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WORKING PAPER 25

MARKET PROSPECTS FOR UPLAND CROPS IN INDONESIA

Memed Gunawan

The CGPRT Centre
Working Paper Series, January 1997

The CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

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In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

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MARKET PROSPECTS FOR UPLAND CROPS IN INDONESIA

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Table of Contents

List of Tables

Chapter 5

Chapter 6

Chapter 7

List of Figures

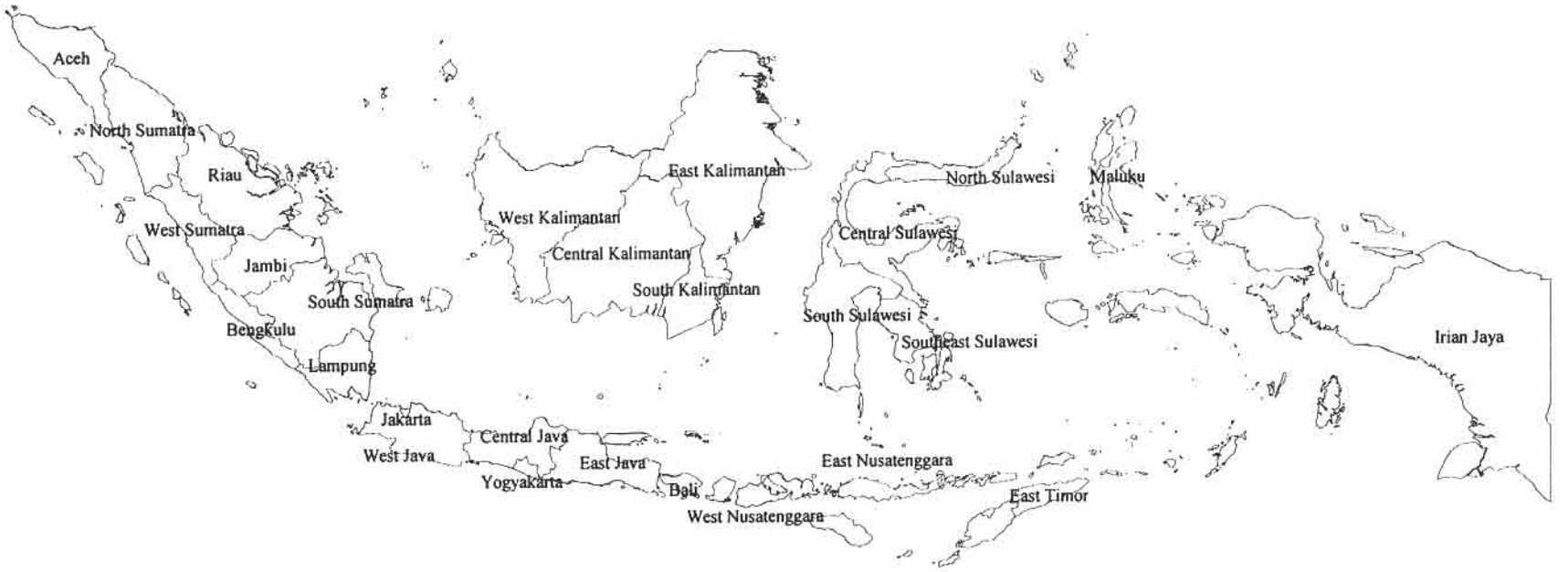
List of Abbreviations

ADP	Agribusiness Development Project
ASBIMTI	Association of Wholesalers of Imported Raw Material for Animal Feed
BULOG	*Badan Urusan Logistik* (National Stock Agency)
CASER	Center for Agro-SocioEconomic Research
CBS	Central Bureau of Statistics
CIF	Cost, Insurance and Freight
CPO	Crude Palm Oil
DDP	Desirable Dietary Pattern
DGFCH	Directorate General of Food and Horticulture
EU	European Union
FAO	Food and Agriculture Organization
FBS	Food Balance Sheet
FOB	Free on Board
GDP	Gross Domestic Product
IPB	*Institut Pertanian Bogor* (Agriculture University of Bogor)
KOPTI	*Koperasi Produsen Tempe dan Tahu Indonesia* (Indonesian Tempe and Tofu Producers' Cooperative)
KUD	*Koperasi Unit Desa* (Village Unit Cooperative)
KUT	*Kredit Usaha Tani* (Farm Credit)
MOA	Ministry of Agriculture
MOI	Ministry of Industry
NES	Nucleus Estate System
NPR	Nominal Protection Rate
PIR	*Perusahaan Inti Rakyat* (Nucleus Estate Smallholder)
PIRTRANS	*Perusahaan Inti Rakyat Transmigrasi* (Transmigration Smallholder Nucleus Estate)
PELITA	*Pembangunan Lima Tahun* (Five Year Development Period)
SUSENAS	*Survei Sosial Ekonomi Nasional* (National Socio-Economic Survey)
UCP	Upland Crop Products

Exchange Rate: Rupiahs per US $.

Year	Rp/$
1979	627
1980	627
1981	644
1982	692
1983	994
1984	1,074
1985	1,125
1986	1,641
1987	1,650
1988	1,731
1989	1,797
1990	1,901
1991	1,992
1992	2,062
1993	2,110
1994	2,200
1995	2,250

Indonesia


Aceh
North Sumatra
Riau
West Sumatra
Jambi
South Sumatra
Bengkulu
Lampung
Jakarta
West Java
Central Java
East Java
Yogyakarta
Bali
West Nusatenggara
East Nusatenggara
East Timor
West Kalimantan
East Kalimantan
Central Kalimantan
South Kalimantan
North Sulawesi
Maluku
Central Sulawesi
South Sulawesi
Southeast Sulawesi
Irian Jaya

Foreword

To answer the growing regional concern for the market prospects of upland crop products (UCPs), the CGPRT Centre has been implementing a research project "Market Prospect of Upland Crop Products and Policy Analysis in Selected Asian Countries (MPUPA)" since November 1994, in collaboration with partners from seven countries: China, India, Indonesia, Pakistan, Philippines, Thailand and Vietnam. In all these countries, important issues regarding UCP market prospects, such as domestic demand, marketing system and future potential, were investigated with an identical research framework by national experts.

Market Prospects for Upland Crops in Indonesia is the sixth volume of the series of country studies. The investigation covers the major upland crops: maize, soybean, cassava and sweet potato as well as various kinds of fruit and vegetables. I believe that readers of the study can obtain broad and practical knowledge for improving the market of UCPs in Indonesia; moreover, the information will be also useful for researchers and policy planners in other countries in the region.

I thank Dr Memed Gunawan for his intensive research and the Indonesian Ministry of Agriculture for allowing him to work with us and for providing continuous support. Dr Boonjit Titapiwatanakun has ably coordinated the various complex steps in the study. I would also like to express appreciation to the Japanese government for funding the project.

Haruo Inagaki
Director
CGPRT Centre

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Dr. Memed Gunawan
Director
Center for Investment Development
and Enviromental Impact

1. Introduction

1.1 Background

In Indonesia upland crops other than rice are known as *palawija* or secondary crops. These crops are second to rice in terms of commodity development priority and consumer preference. To some extent, they are recognized as important food crops that substitute for rice. The role of *palawija* in direct human consumption in Indonesia is decreasing. Most are considered inferior: the amount of direct human consumption declines as real income of consumers increases. On the other hand, indirect consumption may increase with income. The average increase in per capita real income during the country's fourth and fifth (1984-1994) Five Year Plans (*Pelita*) was 2.5-3.5% and it is expected to significantly affect direct human consumption of *palawija* or upland crops.

