

Chapter 1

INTRODUCTION

1.1 Background of the Study

Agricultural development can be defined in many ways. Generally it is defined as changing the characteristics of underlying elements of an agriculture complex from a prior condition, called traditional, towards a posterior condition, called modern agriculture (Mellor 1966; Wharton Jr., 1968; Mosher 1971). Some authors define it as the transformation from subsistence to commercial agriculture, where subsistence and commercial are two of the main characteristics of traditional and modern agriculture respectively (Penny 1964; Mosher 1969 and 1971; Nakayima 1969; Wharton Jr. 1969).

In a subsistence agriculture, "farming" and agriculture are synonymous (Mosher 1971). Each farmer uses only his own or his tribal land, family labour and home made tools, and produce mainly for his own family needs. In a modern agriculture farming is still central, but each farm becomes only the assembly line, utilizing and combining many different types of inputs drawn from throughout the economy; and most or all of the produces are sold.

The above definition implies that in a developing agriculture, the role of the market becomes increasingly important. One of the associated features of the increasing role of the market economy is that an increasing amount of both input factors and farm products passes through the centralized markets. That is, farmers increasingly use cash in transactions involving their own produce and goods and services they want to acquire. Therefore, for the regions where the process of transformation from subsistence to commercial agriculture is at its early stage, it seems reasonable to put the aim of agricultural development as expanding cash economy beyond the existing subsistence base. At the farm level, correspondingly, an increase in farmers' cash incomes over subsistence requirements can be regarded as an indicator of farm development.

Irian Jaya, which up to 1962 was known as Netherlands New Guinea, is now the most eastern province of Indonesia. It is composed of the Western half of the island of New Guinea and adjacent islands. Both during Dutch rule and now as part of Indonesia, to increase farmers' cash incomes has

been one of the main farm level objectives of agricultural development in this region (Moll 1961; Diperta 1976; Youwe 1978). However, research to explain how this policy aim can best be achieved has never been undertaken. Accordingly, the main idea behind this study is to explain, given increasing farmers' cash incomes as the objective, how the existing types of farms could be developed to attain such a goal.

1.2 Specification of the Problem

Mosher (1966) described a farm as

..."a place, a portion on the earth's surface, where agriculture is carried on by a particular farmer, whether he be the owner, tenant or employed manager; it consists of those resources for agricultural production that are found in that place; the sunlight, the soil, the moisture; the improvements that have been made in the land; and the structures that have been built upon it."

In this definition, Mosher seems to be trying to avoid inserting the questionable aspects of a farm, whether it should be regarded as a business or a way of life. Hence, it seems to emphasize only the physical nature of a farm.

Therefore, an alternative definition is given as follows:

A farm is an organization of nature - including land, labour and capital as well as management, and operating for the production of crop and livestock; it is an independent, deliberately separated management unit, and is run by a person or a social group.

The latter definition implies that a farm is not just a collection of physical factors, but is an organized conglomeration of physical factors tied together by ownership and/or tenancy rights, and operates as one management unit. The produce of this unit may be consumed and/or sold.

It has been generally accepted to view a farm as a bio-economic system (Dent and Anderson 1971). This means that the performance of a farm - as a system - can be explained by using biological as well as economic relationships.

Farm development usually refers to change in the organization and management of a farm in order to increase the productive capacity, the profitability, or the economic value of a farm (Hardaker and Gates 1976). However, its emphasis may be viewed differently in farm management theories and in development theories. In farm management theories, farm development refers more specifically to development by extra capital investment on farm in the form of land improvements, structures, plant and livestock, in order to obtain the objectives mentioned above. Its assessment is obtained through the techniques of development budgeting and project appraisal (Makeham 1978). From the development point of view, farm development has a much broader scope, forming part of the general agricultural and economic development. Factors that will be improved include those factors on farm as well as beyond the farm.

Farm development does not refer to physical improvement alone but comprises also social and psychological aspects such as management and attitude towards development. Corresponding restraints to farm development are usually classified as resource constraints, technological constraints, institutional constraints, personal and subjective constraints (Hardaker 1979).

Speaking in terms of a farm as a bio-economic system, the difference in viewing a farm in farm management and development theories is merely a contraction or an expansion of the conceptual boundary around the organization of interrelated factors affecting the result of a farm operation. Economists have borrowed the term 'growth and development' from biology (Malassis 1975). Growth refers to a change in magnitude, i.e., incrementation in time of major economic aggregates such as production and income. Development refers to structural change, i.e., change of the system which the aggregates, that grow, form part of. As development refers to changing the system, it can be regarded as relaxing the constraining factors in order to improve the performance of the system concerned towards achieving its specified goals. Growth and development are therefore interrelated. The intended effect of development is that it may stimulate growth of specified aggregates, and vice-versa. Tinbergen (1967) mentioned that development efforts have shifted from just relaxing constraints to include forecast and anticipation of constraints. This implies that a continuous monitoring of the system's performance should be part of the development efforts; thereby continuous adjustment can be made in order to maintain growth.

Consistent with the agricultural development objectives in Irian Jaya, it has been specified for this study that the component that must grow is farmers' cash income. Within this context, farm development strategy in this study refers to increasing farmers' cash incomes by relaxing some of the existing constraints at the farm level. However, to determine how the existing constraints will be relaxed, it seems plausible to identify first what factors in Irian Jaya constrain farmers from increasing their cash incomes. These are the problems that will be answered in this study.

