developing countries and even in some of the developed capitalistic countries, there has been an increasing trend for greater state intervention. Fiji is no exception.

FIGURE 4.2

GRAPH OF PRICES OF RICE IMPORTS

1947-1979



Government interventions have been in the following forms:

(a) Supply restriction (including imported rice) in 1949. Sale was restricted to Indians only. This, however, gave rise to black markets and the restriction was later lifted.

(b) Imposition of tariffs on rice imports between 1959 to 1962. This was instituted to offer protection for the establishment of a rice mill at Nausori. During this period, rice imports were effectively reduced (vide Figure 4.1)[1].

(c) Licensing of rice imports in 1978. This, however, does not appear to be effectively making imported rice dearer vis-â-vis local rice i.e. on a consistent basis (see Table 4.8).

(d) Infrastructures. These include the establishment of large-scale irrigation schemes, small drainage schemes, Rewa Rice Ltd, the Drainage and Irrigation Division and the Seed Testing Laboratory.

All these interventions except (a) had been instituted to discourage rice imports. For rice imports to appear to be increasing is a testimony of the lack of success of these interventions. However, as noted in Chapter 1, government policies can be frustrated by a host of factors, be they expected or not. Chapter 6 will attempt to discuss this particular aspect.

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1 See Appendix 3.1 for the mechanism of how imports are reduced using General Equilibrium Analysis.

CHAPTER 5

ANALYSIS OF PAST AND PROJECTED TRENDS OF SUPPLY AND DEMAND FOR RICE IN FIJI

5.1 Preamble

Forecasting of long term (five to twenty years) trends together with the underlying growth prospects are conventionally referred to as projections.[1] The relatively longer time-span allows for the implementation of new policies which may be required, for instance, to correct adverse trends.

Projections attempt to show likely trends and developments in commodity markets based on certain stated assumptions about production, consumption etc., over some planning horizon. Projections, then, should follow rigorously and determinately from the models which are used to produce them. The assumptions made about determining variables in such models are then explicitly related to the projections produced using those assumptions.

There may arise cases of individual commodities where no attempt is made to predict or forecast the most likely values of the determining variables. In such a situation, projections should incorporate explicit statements, for example, about the particular price policies considered or the demand levels used according to varying assumed income growth rates. These underlying assumptions need to be explicitly stated. Only then is it possible to present reasoned approximations to both theory and reality which are necessary in making projections.

Demand and supply projection should be a scientific and logical exercise in determining supply and demand in the longer term using a

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1 For a simple discussion of what forecasting is about, see Sawers 1977, p.2.

reasoned set of assumptions about the determining variables which are considered relevant.

Projections of important economic quantities are indispensable for development and or perspective planning. However, present projection techniques are less than perfectly reliable (Sawers 1977, p.5) and economists are forced to make often extensive improvisations to produce projections.

This chapter attempts to project supply and demand for rice to 1985, given the existing policies, and to study the relative trends of supply and demand in order to judge the effectiveness or otherwise of the Food Self-Sufficiency Policy. If the supply and demand trends are diverging over the years, then this would indicate the failure of efforts to increase production proportionately more than demand, or to slow the growth of demand vis-â-vis supply, which a Food Self-Sufficiency Policy aims to do. In such a case of divergent trends, a Food Self-Sufficiency Policy may be regarded as ineffective. Where trends are convergent or tend to converge, however, a Food Self-Sufficiency Policy may be regarded as effective.

5.2 Choice of Models for Projections

Sophisticated econometric multiple regression models were initially considered for this study. However, their results, on the whole, were inconsistent and statistically indefensible. Consequently, they were found unreliable for meaningful projections and for analysing other related objectives, e.g. structural analysis and policy evaluation (vide Koutsoyiannis 1977 for discussions of these objectives). Both the quality and quantity of the data were found to be the principal constraints.

Subsequently, the use of such models was restricted only to the supply projections. Such statistical and econometric prerequisites, e.g. conformity of signs and magnitude of coefficients to a priori expectations, stability

and predictive power of the regression equations were violated, merely to get a series of projected data which may closely approximate reality. Two statistical prerequisites that were ensured, however, were a high R^2 and the absence of autocorrelation. The former ensures the goodness of fit of the relevant variables to the multiple regression model. The latter is equally important in that the independent variables, being time-series data, are likely to be autocorrelated. If autocorrelation is not removed, then the projected value is also likely to be autocorrelated (Pindyck and Rubinfeld 1976, p.178). This would give rise to biased estimates when using the Ordinary Least Squares (OLS) Estimation method. The results of this attempt will be discussed later in comparison to the results of simpler projection methods discussed below.

Perhaps the most widely used technique for agricultural projections is the technique of simple extrapolation. The simplest method of extrapolation is the time trend method which correlates a single variable, say production, with discrete time intervals as follows:

$$Q_{iT} = f(T) \tag{5.1}$$

$$\text{or,} \quad Q_{iT} = a + bT \tag{5.2}$$

where Q_{iT} = output of the i^{th} variable in the discrete time interval, T.

The time trend method is often used in exponential form when projecting production. The functional form to be used is derived from the exponential growth curve:

$$Y_T = f(T) = Ae^{rT} \tag{5.3}$$

which, in logarithmic form, is represented as:

$$\ln y_T = \ln A + rT \ln e \tag{5.4}$$

$$\text{i.e.} \quad \ln y_T = \ln A + rT \quad \text{where } \ln e = 1 \tag{5.5}$$

$$\text{or,} \quad \ln y_T = a + bT \quad \text{where } a = \ln A, \; b = r$$

$$\text{or,} \quad \ln Q_T = a + bT \tag{5.6}$$

for the purpose of this analysis.

The exponential growth curve assumes that a series, say Q_T, grows with constant percentage increases, rather than constant absolute increases.