Upland crop products have a wide range of final products starting from flour, snacks, sugar, oil, chemicals, and animal feed. As human food in Indonesia, upland crops are rarely consumed without processing. Soybean is seldom consumed as soybean grain, but as processed products such as *tofu* (soybean curd), *tempe* (fermented soybean), *kecap* (soy sauce), *tauco* (salty-fermented soybean), or sprouts. These products are important foods for Indonesians as the main source of vegetable protein. Maize and cassava are often consumed as staple food, particularly in Java.

Current demand for soybean, cassava and maize primarily comes from the feed industry. Therefore, market prospect and product development for these commodities seem to be promising for several reasons:

- both technically and biologically, upland crops are suitable for most of Indonesia's agroclimatic conditions;
- upland crops contain high nutrition and provide a wide range of uses for direct human consumption, processed food and animal feed; and
- most upland crops can be processed to obtain higher added value.

Current uses of these commodities as raw materials in food and feed industries have been increasing rapidly. The prospects of upland crop markets are expected to be determined by the rate of development of processing industries. However, lack of information of the demand side hampers further inquiry. So far, research for quality improvement of upland crops has been undertaken at the laboratory and farm level as well as research on marketing and processing aspects. For further market expansion and product development of these commodities, important questions that arise are:

- Can upland crops compete with other food crops in the use of land, capital, labor, and other production inputs?
- How large are the markets for fresh and processed products?
- What are the major constraints for upland crop markets and product development?
- What are the major factors affecting successful and failed processing and marketing efforts?
- What is the basic supporting system required?
- What policy options should be established?

To answer these questions, one requires a comprehensive analysis of the upland crop economy, including supply and demand prospects related to changes in production technology, product development, processing industries, and current policy and supporting policy for product development. Under the market-led commodity development concept, it is believed that the

demand aspect plays an important role in upland crop development. Indeed, the development of these commodities relies more on existing demand and future demand for these crops than on production technology.

1.2 Objectives and expected outcomes of the study

The study focuses on the demand side to provide information as foundation to expand the market for upland crops. More detailed study on the marketing side is probably needed to give a better picture of the upland crop economy. The detailed objectives of the study are:

- to understand current demand and trends for these commodities;
- to measure the impact of changes of other shifter variables to the demand for upland crops;
- to estimate the short term (5-10 year) demand for these commodities;
- to determine the obstacles and prospects of development of these commodities; and
- to analyze and formulate supporting policy for product development.

The study generates:

- information on domestic demand for upland crops for fresh consumption as well as for processing industry raw materials;
- projection of demand for upland crops up to the year 2000 (medium term demand projection);
- practical information from successful and failed marketing attempts of upland crops; and
- policy options for upland crop market development.

1.3 Methodology

The study analyzes domestic demand, market potential and case studies of successful and failed marketing attempts. Simple analytical methods are employed to estimate consumption parameters, trends, prospects and projections. Both quantitative and qualitative analysis are undertaken. Descriptive and simple projections are sufficient to explain the present situation and future prospects of the commodities. The commodity coverage is summarized in Table 1.1.

Data on consumption are compiled by the Central Bureau of Statistics (CBS), Ministry of Agriculture (MOA) and other independent studies. Food Balance Sheet (FBS) data currently collected by MOA are based on aggregate data on production, export, import, losses, feed, and industrial uses. The residual is regarded as the amount of these commodities available for human consumption. Annual per capita availability of the commodity is usually used as a proxy of per capita consumption of the commodity. However, the data on feed and industrial uses are usually the estimated percentage of the total availability. Therefore, the data are regarded as not accurate for estimating industrial demand for these commodities.

CBS records consumption data in Indonesia every three years in a survey called *Susenas* (Survei Sosial Ekonomi Nasional, National Socio-Economic Survey). The most recent *Susenas* was conducted in 1993. The average consumption is calculated based on individual consumption data in the 7 days prior to the interview date. Since the individual consumption data are quite detailed and accurate, *Susenas* data are frequently used to analyze commodity consumption and demand. Industrial use of upland crops as raw material is recorded by the Ministry of Industry (MOI) in Statistik Industri (Industrial Statistics), which is published later by CBS. Statistik Industri records only large and medium scale industrial use of these commodities.

Table 1.1 Commodity coverage.

Analysis	Commodity Coverage
Domestic Demand	
a. Dietary pattern	Rice, secondary crops, meat, fish, dairy products, vegetables, fruits, prepared foods, others
b. Demand composition	Cassava, soybean, maize, sweet potato
c. Policy impact	Cassava, soybean, maize, sweet potato
d. Demand projection	Cassava, soybean, maize, sweet potato
Market potential	
a. Marketing/processing constraints and policy	Cassava, soybean, maize, sweet potato
b. External trade performance	Cassava, soybean, maize, sweet potato
c. New emerging products/markets	Cabbage, mango, potato
d. Case studies:	
1. Successful domestic/export market attempts	Cacao, oil palm, canned pineapple
2. Failed domestic/export market attempts	Canned pineapple, passion fruit, pepper

The economy of upland crops is descriptively discussed through several approaches, namely descriptive tables, identification and analysis of policy regarding upland crops, impact analysis, estimation of rate of growth and income elasticity. Projections are made by taking into account several intervening variables such as population and income.

Long term time series data of consumption of the commodity may be used in a trend equation, as follows:

$$\ln(Q) = a + bT$$

where Q is the quantity consumed, and T is time. Once the coefficients a and b are estimated, the projection of Q can be made.

Income elasticity can be calculated simply through an ad hoc quantity demanded function, as follows:

$$\ln(Q) = a + b \ln(Y)$$

where Y is real income or real GDP.

1.4 Organization of the report

Chapter 2 of the report discusses agricultural policy and strategy currently implemented by the government. It is also presents the macro economic setting, the position of the agricultural sector as a whole in the national economy, the role of the food sector in agriculture, and the importance of upland crops in the food sector. Chapter 3 discusses the consumption pattern, level of consumption, budget share, demand composition, trends of consumption and changes in consumption pattern over time and between regions.

Chapter 4 explains the projection of demand for specific commodities for the years 1995-2000, the model and procedure used in the projection and the interpretation of the projection. The current state and future prospects for production, processing, marketing, utilization, diversification, and product development of the commodities, and the constraints for their development are discussed in Chapter 5. Chapter 6 will highlight some emerging commodities which possess future market prospects in domestic and international markets. The constraints and limitations will also be discussed. Chapter 7 will present some stories of success and failure in market expansion efforts.

The influencing factors are also identified and discussed. Chapter 8 will present conclusions and recommendations.

2. Agricultural Policies

2.1 The role of agriculture in the Indonesian economy

During the last decade the role of the agricultural sector in the Indonesian economy has declined relative to those of other sectors. The current share of agricultural Gross Domestic Product (GDP) is 17.66% with a rate of growth of 2.36% per year (MOA 1994). Agriculture growth is lower than growth in industry (10.40%), trade (7.72%), construction (12.08%), transportation (9.37%), and banking (13.72%) (Table 2.1). In 1990 the agricultural sector absorbed 49.4% of total labor in Indonesia in a declining trend. The agricultural sector remains a strategic sector due to its importance in terms of food security, labor absorption, and support for agroindustry development in Indonesia. In 1985, the labor force working in the agricultural sector was 34.142 million, and increased to 35.747 million in 1990 at a 0.92% annual growth rate. Agricultural labor productivity is the lowest compared to other sectors. In 1990 the total labor productivity was Rp 632,000/year, while in the industrial sector it was Rp 2,724,000, trade Rp 1,769,000, services Rp 1,273,000, and in transportation Rp 2,440,000.

Table 2.1 Trends of sectoral contribution to GDP (in billion rupiah at constant 1983 prices), 1988 and 1991.