1.3 Objectives of the Study

The general aim of this study is to provide the Indonesian Government with the information about how indigenous farms in Irian Jaya, particularly in Nimboran, should be developed in order to increase farmers' cash incomes. Consistent with the problem formulated above, the specific objectives of this study are:

1. to examine those factors which prevent indigenous farmers from increasing their cash incomes, and
2. to examine how these constraints can best be relaxed.

1.4 Hypotheses

One of the basic assumptions in conventional micro-economic theory is that the bliss point lies outside the production possibility region. The theory of subsistence affluence (section 3.3), on the other hand, indicates that it may be possible to find that the bliss point lies within the production possibility region. The associated proposition is that the highest satisfaction may be reached by producing much (conventional economic theory) or desiring little (subsistence affluence theory). In the context of development, resources and technology, and producers' aspirations may become limiting factors in each case, respectively.

It was found in Fiji (de Boer and Chandra 1978) and in Papua New Guinea (Philp 1979), that conditions of subsistence affluence - that Fisk (1962) theorized to exist in Papua New Guinean traditional economy - do not exist. The main hypothesis to be tested in this study is formulated in line with those findings. It is given as follows:

Main Hypothesis

Individual production and consumption decisions of indigenous farmers in Nimboran Irian Jaya can be explained by a model of choice that does not incorporate an interior optimum.

This hypothesis implies that the bliss point lies outside the production possibility region. Correspondingly, resource availability and state of technology may become the limiting factors and not farmers' aspirations - which can be measured in terms of their preferences for cash incomes. Further, it is assumed that land and labour are the main components of Irian Jaya farms' production functions (see sub-section 2.1.3). In terms of their availability, land is relatively plentiful compared to labour. Thus, labour availability may become the most limiting factor. These ideas are formulated in sub-hypotheses one and two as follows :

Sub-hypothesis 1

Farmers' preference for cash income is not the most limiting factor to increasing their cash incomes.

Sub-hypothesis 2

Labour availability is the most limiting factor to increasing farmers' cash incomes.

1.5 Outline of the Dissertation

Following the Introduction to the study in Chapter 1, the general economic and farm conditions in Irian Jaya, and particularly in Nimboran, are described in Chapter 2. In Chapter 3, the theoretical framework is outlined. The first two sections contain an outline of the decision model for small-farm development, which is viewed within the context of general agricultural development. In the following section, systems research and operations research are reviewed in conjunction with whole farm approach in assessing farmers' annual decisions. The last sections contain a review of the attempts to measure decision components and whole farm models in terms of decision making.

In Chapter 4, the methodology used in this study is outlined. In Chapter 5, the results of the study are reported. The final Chapter contains

the summary and conclusions drawn from the results and discussions in previous chapters.

Chapter 2

ECONOMY AND FARMS IN IRIAN JAYA AND NIMBORAN

2.1 Agriculture in the Economy of Irian Jaya2.1.1 Introduction

A comprehensive **review** of the economy of Irian Jaya can be found in Bakker (1965) and Garnaut and Manning (1974). Bakker focussed mainly on development strategies after the second world war until 1962, i.e., the latest period of the region as Netherlands New Guinea. Garnaut and Manning focussed mainly on development from 1962 until 1971, i.e., the early period of the region as an Indonesian province. To avoid repetition, in the subsequent two sub-sections, the economic condition during the 70s will be reviewed with the main focus on the changing economic structure and general agricultural condition.

2.1.2 The changing economic structure during the 70s

Gross regional product (GRP) of Irian Jaya per economic sector for the years 1971 until 1977, calculated on the basis of 1971 constant prices - which are selected to eliminate inflationary effects - is given in Table 2.1. In Table 2.2, the shares of each sector in total GRP are presented, stated as percentages of total GRP for each year, from 1971 to 1977.

In 1971, seen in terms of its share in GRP, agriculture was the main sector in the economy of Irian Jaya and food crop production was the dominant sub-sector. The **average annual rates** of growth from 1971-1977 were food crops production by 11.29 per cent, industrial crops by 9.23 per cent, animal husbandry by 10.28 per cent and forestry as well as fishery by 11.49 per cent. For non-agricultural sub-sectors, mining grew at an average yearly rate of 171.87 per cent and all other sub-sectors by 12.1 per cent. The rate of growth of agricultural sub-sectors appeared to be slower than that of non-agricultural sub-sectors. Hence, as shown in Table 2.2, agriculture's share in GRP has been reduced from 56.33 in 1971 to only 34.12 per cent in 1977. At the same time, mining's share has increased rapidly from 1.34 per cent in 1971 to 35.26 per cent in 1977, exceeding that of agriculture by 0.14 per cent.

In contrast to GRP figures, agriculture supported the majority of the labour force employed in Irian Jaya. Data from the Department of Work

TABLE 2.1

GRP per economic sub-sectors and their growth rates and GRP per capital in Irian Jaya during 1971-1977
Calculated on the basis of 1971 constant price.