In the time trend formulation, it is assumed that the rate of change of growth or decline of a particular variable would continue according to the rate that has been observed in the past. In general the correlation of economic phenomenon with time is devoid of any economic meaning except to the extent that whatever has been the interrelationship of the economic forces in the past, that same interrelationship is projected into the future. Such a proposition is somewhat tautological and does not contribute to analysis of the interrelationships.

On the credit side, the data requirements of the time trend method are absolutely minimal. The virtue of the method lies in its simplicity and the ease with which it can be subjectively updated to give more 'reasonable' projections. It is essentially the method used by OECD (1968) and FAO (1970, 1971); and the same method is used in this study for projections of supply of rice.

As regards projections of demand, a simple linear time trend model of the form of equation 5.2 was used. Moreover, another simple extrapolation technique, the correlation with GNP method was also used. This method consists of establishing some formal relationship (usually linear or log-linear) between growth of output, for example, and the growth of GNP. Generally, GNP is specified as the independent variable as follows:

$$Y_{iT} = f(GNP_T) \qquad (5.7)$$

This method is widely used in food projection work due to the observed high correlation between various food uses and GNP. The empirical basis for this method is shown in studies such as FAO 1957 (cited in Sawers 1977, p.16) which concludes that an essential tool for projecting food demand is per capita income, provided income projections are available.

The method, moreover, also has strong supporting evidence from demand theory (Sawers ibid). Consequently, consumption projections by OECD and FAO have used this approach almost exclusively.

Despite its popularity for its minimal data requirements, the method's economic meaning is subject to considerable controversy. It is argued that the choice of income as the independent variable, is an attempt to gauge the effect of demand on growth in food availability. The changing composition of demand between domestic and export production and between final and intermediary demand becomes quite confused in such a formulation.

Even on straight statistical grounds, one can argue that the high income - consumption correlations may not in fact imply causation. The contribution of agriculture to income growth would have to be explicitly included in the structural specification to overcome this problem.

FAO (1970, 1971) use linear, log inverse, semi-log and double log functions of per capita disposable income to project food consumption at constant prices. The approach adopted here is similar to that of OECD (1968) using undeflated income (GDP) measures.

The supply model to be estimated and used for projections is as follows:

$$\ln Q_r = a_1 + b_1 T \qquad (5.8)$$

where Q = output in tonnes

r = rice

The corresponding demand models are as follows:

$$X_r = c_1 + d_1 T \qquad (5.9)$$

$$\ln X_r = c_2 + d_2 \ln(\text{GDP/head}) \qquad (5.10)$$

where X = per capita consumption in kg.

5.3 Estimation and Results of Models

The results of projections of supply and demand are in Table 5.1. The observed annual output of rice is contained in Table 1.7 and Figure 1.1 and the observed annual per capita consumption in Table 4.4

The results of the multiple regression model have been included for their reasonableness. The model is as follows:

$$Q_r = \alpha + \beta_1 A_r + \beta_2 P_r/P_c + \beta_3 R + \beta_4 T + u \qquad (5.11)$$

where, A_r = area of rice in hectares (Table 1.8)

P_r = price of rice. Retail prices of rice are used as proxy for prices paid to producers (Appendix 2.3).

P_c = price of sugar cane (Appendix 2.3). This variable was included to account for the sugar cane competition on rice land.

R = rainfall in centimeters. Average annual rainfall data for the Western and Labasa districts were used. This was done to account for the fact that the majority of rice grown is in the cane area. See data in Appendix 2.3 also.

T = time

The estimated multiple regression equation is as follows:

$$\underset{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad}{Q_r = -1331851 + 2.15^*A_r - 24.4\ P_r/P_c - 7.6\ R + 676^*T} \qquad (5.12)$$
$$(0.36) \quad (79.05) \quad (4.6) \quad (259)$$

where, $R^2 = 0.94$

F = 27.7*

DW = 1.716 (no autocorrelation at the 1% level)

* = significant at the 5% level

Figures in parentheses are standard errors.

TABLE 5.1

RESULTS OF PROJECTIONS OF SUPPLY AND DEMAND FOR RICE (IN TONNES) USING DIFFERENT MODELS

Year	Supply		Demand	
	Exponential Time Trend Model	Multiple Regression Model	Simple Linear Time Trend Model[1]	Double Log Correlation With GNP Model[2]
1968	17,280	17,630	24,651	25,146
1969	17,507	18,097	25,958	25,958
1970	17,737	20,422	27,978	27,300
1971	17,970	16,646	28,889	28,249
1972	18,206	16,743	30,301	29,648
1973	18,446	16,164	31,748	31,414
1974	18,688	18,350	33,109	33,222
1975	18,934	22,600	34,618	34,906
1976	19,183	19,670	35,978	35,978
1977	19,435	20,937	37,548	37,250
1978	19,690	22,113	39,152	38,241
1979	19,949	22,789	40,792	39,245
1980	20,211	23,465	42,529	40,321
1981	20,477	24,141	44,303	41,409
1982	20,746	24,817	46,047	42,510
1983	21,019	25,493	47,891	43,622
1984	21,295	26,169	49,844	44,812
1985	21,575	36,845	51,767	46,015

Notes: 1 See Appendix 2.1 for derivation of values in this column

2 See Appendix 2.2 for derivation of values in this column.

In projecting the output of rice to 1985, rainfall, the relative price of rice to cane and area are all held constant as conditions for projections under ceteris paribus assumption. Whilst the constancy of the first two variables may be acceptable, that of area may not. However, this may be justified if one looks at the performance during the Seventh Development Plan period. Table 1.9 projects the rice area to be increasing at 4.46% (derived from Growth Rate Tables: Brown 1965, p.4) per year between 1976 and 1978. The achievement, however, is likely to result in a negative growth rate, i.e. about 0.2%. Furthermore, given the greater promotion for cane rather than rice in the cane area and the time span necessary for government efforts to be effective in increasing rice cultivation outside the cane area, it may not be far-fetched to assume constant rice area up to 1985.