Sector	1988	1989	1990	1991**	Growth (%/year)
Agriculture*	20,201	20,944	21,354	21,665	2.36
	(20.20)	(19.49)	(18.55)	(17.66)	
Mining	15,893	16,664	17,489	19,108	6.35
	(15.90)	(15.51)	(15.19)	(15.57)	
Industry	18,182	19,856	22,277	24,461	10.40
	(18.19)	(18.48)	(19.35)	(19.93)	
Electricity	549	616	726	843	15.39
	(0.55)	(0.57)	(0.63)	(0.69)	
Construction	5,259	5,878	6,673	7,403	12.08
	(5.26)	(5.47)	(5.80)	(6.03)	
Trade	15,657	17,338	18,565	19,557	7.72
	(15.66)	(16.14)	(16.13)	(15.94)	
Transportation	5,212	5,812	6,378	6,816	9.37
	(5.21)	(5.41)	(5.54)	(5.55)	
Banking	3,752	4,291	4,899	5,517	13.72
	(3.75)	(3.99)	(4.26)	(4.50)	
Services & Others	15,459	16,039	15,763	17,334	4.00
	(15.46)	(14.93)	(13.69)	(14.13)	
Total	99,981	107,437	115,110	122,705	7.07

Source: CBS, Statistik Indonesia 1991; Indikator Ekonomi March 1993.
* Excluding forestry.
** Preliminary figures.
Figures in presentheses are percentages.

2.1.1 The role of food crops in Indonesian agriculture

Food crops contribute 62.22% to agricultural GDP. Annual growth rate is 1.28%. Estate crops, livestock and fisheries contribute 18.06%, 11.27%, and 8.46% to agricultural GDP with annual growth rates of 4.21%, 3.33% and 5.57% respectively (Table 2.2). Java accounts for the largest portion of food production in Indonesia. Although the relative contribution of Java to national food production is beginning to decline, the total production is continually increasing. The proportion of the labor force working in the food subsector is declining, while in other subsectors it

is increasing. The food subsector absorbs 75% of agricultural labor and produces 62% of agricultural GDP. This condition indicates that on average labor productivity in the food subsector is lower than in other sectors (Table 2.3).

Table 2.2 Share of agricultural sector in GDP by subsector, 1988 and 1991 (at constant 1983 prices).

Subsector	1988		1991		Growth
	(Rp billion)	(%)	(Rp billion)	(%)	(%/year)
Food crops	12,974	64.22	13,479	62.22	1.28
Estate crops	3,458	17.11	3,913	18.06	4.21
Livestock	2,212	10.94	2,441	11.27	3.33
Fishery	1,557	7.70	1,832	8.46	5.57
Agriculture	20,201	100	21,665	100	2.34

Source: CBS, Statistik Indonesia 1991; Indikator Ekonomi March 1993.

Table 2.3 Agricultural labor by subsector, 1985 and 1990.

Subsector	Labor ('000 persons)		Percent		Growth
	1985	1990	1985	1990	(%/year)
Food crops	27,705	26,667	81.15	74.60	- 0.93
Livestock and Fisheries	2,307	2,752	6.75	7.70	3.42
Estate crops	3,106	5,148	9.10	14.40	10.45
Forestry	1,024	1,180	3.00	3.30	2.68
Agriculture	34,142	35,747	100	100	0.92

Source: Recalculated from report of ILO/UNDP project on Sectoral Employment, 1992.

A tremendous effort has been made to increase rice production in Indonesia. Demand for rice increases with income. In 1984 Indonesia achieved a historical rice self sufficiency which was retained in the following years with slight fluctuations. Cassava, maize, soybean, groundnut and sweet potato are the most important secondary crops after rice. In contrast, the development of these commodities is relatively poor.

2.1.2 The role of secondary crops in the food subsector

After the achievement of rice self sufficiency in 1984, the government as well as the private sector began to pay more attention to the development of selected secondary crops. In general the planted area of cassava, maize and sweet potato declined, while the planted area of soybean, groundnut and mungbean increased. The harvested area of soybean increased 4.92% in the period of 1988-1993 as an impact of a special program to boost the production of this particular commodity. Yield of upland crops increased slowly at a rate of less than 2%, except for maize which increased 2.25% per annum. The production of sweet potato was almost stagnant while maize production increased only 0.48%, and cassava increased 1.54% annually. Groundnut and mungbean production increased more than 2% and soybean increased tremendously at a rate of 5.99% yearly (Table 2.4).

As presented in Table 2.5, Java is still the main production center of all food commodities in Indonesia. Around 50-70% of the total production of food crops is produced on Java. The low growth rate in production reflects some inefficiency in production, processing and marketing. Sweet potato is an extreme case. The planted area of this crop is the smallest of the *palawija* crops and its harvested area has been declining since 1985 at a rate of 1.79% per year.

Table 2.4 Trends in production, harvested area, and yield of secondary crops, 1988-1993.

Commodity	1988	1989	1990	1991	1992	1993*	Growth (%/yr)
Maize							
Production ('000 ton)	6,652	6,193	6,734	6,256	7,995	6,385	0.48
Harvest area ('000 ha)	3,406	2,944	3,158	2,909	3,629	2,929	1.74
Yield (qt/ha)	19.53	21.04	21.32	21.50	22.03	21.78	2.25
Cassava							
Production ('000 ton)	15,471	17,117	15,830	15,954	16,515	16,564	1.54
Harvest area ('000 ha)	1,303	1,408	1,312	1,319	1,351	1,367	1.08
Yield (qt/ha)	118.73	121.57	120.66	121.90	122.00	121.00	0.39
Sweet potato							
Production ('000 ton)	2,159	2,224	1,971	2,039	2,171	2,140	0.03
Harvest area ('000 ha)	248	240	209	214	230	224	- 1.78
Yield (qt/ha)	87.06	92.67	94.31	95.00	94.00	95.00	1.79
Soybean							
Production ('000 ton)	1,270	1,315	1,487	1,555	1,870	1,655	5.99
Harvest area ('000 ha)	1,177	1,198	1,334	1,368	1,666	1,452	4.92
Yield (qt/ha)	10.79	10.98	11.15	11.37	11.22	11.40	1.40
Groundnut							
Production ('000 ton)	589	620	651	652	739	639	2.05
Harvest area ('000 ha)	608	621	635	628	720	626	0.98
Yield (qt/ha)	9.69	9.98	10.25	10.38	10.27	10.22	1.08
Mungbean							
Production ('000 ton)	284	262	272	282	318	319	2.56
Harvest area ('000 ha)	361	332	342	301	387	379	1.90
Yield (qt/ha)	7.87	7.89	7.95	7.88	8.26	8.42	1.38

Source: CBS.
* Preliminary figures.

Table 2.5 Secondary crop production share (%) by main region, 1988-1992.

Commodity	Java	Sumatra	Kalimantan	Sulawesi	Other
Maize					
1988	67.90	10.90	0.50	12.20	8.50
1992	69.04	12.09	0.67	10.34	7.86
Cassava					
1988	61.80	20.60	3.10	5.70	8.80
1992	59.86	22.24	2.83	5.98	9.09
Sweet potato					
1988	44.50	17.40	3.40	11.40	23.30
1992	47.76	19.07	3.08	7.28	22.81
Groundnut					
1988	59.90	16.70	2.90	13.20	7.30
1992	66.31	12.32	2.90	10.66	7.81
Soybean					
1988	58.50	22.80	1.00	6.60	11.10
1992	57.74	24.47	1.18	7.92	8.69

Source: CBS.