Economic Sub-sectors	Years						
	1971	1972	1973	1974	1975	1976	1977
Food crops (million Rp)	9272.55	12116.01	12482.29	13995.16	16222.5	16720.61	17210.64
Increments (%)	-	30.67	3.02	12.12	15.92	3.07	2.93
Industrial crops (million Rp)	375.88	547.60	400.36	352.51	426.30	437.25	546.74
Increments (%)	-	45.68	-26.89	-11.95	20.93	2.57	25.04
Animal Husb. (million Rp)	2095.21	1879.34	2291.53	2275.30	1668.77	2619.26	3155.72
Increments (%)	-	-10.30	21.93	-0.71	-26.66	56.96	20.48
Fisheries (million Rp)	3063.14	4344.19	3653.10	5147.78	5170.25	4146.45	5037.47
Increments (%)	-	41.82	-15.91	40.92	0.44	-19.80	21.49
Forestry (million Rp)	195.28	246.48	366.24	303.98	246.98	366.18	406.91
Increments (%)	-	26.22	48.59	-16.99	-18.75	48.26	11.12
Mining (million Rp)	357.07	514.96	4094.90	11954.11	20742.35	24920.42	26462.55
Increments (%)	-	44.22	695.19	191.93	73.52	20.14	6.19
Others (million Rp)	11268.26	12612.75	15768.57	17366.71	19508.10	20850.75	22220.76
Increments (%)	-	11.93	25.02	10.13	12.33	6.88	6.57
Total (million Rp)	26627.39	32261.33	39056.99	51395.55	63985.25	70060.50	75040.79
Increments (%)	-	21.15	21.06	31.59	24.50	9.50	7.10
GRP/Capital (Rp) with mining	28835	34117	40336	51121	61690	66090	69209
GRP/Capital (Rp) without mining	28448	33573	35280	39195	41881	42582	44798

Source: Irian Jaya (1978), *Regional Income Dati I Irian Jaya, 1971-1977*, Bappeda Propinsi Dati I Irian Jaya dan Kantor Sensus dan Statistik Dati I Irian Jaya, p 15-16.

Table 2.2

Economic sub-sectors' share in Gross Regional Product of Irian Jaya (in per cent) in 1971-1977.

Economic sub-sectors	Years						
	1971	1972	1973	1974	1975	1976	1977
Food crops	34.82	37.56	31.96	27.23	25.35	23.97	22.94
Industrial crops	1.41	1.70	1.02	.68	.67	.62	.73
Animal Husbandry	7.87	5.82	5.87	4.43	2.61	3.74	4.21
Fisheries	11.50	13.44	9.37	10.02	8.08	5.92	6.71
Forestry	.73	.76	.94	.59	.38	.52	.54
Mining	1.34	1.60	12.53	23.26	32.42	35.57	35.26
Others	42.33	39.12	38.33	33.79	30.49	29.76	29.61
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Irian Jaya (1978), *Regional-Income Dati I Irian Jaya, 1971-1977*, Bappeda Propinsi Dati I Irian Jaya dan Kantor Sensus dan Statistik Dati I Irian Jaya, p 19-20.

Force in Jayapura shows that in 1979, the agriculture sector employed 320883 or 93.51 per cent of the total labour force in Irian Jaya, whereas the mining sector supported only 2504 or 0.73 per cent, and other sectors supported 19750 or 5.76 per cent. Labour movement between agriculture and other sectors is very rare. Based on the fact that almost all agricultural labourers are poorly educated and lack skills for non-agricultural jobs, it can be assumed that the rate of transfer will remain low. Hence, even though agriculture's share in GRP is slightly less than that of the mining sector, given that it supports the majority of local population, it remains an important sector in the economy of Irian Jaya.

2.1.3 Main features of agriculture in Irian Jaya

The agriculture sector in Irian Jaya is composed of the sub-sectors: food crops; industrial crops; animal husbandry; fishery and forestry. Food crops are the dominant sub-sector (Table 2.1 and 2.2). The figures of food crops produced during 1971-1977 are presented in Table 2.3. It shows that sago and tubers, consisting of sweet potato, taro, yams and cassava, have the largest share in total food crop production.

In contrast to production figures, rice is the main staple food in existing towns. Thus, a large amount of rice is imported: 18281 tonnes in 1969; 36824 in 1974; 32217 tonnes in 1975 and 35863 tonnes in 1976 (Youwe, 1978). The imported rice constituted almost 98 and 97 per cent of total rice consumption in 1974 and 1976 respectively.

A report of the Provincial Agricultural Bureau (1980) reveals that productivity - in tonnes per ha - of most agricultural products decreased during the second five yearly development period (1969-1973). As is shown in Table 2.4, total production increased in the second five yearly development period even though productivity per hectare deteriorated. The increase in total production was due to the land area cultivated and not to the use of improved technology; since new input factors such as fertilizer, insecticides and pesticides are rarely used (Youwe, 1978, Nababan, 1980). These data illustrate that agriculture in this region has been operating using the traditional methods of cultivation.

2.1.4 Summary remarks

It may be said that the economy of Irian Jaya has grown during the 1970s to have a feature of what Boeke named 'static dualism' (Hayami and

Table 2.3

The gross value of food crops production in Irian Jaya during 1971-1977,
based on 1971 constant price ('000Rp).

Crops	1971	1972	1973	1974	1975	1976	1977
Rice	50 001	43 910	60 869	48 051	73 848	83 641	98 769
Corn	60 434	54 022	61 532	115 026	73 478	83 536	89 679
Cassava	1306 016	1287 241	1331 776	1457 885	1414 349	1029 360	1050 739
Other tubers	8011 721	11507 839	12113 881	11770 988	14199 487	14656 800	14656 800
Sago	2957 238	3028 221	2721 438	5819 302	6763 169	6807 648	7218 804
Peanut	70 020	72 000	79 560	61 560	104 580	115 740	130 770
Soybean	4 702	11 125	25 117	48 848	56 313	49 431	55 854
Other legumes	43 078	44 268	53 431	50 813	40 936	60 095	64 736
Vegetables	450 706	684 259	838 801	875 977	848 242	1063 740	1140 266
Fruits	1729 069	2452 685	2479 164	2112 715	2113 476	2487 991	2706 369

Source: Irian Jaya (1978), *Regional-Income Dati I Irian Jaya 1971-1977*, Bappeda Propins, Dati I Irian Jaya dan Kantor Sensus dan Statistic Dati I Irian Jaya, p.72.