The projected rice output of the multiple regression model and the Exponential Time Trend Model, though they are slightly different, both display upward trends. The trend of the former is more optimistic. However, its implications on practicality are still within the realm of possibilities. For instance, the estimated yield by 1980 will be about 3.1 tonnes/hectare.[1] Present yields have certainly achieved or exceeded this level.

The projected rice demand using a Simple Linear Time Trend Model and a Double Log Correlation with GNP Model, though slightly different, both display again similar trends. In calculating the GNP/head to 1985, the GNP was assumed to continue its projected growth rate of the Seventh Development Plan period, i.e. 7.3% annually. Population was projected to grow at the annual growth rate of 1.9%, i.e. the mid-1977 estimate (Current Economic Statistics 1978). The results of this calculation are detailed in Appendix 2.4.

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1 With the area of rice assumed constant to 1985, it can only be said that this relatively high yield is realized through greater productivity.

The results of projections are graphed in Figure 5.1. And regardless of whichever supply or demand trend is used, the conclusion is the same. That is that, given the present production and consumption conditions and policies, supply and demand for rice are unlikely to be reconciled, i.e. rice output would increase but is not likely to increase proportionately more than demand. The implication of the ineffectiveness of Food Self-Sufficiency Policy in terms of rice becomes clear.

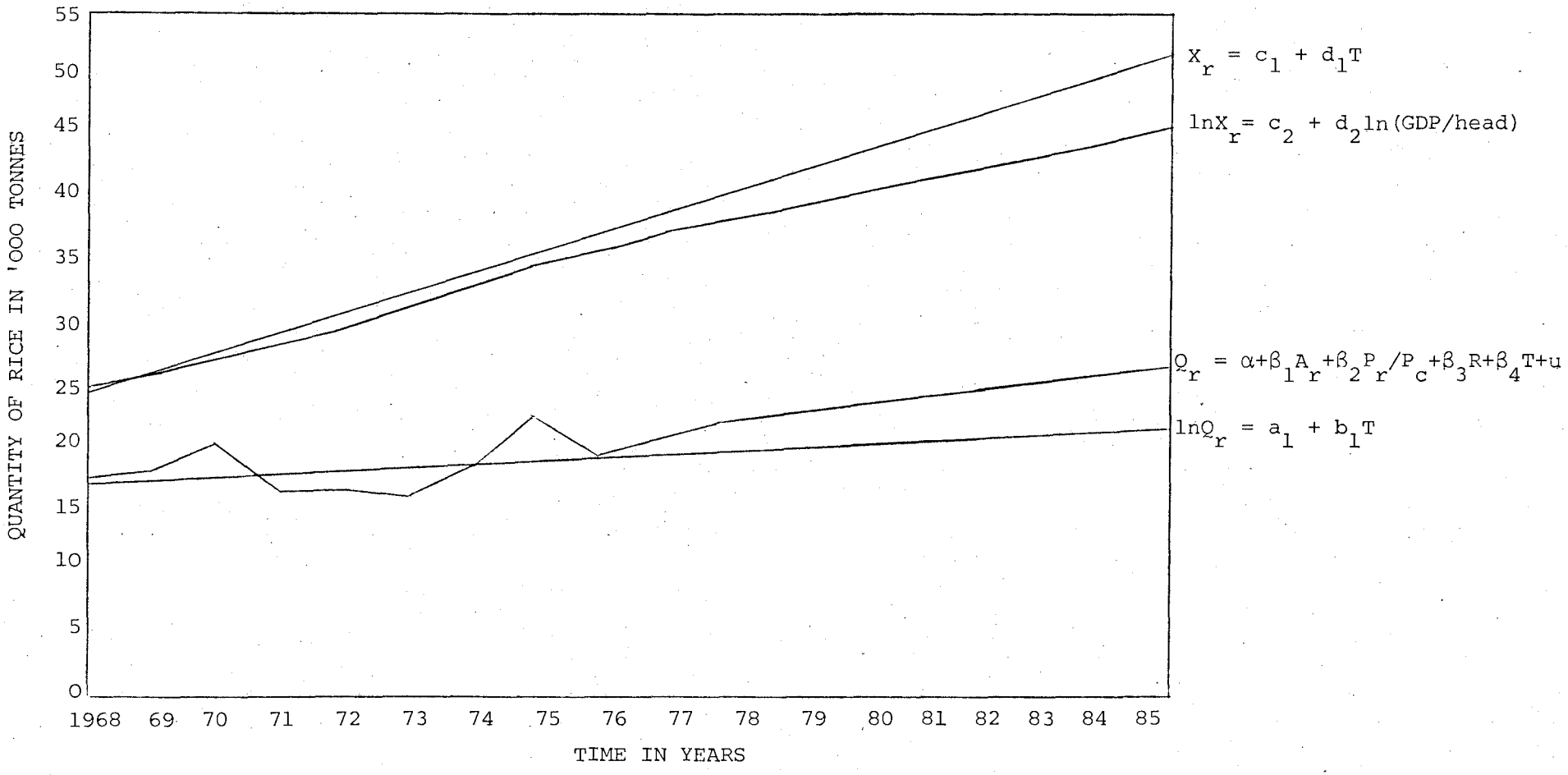
Taking the most conservative estimate of the difference between demand and supply by 1985, i.e. 46,015 less 26,845 = 19,170 tonnes, it can be seen that this quantity, 19,170 tonnes, that have to be imported, is quite substantial. Comparing this to the data on imported rice quantity (vide Table 1.6) on hand, it can be seen that this quantity will be some 2,000 tonnes in excess of the highest quantity realized between 1968 and 1975. As a matter of fact, the 1976 import figure has exceeded this projected level. It appears, therefore, that the projected increases in rice import implied in Figure 5.1 are valid but are rather underestimated by the models.