2.2 Government strategies

Substantial changes in the agricultural development approach occurred during the beginning of the country's fourth Five Year Plan (Pelita). The change was due to some policy changes such as a more liberal trade regime, an outward looking economic policy, a focus on rural development and increasing farmers' income, sustainability and environmental issues, and the aim of agricultural development to support agroindustry.

An important approach known as the agribusiness system approach focuses on vertical coordination of each sub-system in agriculture, i.e. input marketing and distribution, production, processing and marketing which can be harmoniously developed to improve the whole system of agribusiness. In this concept, the role of the market is considered the most important. Many failures in agroindustry development are caused by market inefficiency where the market fails to generate economic incentives to all agribusiness participants. Some studies in the Agribusiness Development Project identified the market structure and market uncertainty as the main factors of agribusiness failure (Kilmer 1993).

In addition, special attention on particular commodities such as rice, soybean, wheat, and sugar played a significant role. To boost food production, diversification, intensification, extensification, and rehabilitation programs were intensified. In general the self sufficiency in rice attained in 1984 can be maintained although production fluctuates and is very sensitive to small changes in conditions such as drought, flood or pest outbreaks. Food security and price stabilization are the main reasons for the government's deep involvement in the marketing of these commodities due to the sensitive food problem. In addition, secondary crops have also been on the list of development priorities. Research and investigation on biotechnology, cultivation and product development are continually conducted by the Agency for Agricultural Research and Development (AARD) and other independent institutions.

The agricultural sector in Indonesia continues to be carried by smallholders. This is one of the reasons why many agricultural policies focus on small farmers, price stabilization, rice self sufficiency, input/credit subsidy, poverty alleviation, and environmental issues. The role of BULOG (Badan Urusan Logistik = National Stock Agency) is to deal with price stabilization of the most strategic commodities, such as rice, sugar, wheat, and soybean.

The outward looking policy, adopted by the government since the early 1980s, has been implemented through continuous deregulation. Imported raw materials such as wheat and maize are zero tariff, and infant industries are protected through high tariffs.

Rice self sufficiency has continually been the priority in Indonesian food policy. Rapid conversion of rice fields (*sawah*) into industrial and public facilities in Java (estimated at 16 - 30,000 ha per year) will clearly affect rice production. Although there are new openings of agricultural area in the other islands, primarily Kalimantan and Sumatra, one should note that the land productivity is much lower than that in Java.

The government intends Indonesia to be self-sufficient in soybean. High and continually increasing demand for this crop indicates the possibility to transfer income from soybean to producers. With regard to price stability, the government is mainly involved in rice and soybean.

Maize becomes increasingly important due to the expanding livestock industry in Indonesia. Indonesia is a net maize importer. With the high growth of the poultry industry in Indonesia, demand for maize is increasing because about 50% of the feed consists of maize. Similarly, demand for cassava in Indonesia has increased lately. Indonesia has almost never met the preferential cassava export quota set by the European Union. Currently, with increasing demand for tapioca in the textile confection industry, there are larger tapioca imports from Thailand and Vietnam.

2.3 Subsidies

2.3.1 Input subsidies

Fertilizer has been subsidized since the 1950s when the rice production program was launched. In 1970 the farm formula determined the fertilizer price = unhusked rice (*gabah*). The formula has encouraged farmers to apply more fertilizer per hectare. The price of fertilizer relative to rice declined during the period of 1960-1982. Since 1983 there was a readjustment of fertilizer prices. In 1995 the subsidy on phosphate fertilizer (TSP) was removed and the subsidy to nitrogen fertilizer (urea) was reduced significantly.

The fertilizer subsidy tends to increase over time due to increasing utilization of fertilizer by farmers. In 1993/1994 the total fertilizer subsidy was Rp 559.8 billion, consisting of urea (Rp 127.3 billion), TSP (Rp 326.2 billion), ZA (Rp 48.6 billion), and other fertilizers (Rp 57.6 billion) (Table 2.6).

Table 2.6 Fertilizer subsidy, 1990/91-1993/94.

Fertilizer (unit)	1990/91	1991/92	1992/93	1993/94
Urea				
Volume (million tons)	3.125	2.825	3.447	3.442
Subsidy (billion rupiah)	160.0	136.7	146.0	127.3
TSP				
Volume (million tons)	1.200	1.042	1.249	1.325
Subsidy (billion rupiah)	325.9	327.4	328.7	326.2
ZA				
Volume (million tons)	0.635	0.532	0.618	0.668
Subsidy (billion rupiah)	80.1	84.0	52.3	48.6
Others				
Volume (million tons)	0.870	0.490	0.502	0.590
Subsidy (billion rupiah)	137.1	74.4	68.6	57.6
Total				
Volume (million tons)	5.829	4.888	5.815	6.026
Subsidy (billion rupiah)	703.1	622.5	595.5	559.8

Currently the fertilizer price in Indonesia is about the lowest in the Asean region (Table 2.7). The fertilizer price is continually adjusted along with the floor price of rice (Table 2.8). The fertilizer/rice price ratio, however, has remained almost unchanged at around 0.71-0.79 over the recent years. The floor price of rice has not been very effective so far, because the prevailing price in the market during the harvest season actually dips on occasion below the floor price. However, the ceiling price of rice is effective. BULOG will immediately undertake market operations, releasing stock if the price is is higher than the ceiling price.

Table 2.7 Price of fertilizers (US $) in Asean countries, 1993.

Country	Urea	TSP	ZA
Indonesia	116.03	149.88	116.03
Malaysia	198.04	233.68	97.37
Philippines	209.50	n.a.	137.97
Thailand	204.69	n.a.	116.07

Table 2.8 Price of urea fertilizer relative to rice, 1980-1995.

Year	Urea	Rice	Relative Price
1985/86	100	175	0.57
1986/87	125	175	0.71
1987/88	135	190	0.71
1988/89	165	210	0.79
1989/90	185	250	0.74
1990/91	210	270	0.78
1991/92	220	295	0.75
1992/93	240	330	0.73
1993/94	260	340	0.76

Source: Binus Tanaman Pangan 1995.

Fertilizer use in Indonesia has been exceptionally high compared to that in neighboring countries. The government has determined the recommended level, but farmers have been using far above the recommended level (Table 2.9). It is not easy to convince farmers that they have been using too much fertilizer. This is the result of cheap price fertilizer policy adopted since the Bimas program (Bimbingan Massal = Mass Guidance) was launched in 1968.

Table 2.9 Recommended and actual fertilizer use by farmers on irrigated rice (kg/ha).

Fertilizer Use	West Java	Lampung	West Sumatra	South Sulawesi
Urea				
Recommended	200	250	250	165
Actual	225	319	160	350
%	112	128	64	189
TSP				
Recommended	100	150	100	50
Actual	116	195	126	185
%	116	130	126	370

Source: MOA 1994.

The prime task of the government in the seed and planting material market is to guarantee that good quality seed and planting materials are made available to farmers at the right time, right place and right price. The government has subsidized rice seed since the rice production program in the late 1950s. This has never been done for secondary crops. Farmers usually buy their seed at market prices, although new varieties are always introduced through intensive extension programs. In contrast, high quality seed and plant materials other than rice are limited. The certified seed production and distribution system needs improvement. In 1992/93 seed production was about 20-50% of the requirement (Table 2.10). If the seed problem is not immediately solved, increasing yield will be difficult to realize.

Table 2.10 Seed requirement, planned production, and realization of seed supply, 1992/93 (tons).

Item	Rice	Maize	Soybean
Requirement	218,539	45,253	67,314
Planned	181,055	39,208	44,250
Realization	123,715	15,388	14,386

Source: MOA 1993.