Ruttan, 1974, p.17) where an 'elite' modern sector (mining), which is run by the multinational corporations, coexists with the traditional agricultural sector. There is hardly any interaction between the two. Local agriculture plays a very minor role in supporting the growth of other sectors.

Agriculture in Irian Jaya is predominantly traditional and subsistence in nature. This means that the production process is based mainly on traditional technology, and most of the produce is devoted to farmers' own consumption. As will be explained in sub-section 2.2.3, the process of commercialization seems to vary consistently with the distance between the villages and the nearest central markets. Introduction of industrial crops, which shared 0.75 per cent of GRP in 1977, is an integral part of the process of commercialization.

2.2 Farms in Irian Jaya

2.2.1 Introduction

In order to understand the present farm situation in Irian Jaya, it is necessary to consider the history of agricultural development. The history of agricultural development in this region has been divided into two periods, viz, the period before and after 1954. The year 1954 is taken as the milestone of agricultural development in this region because at that time, for the first time in history of the region, three important institutions were established: the agricultural extension service, ~~a secondary~~ agricultural school, and a committee to study and plan the establishment of an agricultural research institute (Chief, Division of Agriculture, Animal Husbandry and Fishery 1962).

However, this distinction does not illustrate accurately the changes at farm level. According to the author's belief - both from experience and research - the changes that have occurred in the field of farming in Irian Jaya are as follows: the formation of a new farmers' group, the introduction of manual tools made of steel, the introduction and adoption of new varieties of crops, and the beginnings of the commercialization of farm activities. The year of 1954 is significant only because in that year the introduction of industrial crops was started which, hopefully, can contribute to the change from subsistence to commercial farms. Seen in terms of the overall economy of Irian Jaya, i.e.,

Table 2.4

Average yearly increase (in per cent) of total production, and productivity of selected food crops during the first and second five yearly development period in Irian Jaya.

Food Crops	Average yearly increase in total production (%)		Average productivity per year in 100 kg/ha		% change
	1969-1973	1974-1976	1969-1973	1974-1978	
Rice	24	46	27.05	17.51	-34.68
Corn	5	-35	7.37	9.19	24.69
Tubers	10	10	76.73	52.96	-30.98
Legumes	10	10	6.86	9.01	31.34
Vegetables	40	25	31.46	21.23	-32.52
Fruits	52	9	39.17	27.66	-29.38

Source: 1. Youwe, B., 1978. *Masalah Penyediaan Pangan* (Food supply problems). A paper presented at the conference of Bupati (Regents) in Irian Jaya, 11-14 October, 1978.

2. Nababan, N. H., 1980. *Permasalahan Seksi Pertanian Pangan Propinsi Dati I Irian Jaya (Problems of food crops division of Irian Jaya Province)*. A report of Foodcrop Division, Bureau of Agriculture, Irian Jaya, Province.

from its share in GRP, industrial crops are still insignificant (section 2.1). Other changes at the farm level, as mentioned above, occurred long before 1954.

In order to illustrate those changes clearly, subsequent discussion is arranged on a comparative statics basis: the traditional subsistence economy, and the present farm situation. Factors that contributed to bring about the change - including government policies and programs - will be reviewed after that.

2.2.2 The traditional subsistence economy

The traditional subsistence economy which slowly evolved within the region reflected significant adjustment to the natural environment. The whole region can be distinguished into six typical eco-systems. Particular characteristics of the traditional economy for communities living within each environment are shown in Table 2.5. Their economy is classified in terms of the production and consumption patterns. In places where nature provided enough food plants, wild animals and fish, food gathering, hunting and fishing became primary means of existence. Where nature provided less of these things, shifting cultivated gardening became the main production activity.

The food consumption pattern in an eco-system follows the food production pattern. Where food gathering is the main activity, sago is the staple food. Where shifting cultivation is the main production activity, tubers, in combination with sago and banana, are the staple food. Tubers grown in the low lands are mainly taro and yams and, in the highlands, sweet potato.

Unless there is an unusual natural disaster which damages all crops, famine very rarely occurs in this region. The main food problem appears to be the inadequacy in its composition to meet the basic nutritional standard (Luyken 1961; Garnaut and Manning 1974, p.83).

Land is owned communally by the tribe. Individual household members of the tribe have the right to cultivate the land and enjoy the harvest. Even the untouched forest, rivers and beaches have certain communal ownership in terms of hunting or fishing rights.

Table 2.5

Distribution of the traditional subsistence type of economy of the indigenous population of Irian Jaya.