Evaluating this quantity at the 1977 import unit value index for cereals (vide Table 1.5), it can be seen that the total value of this import would have cost some $4.6 million

FIGURE 5.1

PAST AND PROJECTED TRENDS OF

RICE SUPPLY AND DEMAND, 1968-1985



CHAPTER 6

EVALUATION OF CURRENT GOVERNMENT POLICIES

6.1 Preamble

The results of Chapter 3 provide an indication of the ineffectiveness of the current Food Self-Sufficiency Policy as it relates to rice. It seems expedient, therefore, to take a closer look at the Policy or its various components in order to investigate their performance or lack of it.

This chapter, therefore, discusses very briefly the various policies that are integral parts of the wider Food Self-Sufficiency Policy. And then by treating them as a package of policies, it discusses its performance in respect to the results of Chapter 3. The treatment of the various policies as a package follows from the fact that the activities of a production unit are the results of responses to a wide range of influences (of government policies) rather than a single influence.

In evaluating this package of policies, discussions will focus on rice on the strength of the results of Chapter 3. However, the same package of policies that affects rice also affects other commodities. Therefore, any policy implications that may emerge from this discussion may be implicitly taken as applicable to other commodities as well.

6.2 Current Government Policies

The various policies that are incorporated under the wider Food Self-Sufficiency Policy fall into three categories, viz: Agricultural Subsidies, Agricultural Infrastructure and International Trade Policies.[1]

Agricultural inputs that are subsidized include fertilizers, agro-chemicals, farm capital, fencing wires and posts, irrigation water, freight

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1 A complication that arises here is the identification of policies that specifically relate to the Food Self-Sufficiency Policy *per se* from those that are concomitant with the country's development even if a Food Self-Sufficiency Programme had not been implemented. No solution can be offered except to acknowledge the existence of the problem in the discussions that follow.

charges and certified rice seeds.

Using Wharton's (1967, p.109) classification, two groups of agricultural infrastructures are provided for. Those that need relatively higher levels of capital investment (called capital intensive) and those which have lower capital intensity. The former includes drainage and irrigation; transport; utilities and marketing facilities. The latter are those in which the capital component is low, e.g. extension services; some type of agricultural research, crop and animal protection, control and grading service; soil conservation; credit and financial institutions; and education and health facilities. The distinction between the two is arbitrary, in that the proportion of capital costs in the total costs per unit of service varies throughout a wide spectrum. But at the capital-intensive end of this spectrum, the heavy investment requires choices that turn upon the traditional economic criteria for investment in non-human, reproducible capital. Infrastructures at the extensive end, by contrast, do not compete heavily for capital, but may require substantial recurring operational funds, especially for salaries.

As regards international trade policies, a clarification is in order at this juncture. The policies mentioned above as integral parts of the Food Self-Sufficiency Policy, represent a government intervention in the market of internationally-traded goods. As such, trade in these goods will be affected, thus affecting Fiji's trading relations with the rest of the world.

However, there exist specific trade policies that have a more direct effect on Fiji's trading relations with the rest of the world. Between 1975 and 1976, proposals for a tariff on imported rice were turned down by the government. However, in 1978, the government opted for import quotas on rice. The principal reason for the imposition of this import regulation was the need to effectively support local rice production, i.e. by restricting

the inflow of cheap imported rice into the Fiji market, thus mitigating or eliminating their disincentive effects on local rice production.

Effects of such a policy on the relative prices of imported rice vis-â-vis local rice may be quite immediate.[1] However, its effects on actual production may take time to be apparent. Therefore, it is unlikely that its impact has been felt by the rice growers. Consequently, consideration of this policy has been left out in the discussions that follow.

6.3 Evaluation of Current Government Policies

In any evaluation process, one has to ask whether the predetermined goals are being achieved. One has to study the efficiency with which these goals are being achieved and/or the reasons why they are not. In studying the efficiency of any system, one normally looks at the ratio of the value of output to the value of input. It follows that the efficiency of any process can change with changes in valuations, and because everything depends upon everything else, any change at all in any subjective preference is in principle capable of altering the efficiency of any process. Once efficiencies are estimated, positive decision making can be executed. For instance, any system that is found efficient (i.e. based on some efficiency criterion), can provide grounds for its justification and continuation. If found inefficient, the system or the policy can either be rejected, modified or replaced by an alternative policy.

The policy evaluation approach adopted here is not very rigorous. The more scientific approach of evaluating the inputs to the system and

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1 As we see in Table 4.8, however, imported rice is still by far the cheaper rice. It follows, therefore, that the expectation that imported rice would become more expensive than local rice has not been consistently fulfilled. The price differential, however, may have been reduced to some extent.

the outputs that are derived and subjecting the result to some predetermined efficiency criterion, e.g. a Benefit/Cost ratio or Social Cost Benefit Analysis cannot be used, given data limitation and our knowledge of policy decision theory.[1] Instead, a less rigorous approach is adopted. That is to incorporate the results of Chapter 3 into the discussions and to assume that the interactions of the inputs and outputs have been translated into the graphs of the supply and demand trends in Figure 5.1, to derive what can be termed as a 'divergent gap'[2] as far as rice is concerned. This gap may be regarded as a measure of the 'efficiency' of the system. As mentioned earlier, a divergent gap is taken to represent the ineffectivenss of the Food Self-Sufficiency Policy. Further evaluative discussions must necessarily ensue.

In studying a package of policies and the reasons for its ineffectiveness, three specific areas can be looked at, viz: the design of the package, the implementation and the appraisal stages. As a package, intended to provide a comprehensive range of services to the farming sector, little fault can be found with its design. This, however, does not necessarily mean that individual policies or components of a policy always have perfect designs.[3]

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1 This in itself is a separate study area which could be looked into in the future.