2.3.2 Credit

A credit program was developed in 1968 as part of the Bimas (Bimbingan Massal = Mass Guidance) program. Subsidized credit (with interest of 12% pa) is given to rice farmers for fertilizers, insecticides, seed and the cost of living. This in kind credit was then changed to cash credit, so farmers have more options to vary the composition of the input. KUT (kredit usaha tani = farm credit) was introduced in the late 1980s. In this credit scheme a group of farmers, led by a leader and guided by the KUD (koperasi unit desa = village unit cooperative), proposes a credit package collectively. Farmers return the credit to the BRI (Bank Rakyat Indonesia = People's Bank of Indonesia) through KUD. This scheme has been modified due to high levels of bad credits.

2.3.3 Irrigation

Irrigation up to tertiary level in Indonesia is mostly a public investment. An irrigation fee has been introduced in the last 10 years, but it is still highly subsidized. The irrigation cost in Pelita I was Rp 114.4 billion. In Pelita II, it increased to Rp. 617.1 billion, in Pelita III to Rp. 1,908.2 billion, and in Pelita IV to Rp. 2,294.6 billion. Irrigation development includes rehabilitation, new construction, swamp/tidal areas, and river/flood control. All irrigation infrastructures are generally public facilities.

2.3.4 Technology

The government funds research and development. Agricultural innovation and technology resulting from government funded research and development are disseminated through extension workers. Currently there are more than 50,000 extension workers in the Directorate General of Food Crops alone.

2.4 Marketing policies

2.4.1 Price stabilization

Price stabilization policies adopted by the government since the early 1960s have been continued. Floor and ceiling prices of rice were established; however, only the ceiling price is usually effective.

The price of soybean cake as a raw material for feed is set by the government with a slight price variation. BULOG imports soybean and supplies a national soybean crusher. The soybean cake is distributed by BULOG. Feed industries are required to buy 20% of their required soybean cake from BULOG and import the remaining 80%.

Maize, cassava, and sweet potato are not under price control by the government. The domestic market, however, is severely controlled by buyers, because the market for these commodities is nearly oligopsonic.

2.4.2 Market control

The role of BULOG is increasing since it is carrying out importation and distribution of wheat, sugar, rice, soybean, and maize. The last deregulation package (May 23, 1995) eased some regulation and significantly reduced the import tariff of some inputs and raw material crops (change from 5% to 0% tariff). In general tariffs that were at the 0-5% level did not change. This includes wheat, rice, flour, soybean, palm oil and sugar (Table 2.11).

Table 2.11 Tariffs for several agricultural commodities (1995).

Commodity	Tariff (%)
Rice	200
Maize	0
Soybean and soybean cake	0
Barley	0
Groundnut cake	0

Source: Press releases, Deregulation June 27, 1994, and Deregulation Package 23 May 1995.

The general policy instruments applied to food commodities are shown in Table 2.12.

Table 2.12 Policy instruments applied to food commodities.

Policy Instrument	Rice	Cassava	Maize	Soybean
Farm level				
Public investment: research, training and extension	+	+	+	+
Land development	+	–	–	–
Irrigation system	+	–	–	–
Machinery	–	–	–	–
Input subsidies				
Research	+	+	+	+
Seed/Plant materials	+	–	–	–
Fertilizer	+	+	+	+
Insecticide	–	–	–	–
Credit	+	–	–	–
Guarantee price, floor price	+	+	–	–
Marketing and processing level				
Marketing boards	–	–	–	+
Price support programs	+	–	–	–
Food subsidy to consumers, ceiling price	+	–	–	–
Support for investment, priority	+		–	–
International trade				
Import tariff and surcharge	+	–	–	+
Export subsidies	–	–	–	–
Non-tariff barriers	–	–	–	–
Export promotion	–	–	–	–

3. Dietary Patterns

3.1 Food consumption pattern

Changes in life style, real income, social status, and a growing health consciousness are major factors contributing to changes in diet. In Indonesia the consumption pattern is changing slowly. Rice, the largest portion in the daily menu, is still increasing along with increase in real income. Cassava, maize and sweet potato are consumed by the rural people mostly as seasonal substitutes for rice.

In the last two decades average annual per capita income increased more than three-fold which resulted in an increase of per capita rice consumption and a decline in maize and cassava consumption. Rice consumption is higher in Indonesia than in other rice consuming countries in Asia. In 1993 the average rice consumption was around 130 kg/capita/year (*Susenas* 1993) which was the highest in the world. Surprisingly, at the current level of income and high per capita rice consumption, per capita rice consumption is still increasing. This is an important economic issue: how to feed and satisfy the large and increasing rice eating population, and to maintain self sufficiency of rice under stiffer competition in more liberal external trade.

As far as consumption is concerned, rice is preferred in the population concentrations. It is not only a matter of taste and habit, but also of social status of consumers. Appreciation of rice goes far beyond the properties of rice as a food.

Cassava and *gaplek* (dried cassava) are commonly consumed as staple foods during off seasons of rice in Java. Fresh cassava is usually boiled or steamed and served with grated coconut and other foods such as fish and meat. Since cassava is very perishable (it should be dried or processed one day after harvesting), farmers often peel, slice and dry it before they store the product. As real income increases and consumption patterns change, cassava is less regarded as substitute for rice. However, it is now consumed mostly as a snack between main meals in forms of chips, fermented products, and other products.

Maize used to be the staple food of the Madurese and in hilly East Java. It is still important. It is pounded or hulled into small pieces and separated from the skin and this product is known as *rice corn*. This is actually a healthy food. However, except in Madura and East Java, it is difficult to find a market. South and North Sulawesi people also consume a high proportion of maize. Along with the general trend in eating habits, sweet maize and baby corn have become in high demand as snacks and vegetables in the country.

Soybean is rarely used for direct consumption. Most consumption of soybean is in the form of *tofu* (soybean curd), *tempe* (fermented soybean cake), *kecap* (soya sauce), and *tauco* (fermented soybean). Sweet potato is the main food of the Irianese and several other ethnic groups in Eastern Indonesia. In other parts of the country, the consumption of sweet potato is decreasing rapidly due to the changing consumption pattern.

Consumption of other foods, especially meat and milk is low compared to other Asean countries. Besides their relatively high price, this is probably due to the eating habits of most Indonesians who prefer vegetable protein to animal protein. Cereals are the largest source of calories and protein for most of the population, more so than in other countries with similar economic conditions.

In 1993 rice consumption was 2.238 kg/capita/week or 116.4 kg/capita/year, maize was 6.8 kg/capita/year, cassava 15.1, soybean 0.1, and sweet potato 5.6 kg/capita/year (Table 3.1). Fresh fish consumption was 12.9 kg, dried fish 26.26 kg/capita/year, poultry meat 10.92 kg, and milk 0.3 liter/capita/year. The consumption of soybean products (*tofu, tempe, tauco* and *oncom*) was 10.5 kg/capita/year.

Table 3.1 Average consumption (kg/capita/year) of major food commodities in rural and urban areas, 1993.

Commodity	Rural	Urban	Total
Rice	116.3	106.496	116.1
Rice flour	0.312	0.260	0.260
Fresh Maize	1.716	0.728	1.404
Dried Maize	0.150	0.416	5.304
Maize flour	7.8	0.052	0.104
Cassava	15.756	6.552	12.740
Gaplek	2.340	0.052	1.560
Cassava flour	1.248	0.104	0.884
Sweet potato	6.552	3.484	5.564
Soybean	0.104	0.052	0.104
Tofu	4.056	7.124	5.044
Tempe	4.524	6.500	5.200
Tauco	0.052	0.104	0.052
Oncom	0.156	0.156	0.156
Fresh fish	11.752	13.780	12.948
Dried fish	36.816	19.188	26.260
Meat	0.340	0.850	0.511
Milk	0.104	0.676	0.312

Source: CBS, Susenas 1993.