	Low Lands	
A. Main plant formation	Marshy forest with metroxilon Rumphii (Sago)	Savana forest and grass-land
B. Subsistence economy	Food gathering fishing and/or hunting & shifting cultivation	Shifting cultivation, food gathering & hunting and/or fishing
C. Staple food of plant origin	1. Sago	1. Tubers 2. Sago 3. Banana and Saccharum sp.
D. Subsidiary food of plant origin	a. Coconut b. Banana, tubers & Sacch. sp. c. Vegetables and wild fruits	a. Coconut b. Vegetables and wild wild fruits
E. Food of animal origin	1. Fish and/or wild animal 2. Generally pig	1. Fish and/or wild animal 2. Occasionally pig.
F. Average acreage of the gardens	0.55 ha	0.05 - 0.1 ha
G. Sample region	Waropen	Knoem

.. .. Continued

Table 2.3 (cont)

	Plateau, Hilly and mountaneous	
A. Main Plant formation	Savana, grassland and rain forest	Grassland, marshy-grassland, rain forest and mouldy forest
B. Subsistence	Shifting cultivation food gathering & hunting and/or fishing	1. nearly settled agriculture, using manure and drainage 2. Shifting cultivation, food gathering, hunting and/or fishing
C. Staple food of plant origin	1. Tubers 2. Banana and Sacch. sp or 1. Banana 2. Tubers and Sacch. sp.	1. Tubers 2. Vegetables
D. Subsidiary food of plant origin	a. vegetable and beans b. wild greens and fruits especially	a. Pandanus with edible seeds b. Banana, Sacch. sp., wild fruits
E. Food of animal origin	1. Wild animal and/or fish 2. Occasionally pig	1. Fish and/or wild animal 2. Occasionally pig
F. Average acreage of the gardens	0.15 - 0.25 ha	1. 0.05 - 0.1 ha 2. 0.075 - 0.15 ha
G. Sample region	Muyu	Baliem plateau

.. .. Continued

Table 2,5 (cont)

	Mountaineous coast	
A. Main plant	Marshy forest with Metroxilon Rumphii (Sago)	Tropical rain forest
B. Subsistence economy	Food gathering & shifting culti- vation & hunting and/or fishing	Shifting cultivation & food gathering & fishing and/or hunting
C. Staple food of plant origin	1. Sago 2. Tubers, banana and Sacch. sp.	1. Tubers 2. Sago 3. Banana and Sacch. sp.
D. Subsidiary food of plant origin	a. Coconut b. Vegetabels and fruits	a. Coconut b. Wild greens and fruits
E. Food of animal origin	1. Fish and/or wild animal 2. Occasionally pig.	1. Fish and/or wild animal 2. Occasionally pig
F. Average acreage of the gardens	0.075 ha	0.075 - 0.15 ha
G. Sample region	Sentani Lake	Nimboran

Source: Barrau, (1957)

The cropping pattern usually follows a one year cycle. Labour shortages during peak periods, especially during land clearing and planting, are overcome by practising exchange labour (see sub-section 4.3.2). Main implements used are wooden digging sticks, stone axes, and shell adzes, with spears and bows for hunting. For those living near the water ways, boats for fishing and transportation may also be included. Most of these tools were subsequently substituted by metal ones. Without introducing an open economy where output in excess of consumption is traded, the substitution of metal implements created labour savings, which further resulted in under-employment, particularly of males (Garnaut and Manning 1974, p.7).

2.2.3 Present farm situation

At present there are three distinct groups of farmers in Irian Jaya, namely indigenous farmers in the villages, transmigrant farmers and part-time farmers. Transmigrant farmers are farmers from over-populated regions in Indonesia (mainly from Java) who are resettled in Irian Jaya and other thinly populated regions under a population redistribution program called 'transmigration'. Part-time farmers are those, indigenous or non-indigenous, whose former occupation was not in farming. Most of the part-time farmers are employed either in government or in private institutions, or are pensioners.

Consistent with the subject in this study, further discussion will be focussed on the indigenous farm situation, where transmigrants' farms will now and then be used for comparison. Three aspects will be outlined subsequently: the structure of farm organization and operation; number and types of farm enterprises; and the economic nature of farm operation.

The structure of farm organization and operations

The present indigenous farm situation is no longer the same as summarized in Table 2.5. Changes have occurred directly, as a result of agricultural development activities and indirectly, as farmers adjusted to the changing socio-economic conditions. Nevertheless, traditional activities still dominate the rural economy. This means that shifting cultivation, gathering, hunting and fishing are still conducted beside newly adopted activities such as wage earning activities, marketing activities and cash crop production. Wage earning activities besides farming are performed by the villagers near the towns.

Unlike transmigrants who owned the land allocated to them, traditional land rights in the form of communal land ownership still holds for the indigenous. In one year, an indigenous farmer may have four to six portions of land under crops, sometimes quite a long distance from his village. Transmigrant's farm land is always consolidated, and consists of about 0.25 ha home garden and about 1.75 to 2.75 ha farm land.

There exists a clearcut job division between males and females. In clearing a forest land for cultivation, the male's job is mainly to fell the trees. They also build fences around the garden and, to a certain extent, help in planting and harvesting. Planting sago, coconut and other perennial crops as well as banana is almost entirely a male job. Planting and harvesting tubers and other smaller crops is a female job. Selling activities are done mostly by women. Off-farm activities such as wage earning, fishing, and hunting are male jobs. Exchange labour activities are still practised during peak labour periods.

General features of yearly production cycles on indigenous and transmigrants' farms are shown in figure 2.1. The actual production cycle on indigenous farms is much more complicated because it involves a wide variety of crops which vary in their maturing and harvesting periods. In fact, harvesting is conducted throughout the whole year. The figure shows only the production cycle of annual crops on a shifting cultivated garden. With the exception of yams, which are harvested and stored, the other crops are harvested in small amounts once or twice in a week for farm family weekly consumption. The rest are left in the field (ground storage). It usually takes about six to ten months to harvest all Xanthosoma grown, and one to three months for Colocasia and sweet potato. The transmigrants, who normally cultivate early maturing crops like rice and soybean, work the land twice in one year.