2 It should be noted that if supply and demand trends are diverging based on past trends, then those trends will be projected into the future, since an inherent assumption in projections of the type used in this study is that existing policies etc. remain unchanged. On this basis, therefore, future trends will be continuous rather than discontinuous from past trends.

3 A good example is the Rewa Irrigation Scheme whose earlier operation had been constrained by defects in the original design and planning. Moreover, its siting appears to have been a faux pas as well. To pursue an approach that would rigorously evaluate the designs etc. of individual policies in order to come up with positive policy implications is beyond the scope of this study.

Production subsidies are designed to promote production for which inputs are being subsidized. General Equilibrium Analysis such as that in Appendix 3.1 provides justification[1]. As regards agricultural infrastructures, these have always gone hand in hand with agricultural development. Moreover, they have been occasionally linked with external economies, i.e. in their capacity to lower factor input and product marketing costs to the firm or industry, thus enabling a shift in the industry supply curve to the right. Apart from their effect on lowering costs, some infrastructures may affect the shape and position of the production function directly or indirectly. Agricultural Research, for instance, that produces a new hybrid rice seed, can directly alter the production surface. On the other hand, programs of crop protection increase the effective harvest and reduce storage losses, etc. and consequently alter the levels of effective market supply and returns.

As a package, therefore, these individual policies initiate an overall promotion of agricultural development in all aspects, i.e. production, marketing and consumption. Thus from a design standpoint, it appears satisfactory.

When looking at the implementation of such a policy package, one must necessarily look at the coordination and organizational aspects. And these are the areas where the Food Self-Sufficiency Policy seems to be weakest as regards its impact on rice.

To achieve coordination within a system, the relevant factors or aspects have to be arranged in a correct relationship and to be working together efficiently and harmoniously. This does not always happen. Many examples can be found. One that relates to rice is of particular significance. That

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1 See particularly the effect of the production subsidy component of a tariff in the Appendix. A Partial Equilibrium Analysis also provides the same justification if one is interested in a specific commodity. For methodology, see Caves and Jones (1977) for instance.

is the lack of acceptance of new rice seeds by the rice growers. It appears that when researchers release a new rice seed, there is insufficient effort directed at breaking down growers' resistance or conditioning them to accept the innovation. The variety, 'Bilo' that was released in 1976 was one example, and its unfavourable reception by the rice growers[1] contributed substantially to the failure to achieve the targets for rainfed rice between 1976 and 1977 (see e.g. DP 7 Review op cit p.24).

Farmers resistance can be explained by their lack of familiarity with the new input. At first, therefore, their demand for this input would be relatively inelastic. However, with more knowledge and experience which any conditioning process is likely to conduce, farmers demand would tend to be relatively elastic over time. Therefore, given a drop in the price (through a subsidy for instance), there will be a greater than proportionate increase in the quantity demanded of these inputs.

With familiarity established and the use of the new input a likely proposition, other aspects need to be ensured. Firstly, is the assurance that costs remain stable and relatively low. This would determine a farmer's rate of absorption of the input. Secondly, the supply of that input needs to be guaranteed so that demand is invariably satisfied. Failure to satisfy demand will mean a reversion, not only in the use of the inferior input that used to be applied previously, but also in the state of mind of the farmer.

A guarantee does not only apply to supplies of inputs. It also applies to outlets of agricultural produce. A guarantee of outlet is a well-documented incentive for producers. It not only helps the farmer to plan his production systematically, but also assits him to allocate his resources in such a way so as to maximize his returns.

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1 The writer came to know later that the variety was intended for wet conditions and those who showed resistance towards it were those not intended to have received the new seeds. This only goes to highlight the need for better coordination and efficiency.

Guaranteeing an outlet must, invariably, be coordinated with other aspects of marketing, e.g. transport facilities. This problem of transport however, is particularly felt by other bulky and more commercialized commodities, e.g. beef cattle. This does not necessarily mean that all rice marketing aspects are well coordinated. If they were this particular chapter would not have been necessary.

A guarantee could also apply to prices of agricultural produce. Any pricing policy that is positively[1]-oriented must accelerate the growth of agricultural output; it must achieve the crop-mix desired and it must secure increases in the marketed surplus from the predominantly-subsistence sector. Furthermore, farmers should have clear knowledge about the prices in advance, and the implementation of the policy should continue over a sufficient time.

The guaranteed prices for rice offered by the government-sponsored Rewa Rice Ltd. fall short of the objectives mentioned above. The effort by the Rewa Rice Ltd. to guarantee prices is extremely localized and it seems overshadowed by the complexities of the rice market conditions. The nature of rice, being storable and predominantly subsistent, and moreover, the decentralization of milling facilities and the variability of prices at any one time, all contribute to the complexities. Streamlining these factors is not simple. However, some effort has to be made in this direction before any pricing policy becomes fully workable.

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1 Economists talk about two categories of price policies - the negative and positive policies. The former constitutes a deliberate attempt to depress the agriculture's terms of trade in order that agricultural produce and raw materials remain cheap for the growing industrial sector. The latter improves or at least maintains the terms of trade of agriculture. The government, according to the indications in the rhetoric of government plans, appears sympathetic to the positive price policies. Being sympathetic to a policy and to be actually implementing it, however, are two different issues. Indications are that practice of this policy appears lacking.

Some organizational aspects of the policy package have been touched on in the preceding discussions since coordination and organization are closely related. The latter also implies some sort of arrangement of factors that is systematic and efficient. This, too, seems deficient in some aspects of the Food-Self-Sufficiency Policy.