3.2 Calorie consumption

Calorie consumption data in Susenas surveys are underestimated due to exclusion of food consumption away from home. The average availability of calories according to Food Balance Sheet data was more than 2,700 calories, of which 1,790 calories came from cereals, 186 from starchy foods, 155 from sugar, 290 from pulses, nuts and oil seeds (CBS 1993). The large differences between Susenas data and other sources of data indicates that consumption away from home is substantial. This is the result of the increasing labor mobilization. A higher population mobility and more workers who can afford to work far away from their homes or as commuters, and more women entering the labor force, coupled with an increase in real income, allows people to increase the frequency of eating away from home. These data are unrecorded in the *Susenas* survey.

A high portion of calorie and protein intake comes from rice. According to Susenas data, total daily calorie consumption in rural and urban combined from rice was 1,245 (1987), 1,247 (1990) and 1,210 kcal (1993). Total daily calorie consumption from all sources was 1,879, 1,901 and 1,879 kcal respectively (Table 3.2 and 3.3). Around 61% of calorie consumption comes from cereals, 10% from animal products, and 4% from fruit and vegetables. This diet composition skewed to rice is actually not a balanced diet, because the calorie consumption from meat and vegetable and fruit is very low. However, in terms of total calorie consumption, Indonesia is comparable to other middle income countries. The Desirable Dietary Pattern (DDP) according to FAO (1993) has a composition of calorie sources as follows: cereals, roots, tubers, banana and plantains (45%); animal products (20%); added fats and oils (10%); nuts and oil seeds (3%); pulses, beans and soybeans (5%); sweeteners (8%); fruits and vegetables (5%); and beverages and seasonings (4%).

Tables 3.2 and 3.3 also show that consumption of prepared food is obviously low. In terms of calories, only 15% of the total calorie consumption in urban and 6.5% in rural areas in 1993 came from prepared food. This may be an underestimation. The market for preserved, processed, and cooked food is small in Indonesia, but it is increasing. The difference between rural and urban consumption indicates that the prepared food market is small in the rural area compared to that in the urban region.

Table 3.2 Average home consumption of calories in rural and urban areas, 1987, 1990, 1993 (calories/capita/day).

Commodity	Urban			Rural			Urban + Rural		
Group	1987	1990	1993	1987	1990	1993	1987	1990	1993
Cereals	1,105. 71	1,124.13	1,073. 54	1,295.07	1,300.65	1,278. 42	1,245.03	1,247.20	1,210.42
Tubers	45.95	42.30	42.91	125.65	134.50	118.91	104.60	106.57	93.70
Fish	35.11	37.15	40.33	33.80	38.85	40.07	34.16	38.33	40.14
Meat	31.89	28.36	32.25	12.88	16.38	15.29	17.91	20.02	20.91
Eggs and milk	41.21	37.20	47.49	15.56	14.71	18.00	22.35	21.53	27.79
Vegetables									
Legumes	37.60	34.23	34.30	41.29	42.99	39.49	40.33	40.33	37.75
Fruits	59.61	57.96	62.23	40.79	45.36	45.51	45.77	49.17	51.07
Other food items	37.45	37.32	34.93	40.25	45.28	39.30	39.49	42.88	37.83
Prepared food	331.69	379.98	379.98	291.75	322.81	334.97	302.30	330.02	349.91
Alcoholic Beverages	10.41	15.31	15.31	5.50	3.45	6.59	5.80	5.24	9.47
Tobacco,	0.19	0.17	0.17	0.0	0.14	0.12	0.13	0.15	0.14
betelnut	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
Total Food	1,735. 92	1,745. 81	1,763. 44	1,902.64	1,965.12	1,936. 67	1,858.64	1,901.44	1,879.13

Source: CBS, Susenas 1989, 1990, and 1993.

Table 3.3 Average home consumption of protein by commodity group in rural and urban areas, 1987, 1990, 1993 (grams/capita/day).

Commodity	Urban			Rural			Urban + Rural		
Group	1987	1990	1993	1987	1990	1993	1987	1990	1993
Cereals	20.99	21.36	20.37	25.28	25.29	24.69	24.14	24.08	23.26
Tubers	0.54	0.46	0.48	1.10	1.06	0.98	0.93	0.88	0.81
Fish	6.35	6.74	7.24	6.18	7.11	7.27	6.23	7.01	7.26
Meat	2.31	2.0	2.33	0.82	0.99	0.93	1.20	1.31	1.40
Eggs and milk	2.43	2.18	2.74	0.98	0.95	1.16	1.36	1.33	1.67
Vegetables	2.48	2.26	2.55	3.01	3.10	2.83	2.87	2.85	2.63
Legumes	5.89	5.74	6.19	3.84	4.17	4.35	4.40	4.65	4.97
Fruits	0.44	0.45	0.40	0.48	0.55	0.46	0.46	0.51	0.43
Other food items	2.49	2.73	3.02	2.36	2.72	2.82	2.41	2.71	2.87
Prepared food	0.23	0.22	0.33	0.09	0.06	0.11	0.13	0.11	0.19
Alcoholic	0.00	-	-	0.00	-	-	0.0	-	-
Beverages	-	-	-	-	-	-	-	-	-
Tobacco, betelnut	-	-	-	-	-	-	-	-	-
Total Food	44.15	44.22	45.35	44.14	46.00	45.60	44.13	45.44	45.49

Source: CBS, Susenas 1989, 1990, and 1993.

3.3 Share of expenditure

Average per capita expenditure for food in 1993 was Rp 24,772/month, or 36.2% of the total expenditure (Table 3.4). In the rural area, the average was Rp 21,228/month and in urban area Rp 31,908. In terms of diet composition, rural people consume more cereals and tubers, and consume less fish, meat, milk, eggs, vegetables, fruit and other foods. As the consumption of cereals and other sources of carbohydrate is extremely high for both rural and urban areas as shown in Table 3.1, the total expenditure for cereals is also the highest, that is 25% of food expenditure (Table 3.4). The budget share for roots and tubers was 0.5% of total expenditure and for nuts (including soybean) it was 1.4%. Clearly, in terms of consumers' expenditure share, the role of the crops under investigation is minor. As has been mentioned, future prospects of upland crops will come from food and feed processing industries.

The non-food expense consists of housing, medical care, entertainment and other forms of expenditure. In this case, the expenditure on tobacco is higher than that for fish or meat. The average expense for cigarettes in 1993 was Rp 2,156 per month.

Table 3.4 Monthly expenditure for food and non-food, 1993.

Commodity Group	Average Expenditure (Rp/capita)	Share (%)
Food	24,772	36.20
Cereals	6,019	8.80
Roots and tubers	369	0.50
Fish	2,267	3.30
Meats	1,294	1.90
Eggs and milk	1,264	1.80
Vegetables	2,162	3.20
Nuts	973	1.40
Fruits	1,191	1.70
Oil and fats	1,107	1.60
Others	8,036	11.80
Total Non-food	43,565	63.80
Food and Non-food	68,337	100

Source: CBS 1993.

3.4 Trends in food consumption

The budget share for rice and cereals, fruit and vegetables, and fish, meat, eggs and milk changed significantly in the last 10 years. The consumption of fish, meat, eggs and milk, prepared food, and food away from home is still low but increasing rapidly. This increase probably occurs in the emerging middle income group.

This trend is mainly related to:

- Increase in real income. In the last 20 years per capita real income increased four-fold and has created new demand for better quality and larger quantity food commodities. Growth of average per capita real income in Indonesia is about 3-4%. In the 1970-1995 period, per capita income per year has increased from around US $ 200 to US $ 800. Consumers gradually change their consumption pattern, increase consumption or shift to better quality food.
- Working conditions have changed in the last 25 years. Better accessibility and transportation facilities make it possible for one to commute to work at a location far away from home.
- Women's participation in the labor market has increased tremendously, especially in the urban areas. This has immensely influenced consumption patterns.