Numbers and types of farm enterprises

Almost all farms in Irian Jaya are diversified. The indigenous farmers grow in their shifting cultivated garden mainly annual crops such as tubers (taro, yams, potatoes and cassava) and also corn, vegetables and sugar cane. Banana and pawpaw are also found. Beside those, the farmers have parcels of land with sago and other perennial crops such as coconut, betelnut, cocoa, coffee, clove, nutmeg and various kinds of fruit trees. Their home gardens are usually planted with coconut, betelnut and fruit trees. Some indigenous farmers

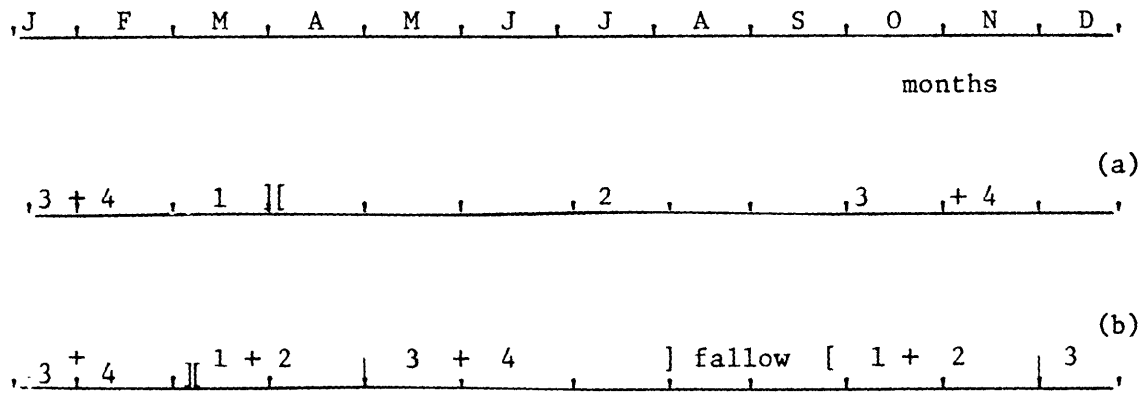


Figure 2.1 Yearly production cycle(s) on indigenous' farms (a) and transmigrants' farms (b) in Irian Jaya

Legend:

] ... [= one production cycle

|....| = stage of activity within one production cycle

1 = Land clearing/tilling stage

2 = planting stage

3 = growing stage/nursing

4 = harvesting stage.

cultivate peanuts, soybeans, and rice, and rear pigs, cattle and chickens.

The economic nature of farm operation

The economic nature of transmigrants and indigeneous farms in three localities, in terms of the percentage of total produce sold and efficiency of farm operation, is summarized in table 2.6, taken from Karafin (1974).

In Jayapura regency, the sample villages are very close to the main town and are directly connected by road to the central market. In Merauke, the villagers have to cross the big river Maro to reach the central market in town. In Manokwari, the sample villages are far from the main town and are isolated. Irregularly, once or twice in a month, there is a boat service connecting the region and the main town. These regions can be ordered according to the ease with which one can reach the market place in the nearby town. As is shown, the percentages of produce sold tend to follow the same order. Of the groups, transmigrant farmers sell more of their produce.

Returns per unit cost in one year - as shown in the table - are used as a measure of efficiency of farm operations in one year. Indigenous farm operations appear to be consistently more efficient than transmigrants' farm operations. Differences in efficiency can be explained by looking at the types of crops grown with associated methods of cultivation, which further affect the cost and income structure. Main crops on transmigrants' farms are rice, soybean and peanuts, whereas main crops on indigenous farms are tubers and banana. Production per hectare of rice and legumes are relatively lower than that of tubers (see Table 2.4). Under existing methods of cultivation, rice and legumes demand more labour than for tubers. Except for farm tools, none of the farm inputs are bought. Up to 1975, no fertilizer, insecticides or pesticides were used, and nearly all farmers provided seeds from their own farms. As a result, labour cost is the main component of production costs on the existing farms. Lower yield with high labour demand, aggravated by the absence of labour-substituting technology, seems to contribute to the relatively inefficient production on transmigrants' farms.

2.2.4 Review of the changes and associated policies

Before 1954, teachers, employed by the Missions, and traders, especially from other islands in Eastern Indonesia, contributed significantly to the early changes of agriculture in the region. These changes include the introduction of new crops such as beans, fruit trees, rice, and steel working tools.

Table 2.6

Economic feature of transmigrants and indigenous farms in Irian Jaya in 1970, seen in terms of gross revenue, cost, revenue per unit cost and portion of total produce sold

Region Sample group	Average Gross Revenue per year (IBRp)	Average total cost per year (IBRp)	Revenue per unit cost	Percent of total produce sold
<u>Jayapura</u>				
Transmigrant	8773.60	51.70	16.15	70.23
Indigenous	14497.30	143.10	101.31	59.31
<u>Merauke</u>				
Transmigrant	6289.50	656.70	9.58	66.39
Indigenous	3789.40	108.60	34.89	29.30
<u>Manokwan</u>				
Transmigrant	3985.05	293.00	13.60	50.71
Indigenous	3060.90	38.90	78.69	3.57
<u>Irian Jaya</u>				
Transmigrant	6336.05	496.80	13.11	62.45
Indigenous	7115.87	96.87	73.46	30.73

Note: IBRp = Irian Barat Rupiahs

Source: Karafir, Y. P. 1974.