Organization of resources to cater for the more urgent needs in the implementation of the policy was lacking at times. For instance, on occasions, Extension officers have been immobilized and become ineffective due to lack of appropriate facilities. The allocation of staff, particularly the professionals who are in short supply, to shoulder many responsibilities, tends to reduce productivity. On the other hand, certain projects have not had opportunities to contribute to productivity because they had been shelved due to lack of appropriate personnel.

The lack of financial resources sufficient to fund all the activities necessary for the success of the Food Self-Sufficiency Policy seems to be an overriding factor.

The last area of the policy package to be looked at is the appraisal or some form of evaluative process to gauge the effectiveness, not necessarily of the package as a whole, but also of components of this package. Knowledge of the effectiveness of various policies initiates wise decision making. It is likely to assist in the optimal allocation of the scarce resource and in the scheduling of projects or activities in order to maximize benefits or in some cost-effective fashion.

With this knowledge, decision makers can also establish causality, complementarity and interdependence amongst various activities. And given funds, decisions on project choice, timing, sequence, combination, location and linkages can be effectively streamlined.

There appears to be a dearth of knowledge in this area at present. Admittedly, studies of this sort may be costly since good reliable data have to be recorded and reference points established. Moreover, results which attempt to account for primary and secondary benefits etc. which may necessitate value judgement, may in the final analysis prove spurious.

However, there is still room for evaluation in some more important aspects of the policy or in the use of less sophisticated evaluative techniques.

Agricultural marketing efficiency is one aspect that has been studied frequently in other countries. Some of the approaches can easily be adopted in Fiji. Bain's (cited in Abbot 1967, p.371) measures of efficiency, for instance, can be envisaged with the following strategic dimensions:

a. Cost and profit margins approach the level that is just sufficient to reward investment at the going rate; it should also provide an incentive for risk bearing and the introduction of innovations designed to save costs or improve services.
b. Size and number of firms.
c. Service provided.

Because there can be no absolute standard, efficiency is generally measured by comparison within and between marketing sectors.

Two other marketing efficiency measures, viz: Pricing Efficiency and Technical Knowledge Efficiency can also be studied. The former represents the efficiency in the transmission of price signals through the marketing channels from the consumers to the producers. The latter measures how well the producers know the requirements of consumers in technical terms and, similarly, how well consumers know the technical constraints on production.

The use of less sophisticated evaluative techniques has some scope in Extension for instance. Even the crudest estimates of the ratio of primary benefits to costs may not be appropriate to evaluate Extension per se, but they may be sufficient measures for assessing the relative economic efficiencies of alternative Extension methods.

Moreover, in the area of capital-intensive agricultural infrastructures, similar simple approaches can be envisaged. Tolani and Stanton (cited in Wharton op cit, p.117), for example, suggest two methods, viz: 'addition to net national product' and 'value added to capital ratio'. Hirschman (ibid, p.118) suggests an 'efficient sequences' approach, i.e. choosing projects based on a sequence that does not drastically change predetermined rates of return.

CHAPTER 7

CONCLUSIONS AND SOME IMPLICATIONS

Fiji's Food Self-Sufficiency Policy must be viewed in very broad perspective. The policy itself represents a mix of policy instruments and objectives relating to such areas as external accounting, nutritional, technological, welfare and even political considerations. The policy is justified on these grounds or by the multiplicity of their various interactions. To ignore this broad and multi-disciplinary approach to the policy and to view it from a restricted perspective e.g. on purely economic grounds, it may appear that the policy is invalidated and indefensible.

Also important is the need to view the policy within the general framework of the economy and the direction to which it is going. Relevant considerations here are the need to understand the relatively high propensity to import, not only in terms of food imports but also in others, inherent in marginal micro-economy like Fiji, and the apparent stagnation of local production of some major commodity e.g. rice.

These considerations create a prima facie case for a Food Self-Sufficiency Policy particularly that which lays emphasis on rice.

After analysing the empirical data available on rice, however, one intuitively concludes that certain inconsistencies exist and that the predetermined goals and directions of the policy are not quite being achieved. Formulation of hypotheses as provisional explanations of observed facts, therefore, becomes necessary.

The hypothesis that the decline in the rice area is due to competition from sugar cane should, ideally, be conclusively established by graphical illustration of an inverse relationship between rice area and cane area in the localities where both commodities are found. This, however, could

not be demonstrated due to unavailability of data. The hypothesis was therefore substantiated using logical arguments based on reasonable assumptions and historical justifications. Moreover, a rice acreage response study using statistical methods to further analyse this competition was attempted.

Discussions on the second hypothesis that the increase in rice imports was due to a host of factors focussed on these various factors including domestic supply and demand conditions, population, income and government intervention. Furthermore, discussions also focussed on external factors e.g. overseas supply and demand conditions and exchange rate. A combination of these factors rather than any single factor was established to be responsible for the increases in rice imports.

These two hypotheses looked at both the supply and demand aspects of rice. The stage was set, therefore, to estimate statistically both the past and future trends of supply and demand for rice so as to gauge the effectiveness or otherwise of the Food Self-Sufficiency Policy.

The ineffectiveness of the rice self-sufficiency policy was demonstrated by the fact that the supply and demand trend lines were diverging rather than converging. These trend lines were then projected into the future, ceteris paribus, and the conclusion that the trend lines will become more divergent, with the implication that rice imports will tend to increase, was reached. These increased rice imports have been borne out by recent rice import statistics.

The final hypothesis that government policies have not performed as well as expected was then discussed in the light of the results of the statistical estimation. All the government policies within the framework of the wider Food Self-Sufficiency Policy were then treated as a package of policies and then evaluated under three areas, viz: the design of the

package, its implementation and appraisal stages.

Whilst there were no apparent inconsistencies relating to the design of the package, there was evidence of inconsistencies in the implementation and appraisal stages of this package of policies. These are the likely areas for further policy formulation.