- Greater access to information and new food items through TV commercials, newspaper, radio and other media has affected consumption patterns.
- Increase in the average education level in the last 20 years has contributed to awareness of health.

Consumption of prepared food is still low but increasing rapidly at a rate of 10.5% per year. Unfortunately, the consumption away from home is not recorded in the survey. The consumption of cereals and tubers has declined; in 1993, consumption of these commodities were about 3% less than in 1987 (see Tables 3.2-3.3). On the other hand, consumption of meat, fish, egg, milk, and prepared food increased significantly. Average calorie consumption as indicated by *Susenas* 1987, 1990, and 1993 has not changed significantly (Table 3.2). Protein consumption has a similar trend to that of calories. Cereals contributed 67% of calorie consumption in 1987, Then it declined to 64% in 1990 and 1993. In general the consumption pattern has been relatively unchanged over the last decade.

Consumption of almost all food commodities, except cereals, tubers, vegetables, and fruits increased parallel with income improvement. Consumption of these commodities in 1993 increased around 20% compared to 1987 (Tables 3.2 and 3.3.). Cereals, particularly rice, have been the main food item for urban as well as rural people, and for consumers in all income brackets. There is almost no difference in consumption level of cereals between income group and between urban and rural areas.

Consumption of meat, fish, eggs and milk increased in line with income. Compared to the average income group (Rp 40,000 - 60,000 per capita per month), the three highest income groups consumed 50% more fish, 200-400% more meat, and 200-350% more eggs/milk. The difference in meat, fish, eggs and milk consumption was very significant between lower and higher income groups.

3.5 Rural and urban areas

Consumption of calories from cereals and tubers in rural areas is higher than that in urban areas (1,278 and 119 calories compared to 1,073 and 43 calories), but higher consumption of calories from meat and eggs and milk is found in urban areas (32 and 48 calories compared to 15 and 18 calories). Rural people consume more calories from vegetables and fruits (40 and 39 calories compared to 34 and 35 calories) but fewer calories from beverages, spices, other food and prepared foods (88, 27, 12, and 7 calories compared to 106, 20, 23, and 15 calories). Better availability and diversity of food and higher per capita income in urban areas allow urban people to consume more and better nutritious food. Both urban and rural consumption trends, however, consistently increased in the period of 1987-1993. The trend of carbohydrate (cereals and tubers) consumption seem to be flattening, while consumption of animal products is increasing. Rural people consume more cereals compared to urban people (16% higher), tubers (177% higher), and fruit and vegetables (9% higher), but consume less animal products (36% lower), prepared food (60% lower) and other food items (12% lower). Total calorie consumption in 1993 was 1,763 kcal in urban and 1,937 kcal in rural areas, but these figures do not include food consumption away from home.

Table 3.5 Average daily per capita consumption of calories by commodity group and by monthly per capita expenditure group in urban areas, 1993.

Commodity	Monthly per Capita Expenditure (Rp)											Per Capita
Group	<10,000	10,000	15,000	20,000	30,000	40,000	60,000	80,000	100,000	150,000	200,000	Average
Cereals	-	1,008.15	1,073.44	1,073.44	1,099.44	1,085.95	1,078.29	1,055.29	1,034.88	1,035.97	1,008.83	1,073.54
Tubers	-	84.01	49.62	48.63	44.99	41.49	39.21	39.21	41.95	41.22	41.45	42.91
Fish	-	14.71	18.72	25.37	32.92	39.94	46.54	50.04	52.89	58.26	65.61	40.33
Meat	-	0.13	2.59	6.28	11.59	22.42	38.64	54.37	73.55	93.56	133.03	32.25
Eggs and milk	-	3.25	7.20	13.25	23.20	37.71	59.15	75.88	96.17	113.93	141.97	47.49
Vegetables	-	18.84	22.88	27.90	30.53	33.30	36.64	38.71	41.93	45.92	51.35	34.30
Legumes	-	23.44	32.74	40.87	47.92	47.92	69.65	76.93	87.92	97.78	116.69	62.23
Fruits	-	9.17	13.37	18.25	24.92	24.92	38.23	46.90	58.25	70.53	80.11	34.93
Oils and fats	-	93.28	120.27	148.58	181.15	220.19	248.51	270.70	296.21	314.02	347.19	222.01
Beverage	-	38.07	52.91	67.27	86.51	104.75	119.22	130.75	145.72	153.84	172.26	106.14
Spices	-	12.65	14.53	19.85	24.21	27.78	32.58	36.17	40.01	41.17	46.77	29.09
Other food items	-	2.04	4.11	7.51	11.86	18.60	26.09	34.72	43.97	53.13	79.28	22.74
Prepared food	-	6.77	2.83	4.14	6.00	10.47	15.18	24.80	36.32	47.78	68.91	15.31
Alcoholic beverages	-	-	-	0.03	0.06	0.09	0.17	0.18	0.34	0.51	1.64	0.17
Tobacco and betelnut	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	1,314.51	1,379.76	1,501.37	1,624.89	1,733.56	1,848.10	1,934.99	2,050.11	2,167.62	2,355.09	1,763.44

Source: CBS, Susenas 1993.

Table 3.6 Average daily per capita consumption of calories by commodity group and by monthly per capita expenditure in rural areas, 1993.

Commodity	Monthly per Capita Expenditure (Rp)											Per Capita
Group	< Rp 10,000	10,000	15,000	20,000	30,000	40,000	60,000	80,000	100,000	150,000	200,000	Average
Cereals	888.24	992.39	1,148.57	1,260.17	1,346.67	1,381.34	1,387.99	1,386.09	1,326.20	1,318.98	1,153.46	1,278.42
Tubers	336.97	249.46	148.29	118.58	101.89	91.82	85.69	94.93	79.34	71.79	87.45	118.90
Fish	8.68	17.16	23.46	33.46	44.75	55.63	67.17	77.29	74.71	90.98	64.05	40.07
Meat	4.61	3.06	2.80	7.92	15.72	27.24	44.40	64.66	80.15	82.48	133.39	15.29
Eggs and milk	0.81	2.43	5.39	10.34	17.90	30.88	49.18	71.73	94.48	103.15	134.05	18.00
Vegetables	31.37	31.33	33.89	37.09	40.48	45.17	49.64	54.47	52.89	59.38	70.99	39.49
Legumes	9.94	20.80	28.01	36.82	49.21	62.86	81.52	94.86	106.66	126.52	117.32	45.51
Fruits	9.99	18.02	25.50	32.51	42.87	53.56	65.79	77.26	82.83	83.82	98.88	39.30
Oils and fats	86.10	121.09	146.78	181.48	225.66	267.38	311.17	349.32	357.09	381.53	353.65	207.77
Beverage	22.58	38.81	55.89	76.19	96.90	118.17	141.65	164.47	166.27	183.29	151.77	88.22
Spices	9.29	13.79	16.93	22.67	29.40	35.17	44.31	48.93	58.43	57.87	68.46	26.76
Other food items	0.62	3.90	5.87	8.54	12.48	18.50	27.46	39.52	43.57	42.96	82.57	12.22
Prepared food	1.20	1.81	2.52	4.38	7.09	9.88	16.45	21.78	22.95	38.31	55.71	6.59
Alcoholic beverages	-	-	0.03	0.06	0.14	0.21	0.41	0.46	0.68	0.78	0.69	0.12
Tobacco and betelnut	-	-	-	-	-	-	-	-	-	-	-	
Total	-	1,410.40	1,514.05	1,643.92	1,830.21	2,031.16	2,197.91	2 ,372.83	2 ,546.25	2,641.84	2,572.44	1,936.67

Source: CBS, Susenas 1993.