The establishment of government activities¹ associated with the market development in the administrative centres has contributed to the expansion of the cash economy in the adjacent villages. Many farmers from the remote villages migrated to towns, where they could exchange their labour for wages. Due to lack of education and appropriate skills, they were paid very low wages, hardly enough to support family life. Therefore, most of them became part-time farmers. Generally, changes at farm level before 1954 were unplanned, and occurred as a spontaneous adjustment of local farmers to the changing socio-economic conditions around their villages.

Agricultural strategy during the latest period of Dutch rule (1954-1962) was directed towards the creation of agricultural development nuclei, or in other words, the creation of a native farming class. It was stated that new social units have to grow in the long run around production nuclei, composed of selected farmers and their families who were engaged in cultivating cash crops, in stock breeding and producing food for consumption within their own family group (Bakker 1965). The approach is pursued by introducing to the indigenous farmers perennial cash crops; mainly cocoa, coconut, nutmeg and, less intensively, rubber. In this case, no direct change was forced on the existing farming system, but instead, those crops were suggested to be planted in the shifting cultivated gardens. By increasing the area of perennial cash crops, land area available for shifting was expected to be reduced. Thereby settled farming and individual ownership, hopefully, could gradually be established in the region. A foundation for more intensive agricultural research was also established to support these programs. Its activities were pooled in an experimental station, which had test plots throughout the whole region.

The stress of agricultural development programs since 1963 has been mainly on food crops particularly rice, soybean and vegetables. Later on, commencing with the establishment of the industrial crop division at the Bureau of Agriculture in 1970, the stress was laid on developing perennial cash crops, especially coconut and cloves. The clove development project, which started in 1975, is of particular interest in that it gave rise to a new land holder class, consisting of retired army officers, retired public

¹ West New Guinea was formally proclaimed as a Dutch colony on 24 August 1828. See: Paul A. van der Veur, 1977.

servants and business men in towns. Another important project in conjunction with agricultural development during the latter period is transmigration. This program (see sub-section 2.2.3) can be regarded as a guided rural to rural migration. In Irian Jaya, as a recipient region, transmigration is conducted in conjunction with the program to encourage food production, especially rice. Up to 1979, about 1092 families have been resettled in ten transmigration resettlements throughout Irian Jaya. Each migrant family received two to three hectares of land.

2.3 Nimboran Region

2.3.1 Its history of agricultural development

The Nimboran region lies South-West from Jayapura, the capital city of Irian Jaya. The area has attracted the interest of both Dutch and, later, the Indonesian Governments to be developed as an agricultural region.

Based on the recommendation of the South Pacific Commission Research Council in 1949, a pilot project of community development schemes in the form of a cooperative called 'Jawa Datum' was established in this region. A fully mechanized farm project - run by the cooperative - started in December 1952 with the opening of 11 ha of land and planted with corn, peanuts and rice. This project failed to maintain its viability, and because of heavy losses, it stopped operating after two years of operation.

In 1954, an extension project on cocoa started in Irian Jaya. Model farms were established based on nuclear family units. A pilot experiment was established in Blitung, a village in Nimboran. Nimboran was since developed as one of the main cocoa producing regions in Irian Jaya. Up to 1962, wet cocoa beans from the farmers were bought by the extension agency, who organized the fermentation and further treatment, and sold to the New Guinea Import Export Company. This activity ceased when Irian Jaya became part of Indonesia; as a result, cocoa production also ceased in 1963. In 1972, the Agricultural Bureau tried to resume buying cocoa beans but due to lack of money, it did not last for more than a year.

In 1971, a Joint Foundation for Irian Jaya development was established by the Government of Indonesia and United Nations Development Programme (U.N. D.P.). The Foundation's task was to observe and plan productive projects to raise income in Irian Jaya, offer credits and advice relating to the first task. Its operation is mainly in the field of agriculture and industry.

In Nimboran, since 1975, the Foundation has resumed buying cocoa beans from the indigenous farmers and offering credit for cocoa expansion and cattle raising. Advice to the farmers is given in collaboration with the Agricultural Extension Bureau. Until early 1980, about 48 indigenous farmers in Nimboran have received credits for cattle production. Each farmer received four cows and one bull, 5000 m barbed wire and working tools, with a total value of one million Rupiahs. About 488 farmers in Nimboran and its neighbouring sub-regency, Kemtuk Gresi, have obtained credit for cocoa expansion in the form of seedlings, equipment, medicine, fertilizer and working capital, to a value of 175 000 Rupiahs per ha for each farmer.

The present Government is very keen to develop Nimboran as a main food producing region. The transmigration project is conducted within this context. In 1976 and 1977, a hundred and fifty families were resettled in Nimboran, occupying an area of 450 hectares. Three thousand hectares were later prepared for another thousand families, two hundred of whom arrived in early 1980. During the survey, a big dam was under construction in the South-eastern corner of Nimboran valley for irrigation of the transmigrants' rice fields.