APPENDIX 1.1

FIJI'S TRADE BALANCE, 1965-1975

(F$m)

Year	Imports	Exports	Balance
1965	47.2	38.2	- 9.1
1966	39.8	34.8	- 4.9
1967	45.7	28.1	- 7.6
1968	55.3	43.3	-12.0
1969[1]	69.1	47.3	-21.8
1970	80.6	54.1	-26.5
1971	97.3	54.5	-42.8
1972	115.1	58.7	-56.4
1973	152.9	65.7	-87.2
1974	188.8	114.7	-74.1
1975[2]	191.4	130.8	-60.6

Notes: 1 1969-1975 revised series

2 provisional

Source: IBRD Report No. 1296-FIJ

APPENDIX 1.2

SUMMARY OF FIJI'S BALANCE OF PAYMENTS

1965 - 1975

(F$m)

	1965	66	67	68	69[1]	70	71	72	73	74	75[2]
Current Account	-11.9	- 5.7	- 6.2	-10.8	-14.6	-12.3	-23.7	-26.0	-43.8	-23.4	- 7.2
Capital Account	4.3	2.3	2.0	6.1	6.7	13.2	12.1	21.3	38.8	37.6	40.4
Monetary Sector	1.2	- 0.6	- 1.2	-	- 3.5	- 2.3	0.6	7.3	13.6	3.3	- 0.1
Net Errors & Omissions	2.5	1.1	5.0	5.4	16.9	2.5	20.4	18.5	- 4.8	9.5	6.0
Reserves & Related Items (- = increase)	3.9	2.9	0.4	- 0.7	- 5.5	- 1.1	- 9.4	-22.3[3]	- 3.8	-27.0	-39.1

Notes: 1 1969-1975 revised series

2 provisional

3 includes F$1.2m from allocation of SDR's

Source: IBRD Report No. 1296-FIJ

APPENDIX 1.3

PROPORTION OF FOOD IMPORTS AND TOTAL IMPORTS TO GDP

Year	GDP (at current prices) (F$000)	Total Imports (F$000)	Food Imports (F$000)	Proportion of Total Imports to GDP[1]	Proportion of Food Imports to GDP[2]
1965	116,800	58,162	12,202	49.8	10.4
1966	119,700	50,545	11,684	42.2	9.8
1967	130,800	56,291	12,651	43.0	9.7
1968	145,800	68,402	13,329	46.9	9.1
1969	159,300	77,888	15,281	48.9	9.6
1970	191,800	90,502	16,884	47.2	8.8
1971	211,800	111,550	20,643	52.6	9.7
1972	261,300	131,549	25,013	50.3	9.6
1973	338,300	174,645	33,909	51.6	10.0
1974	450,000	219,331	41,302	48.7	9.2
1975	536,000	220,967	38,504	41.2	7.2

Notes: 1 A simple time trend analysis of these data reveals that there had not been any significant change in the porportion of total imports to GDP during the period studied. The analysis results were:

$b = 0.175$, $r = 0.151$, $r^2 = 0.023$ and $t_{(r)} = 0.458$.

2 A similar time trend analysis reveals a significant negative correlation between the data in this column and the time variable ($r = -0.587$*). However, there does not seem to be any significant downward trend. * indicates statistical significance at the 10% level.

Sources: 1 Current Economic Statistics, 1969-1978.

2 IBRD Report No. 1296-FIJ

APPENDIX 2.1

RESULTS OF PROJECTION OF THE DEMAND

FOR RICE USING SIMPLE LINEAR TIME TREND MODEL[1]

Year	Population ('000)	Projected Per Capita Consumption of Rice (Kg)	Projected Total Consumption of Rice (tonnes)
1968	495	49.8	24,651
1969	506	51.3	25,958
1970	521	53.7	27,978
1971	533	54.2	28,889
1972	544	55.7	30,301
1973	556	57.1	31,748
1974	565	58.6	33,109
1975	576	60.1	34,618
1976	585	61.5	35,978
1977	596	63.0	37,548
1978	607	64.5	39,152
1979	619	65.9	40,792
1980	631	67.4	42,529
1981	643	68.9	44,303
1982	655	70.3	46,047
1983	667	71.8	47,891
1984	680	73.3	49,844
1985	693	74.7	51,767

Note: 1 Based on Data in Table 4.4

APPENDIX 2.2

RESULTS OF PROJECTION OF THE DEMAND FOR

RICE USING DOUBLE LOG CORRELATION WITH GNP MODEL[1]

Year	Population ('000)	Projected Per Capita Consumption of Rice (Kg)	Projected Total Consumption of Rice (tonnes)
1968	495	50.8	25,146
1969	506	51.3	25,958
1970	521	52.4	27,300
1971	533	53.0	28,249
1972	544	54.5	29,648
1973	556	56.5	31,414
1974	565	58.8	33,222
1975	576	60.6	34,906
1976	585	61.5	35,978
1977	596	62.5	37,250
1978	607	63.0	38,241
1979	619	63.4	39,245
1980	631	63.9	40,321
1981	643	64.4	41,409
1982	655	64.9	42,510
1983	667	65.4	43,622
1984	680	65.9	44,812
1985	693	66.4	46,015

Note: 1 Based on Data in Table 4.4

APPENDIX 2.3

OTHER DATA USED FOR THE PROJECTION OF

RICE PRODUCTION

Year	Retail Price of Rice ($/tonne)	Price of Cane ($/tonne)	Rainfall (cm)
1967	277	6.23	187.7
1968	284	6.40	185.9
1969	291	6.62	99.8
1970	298	7.62	197.9
1971	280	7.95	277.3
1972	265	9.90	373.1
1973	309	9.76	244.2
1974	463	20.57	323.8
1975	437	31.60	238.9
1976	364	24.18	264.7
1977	377	24.58	214.2
1978	483	24.98	163.7