2.3.2 Socio-Economic condition

Nimboran region, as shown in the map (see figure 4.1) is a sub-regency¹ which administered eight desas and 26 villages. During the survey, a ninth desa, which is the second transmigrants' resettlement in the region has been established. The administrative centre, where offices of extension agents for foodcrops, industrial crops, animal husbandry and inland fishery are found as well as the local government ones, is Genyem. It lies about 93 km South-west from Jayapura.

i) Population Total population in 1979 was 5119, consisting of 1056 families. The work force, i.e., those aged between 14 and 55 years, consists of 1508 males and 1186 females. Of the total population, 2684 are Protestants, 1344 are Pentecost, 985 are Moslems and 105 are Catholics. Education data reveal that 756 are illiterate, 2590 have got three to six years primary education, 521 graduated from Junior High school, 56 graduated from Senior high school and five graduated from the university. Classified by

¹Administrative divisions in Indonesia: Province, Regency, sub-recency and desa.

occupation, 2744 are farmers, 712 are labourers, 133 are Government officials and teachers, 18 are traders and 2508 are children below 15 years of age, some of whom are still attending primary school.

ii) Land rights Except for the transmigrants, land for the indigenous is owned communally by each clan. There are about 37 clans in the region, each with its own territory. The boundaries of the territories are usually mountains, rivers or creeks, rocks, trees, or any distinctive plant formation. Each member of the clan has the right to open and cultivate any piece of land within the boundary of his clan's land. Once the land is cultivated, the individual has the right to protect his crop from other individuals, even from the same clan. This applies for annual, as well as for perennial crops.

iii) Transport The road system in Nimboran is shown on the map (Figure 4.1). The first part of the road to Genyem, which started from the Western end of Lake Entani, was built during 1948 and 1952. Those who wanted to travel between Genyem and Jayapura had to take part of the journey through the lake by boat or pontoon. In 1971, the old road was upgraded and a new section was built West of the lake which provided a direct connection between Jayapura and Genyem. The road was formally opened in 1978. At present, 16 out of 26 villages in the region can be easily reached by car. There are, however, some villages which lie far from the main road, and are connected by foot paths.

There is a daily bus service connecting Genyem and the central market in Jayapura. Its capacity is less than 50 passengers. Private micro buses are also available. For a one way trip to Jayapura, a passenger is charged 2100 Rupiahs for private micro bus, and 650 Rupiahs for the Government bus. Each parcel of about 10 kg carries a charge of 500 Rupiahs freight.

iv) Trade Agriculture is the main economic activity in Nimboran. There are two distinct ways of marketing agricultural produce in this region. The first operates only for cocoa. Each Wednesday, the farmers take their wet cocoa beans to the only fermentation centre. The buyer, who also runs the fermentation centre, is a limited corporation, set up by the Joint Development Foundation - which has been mentioned before. At the fermentation centre, the farmers are paid 200 Rupiahs per kg wet cocoa beans, or 500 Rupiahs per kg dry beans. At the time of survey all farmers sold wet beans. Further

processing to export is handled by the corporation. The amount of cocoa bought in 1979, which shows the total production from the region in one year, is shown in Table 2.7. Second, marketing of food crops: in Nimboran sub-regency, three market places have been set up. The one which is opened daily is Genyem. The second is in the first transmigration resettlement. It is opened twice weekly, on Mondays and Saturdays. The third is close to the cocoa fermentation centre and is open each Wednesday. Normal business hours are from six o'clock in the morning to twelve midday.

Selling activities are mostly carried out by women. However, even where roads have been built, cars or any other vehicle for inter-village travel within the region are very scarce. Hence, the farm women have to carry the commodities by themselves to the local market place. The amount they can sell is therefore very restricted. Furthermore, local demand is also very low. Therefore, most farmers normally take their goods to the central market in Jayapura by bus.

Imported goods can be found in the retail shops in Genyem and two other places, mostly run by people from South Sulawesi. Most of them are small retailers. Frequently, people from Genyem go to Jayapura for shopping where they can get various other goods not sold locally.

2.3.3 Farms in Nimboran

The natural conditions: topography, soil types, the climate and the river systems, are presented in appendix v. The traditional subsistence economy in Nimboran, which reflects the adjustment to the existing natural environment, is summarized in the last column of Table 2.5. It seems - from impressions during field work - that this traditional economy persists as part of the economic activities in the villages in Nimboran.

Most aspects of the present farm situation will be covered in the chapter on Methodology. Those aspects are : the number of farms and associated aspects (section 4.2), farmers subjective beliefs (sub-section 4.4.4), their utility functions (sub-section 4.4.3), methods of cultivation and main enterprises (sub-section 4.3.2), and resources available (sub-section 4.3.3 and section 4.5). Other aspects like consumption, income, and resource allocation, will be explained in Chapter 5. As most of the farm aspects will be covered, it is considered unnecessary to expand the discussion here.

Table 2.7

Total cocoa production from Nimboran and Kentuk
Gresi, bought by P.T. Jodefo in 1979 and early
1980

MONTHS	Quantity bought (kg/ wet beans)	
	1979	1980
January	12813	11252
February	8429	4890
March	7668	9548
April	5896	-
May	13564	-
June	7388	-
July	3907	-
August	2689	-
September	1165	-
October	4464	-
November	5989	-
December	3068	-
TOTAL	79949	25690

Source: P. T. Jodefo, Jayapura.

2.4 Summary Remarks of the Chapter

This chapter contains a brief and comprehensive review of the general economic, agricultural, and farm conditions, as well as policies and programs for development in Irian Jaya, and Nimboran in particular. Policies and programs for agricultural development in Irian Jaya - from previous discussions - entail two distinct strategies: 1) expansion of perennial cash crops, and 2) expansion of food crops. However, food crops in this case are cereal (rice) and legumes (soybean and peanut), and not the traditional tubers.

These strategies will be incorporated in the model and tested to measure their effect on farmers' expected net cash incomes. The results will be used as raw material for the discussion. The expansion of perennial cash crops, in this case, cocoa and coconut, are imposed by parametrising the maximum amount that can be produced yearly. Increasing the amount of production is achieved by increasing the area of those crops, thus reducing the area of land available for shifting cultivation. Rice is a new crop for the indigenous farmers. It will therefore be imposed as a new activity into the model.