Sources: 1 Bureau of Statistics (personal communication)

2 Current Economic Statistics, 1969-1978

3 Annual Statistical Abstract, 1969-1971

4 Ministry of Agriculture and Fisheries (personal communication)

APPENDIX 2.4

DATA ON POPULATION AND GROSS DOMESTIC PRODUCT (GDP) AND THEIR RESPECTIVE PROJECTED VALUES, 1968-1985[1]

Year	Population ('000)	GDP (F$m)	GDP/head ($)
1968	495	129.6	262
1969	506	140.5	278
1970	521	168.9	324
1971	533	184.7	347
1972	544	230.5	424
1973	556	300.6	541
1974	565	400.0	708
1975	576	502.4	872
1976	585	558.5	955
1977	596	636.2	1067
1978	607	682.6	1125
1979	619	732.4	1183
1980	631	785.9	1245
1981	643	843.3	1312
1982	655	904.9	1381
1983	667	971.0	1456
1984	680	1041.9	1532
1985	693	1117.0	1612

Note: 1 Values below the dotted line are the projected values

Source: Current Economic Statistics, 1969-1978.

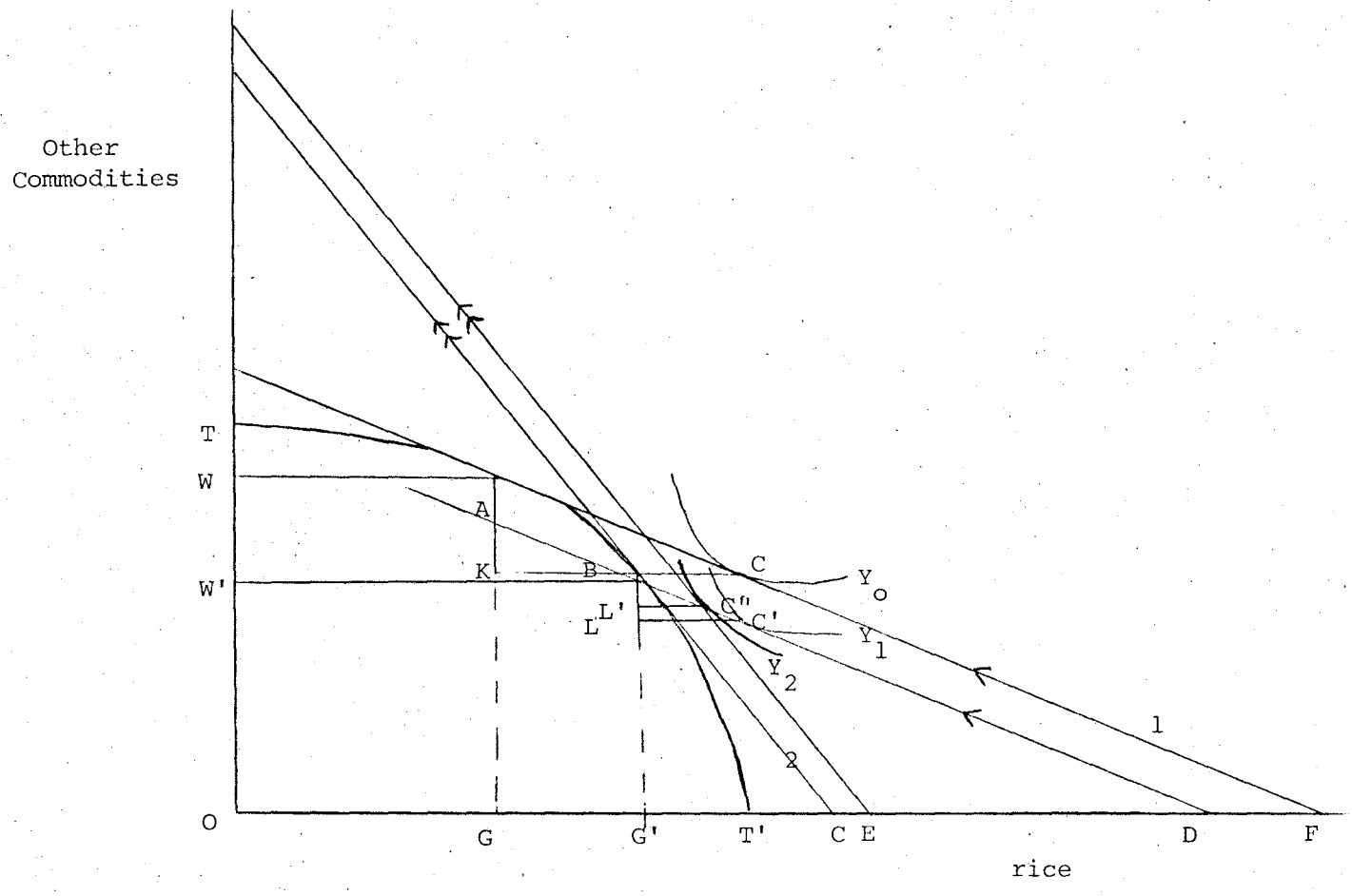
APPENDIX 3.1

TARIFF ON RICE IMPORTS AND ITS EFFECTS

ON THE ECONOMY

GENERAL EQUILIBRIUM ANALYSIS

(not drawn to scale)



rice consumers and other producers to rice producers and other consumers and to government - the latter in the form of government revenue.

(v) Welfare effect

There has been a net loss in welfare represented by the shift from Y_o to Y_2 of the real income level and the decline in national income in rice units from OF to OE.

FD = decrease in national income in rice units due to production subsidy component.

DE = decrease in national income in rice units due to consumption tax component.

The decline from OW to OW' of the production of other commodities is realized because of the expected increased outflow of resources from those commodities to the rice industry.

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