Table 3.7 Average daily per capita consumption of protein (grams) by commodity group and by monthly per capita expenditure in urban areas, 1993.

Commodity	Monthly per Capita Expenditure (Rp)											Per Capita
Group	< Rp 10,000	10,000	15,000	20,000	30,000	40,000	60,000	80,000	100,000	150,000	200,000	Average
Cereals	-	19.17	19.76	20.37	20.83	20.59	20.47	20.05	19.67	19.72	19.27	20.37
Tubers	-	0.46	0.47	0.50	0.48	0.48	0.48	0.50	0.56	0.55	0.63	0.48
Fish	-	2.73	3.41	4.54	5.95	7.18	8.34	9.01	9.48	10.31	11.70	7.24
Meat	-	0.01	0.16	0.43	0.82	1.60	2.77	3.93	5.33	6.79	9.48	2.33
Eggs and milk	-	0.25	0.52	0.91	1.49	2.27	3.36	4.21	5.32	6.26	7.89	2.74
Vegetables	-	1.31	1.59	1.89	2.03	2.22	2.37	2.50	2.65	2.90	3.23	2.25
Legumes	-	2.64	3.63	4.44	5.07	5.99	6.81	7.40	8.25	8.95	10.32	6.19
Fruits	-	0.09	0.15	0.20	0.26	0.35	0.45	0.58	0.72	0.87	0.97	0.40
Oils and fats	-	0.34	0.37	0.46	0.53	0.59	0.62	0.67	0.71	0.76	0.77	0.58
Beverage	-	0.35	0.43	0.57	0.68	0.77	0.91	0.98	1.06	1.10	1.16	0.80
Spices	-	0.39	0.48	0.62	0.73	0.86	1.01	1.11	1.20	1.20	1.39	0.90
Other food items	-	0.08	0.16	0.27	0.42	0.62	0.85	1.09	1.38	1.62	2.26	0.74
Prepared food	-	0.11	0.05	0.07	0.12	0.21	0.33	0.56	0.83	1.16	1.61	0.33
Alcoholic beverages	-	-	-	-	-	-	-	-	-	0.01	0.02	-
Tobacco and betelnut	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	27.93	31.18	35.27	39.41	43.73	48.77	52.59	57.16	62.20	70.70	45.35

Source: CBS, Susenas 1993.

Table 3.8 Average daily per capita consumption of protein (grams) by commodity group and by monthly per capita expenditure in rural areas, 1993.

Commodity	Monthly per Capita Expenditure (Rp)											Per Capita
Group	<10,000	10,000	15,000	20,000	30,000	40,000	60,000	80,000	100,000	150,000	200,000	Average
Cereals	19.19	20.31	22.68	24.34	25.79	26.31	26.44	26.45	25.29	25.19	21.21	24.69
Tubers	2,30	1.68	1.00	0.94	0.92	0.93	0.91	1.08	0.89	0.90	1.29	0.98
Fish	1.68	3.19	4.30	6.11	8.13	10.09	12.10	13.67	13.37	16.07	11.86	7.27
Meat	0.12	0.12	0.14	0.44	0.96	1.68	2.90	4.34	5.88	6.09	9.86	0.93
Eggs and milk	0.06	0.17	0.38	0.71	1.17	1.93	2.88	4.02	5.24	5.48	7.54	1.16
Vegetables	2.49	2.37	2.52	2.70	2.90	3.16	3.47	3.69	3.51	3.86	4.52	2.83
Legumes	1.04	2.03	2.83	3.63	4.74	5.86	7.37	8.40	9.29	10.60	10.53	4.35
Fruits	0.11	0.19	0.29	0.36	0.50	0.62	0.78	0.95	1.00	1.03	1.27	0.46
Oils and fats	0.41	0.55	0.63	0.72	0.85	0.94	1.06	1.20	1.19	1.20	1.01	0.79
Beverage	0.33	0.44	0.57	0.72	0.87	0.99	1.14	1.32	1.29	1.50	1.46	0.81
Spices	0.24	0.40	0.52	0.69	0.89	1.06	1.25	1.41	1.52	1.83	1.84	0.80
Other food items	0.02	0.13	0.21	0.31	0.43	0.62	0.91	1.30	1.49	1.39	2.35	0.42
Prepared food	0.02	0.03	0.05	0.07	0.12	0.17	0.29	0.42	0.42	0.77	1.15	0.11
Alcoholic beverages	-	-	-	-	-	-	-	-	0.01	0.01	0.01	-
Tobacco and betelnut	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	28.01	36.12	41.74	48.27	54.36	61.50	68.25	70.39	75.92	46.90	45.60

Source: CBS, Susenas 1993.

4. Demand for CGPRT Crops

4.1 Demand composition

Reliable data on utilization of each upland crop commodity for different purposes such as feed, food industries, and human consumption are not available. The time series Food Balance Sheet (FBS) data provide information on the average availability of each crop per capita per year and the use for feed and food industries as well as for human consumption. These data are published by MOA and CBS. Production, export and import on the supply side are regarded as accurate, but the data on feed and food industries are generally very poor. Data on seed, feed and food industries are usually estimated as percentages of total supply. In FBS data, the portion of commodity for seed is estimated as 5%, waste around 20%, and feed 2% (see CBS: Statistik Indonesia 1993). Hence, it is difficult to estimate the trend in demand for industry for a particular commodity using FBS data.

There are also zeros recorded for feed and food processing industries, where in fact a large amount of the commodity is processed in feed and food industries (Table 4.1). For example, demand for food and feed industries is very low, but in fact, large amounts of soybean and maize are currently processed in the feed industry as well as food industries such as maize oil, soybean oil, tofu, and *tempe*.

Table 4.1 Demand composition of upland crops, 1992.

Crop	Feed*	Industry	Direct Consumption
Cassava	2-3 %	34-35%	61-62%
Maize	0.3-0.6%	1%	98%
Soybean	0%	0%	99%
Sweet potato	2%	0%	99%

Source: FBS data, 1992.
Note: CBS data recorded only raw material processed in large industries.
* The proportion for feed is based on assumptions made by CBS.

The other source of information is the Ministry of Industry (MOI). MOI regularly records the use of commodities in various medium and large food industries. However the data are severely under-estimated. The most crucial factor is that MOI records the commodity use only in medium and large scale processing industries. However, households and small industries also process a large amount (or even more upland crop products than medium and large industries). For example, soybean and sweet potato are processed mostly in household and small industries rather than in large industries.

According to FBS data, cassava is used for feed, as a raw material in industry and for fresh consumption. During the period of 1968-1992, cassava use for these purposes was relatively constant at 2-3%, 34-35%, and 61-62%, respectively. On the other side, the utilization of maize has changed significantly. In 1968-1980 less than 100 thousand tons of maize was used for feed (0.3% of total availability). In the 1990s it increased to around 400 thousand tons (0.6%). Industrial use fluctuated between 300 and 500 thousand tons (1.0%). Maize is used primarily for direct consumption (98-99%). The figure shows an increasing trend from around 2 million tons in 1960s to 5-6.4 million tons in the 1990s. Soybean has been mainly used for human consumption (98%) and this has not changed over the period of 1968-1992. Sweet potato was also used for direct human consumption. In general, demand composition of cassava, maize, soybean and sweet potato has not changed significantly.

In contrast, with the current growth rate of development of the processing industry, there is no question that demand by industry for secondary crops is high. A large portion of soybean is processed in food industries and a large amount is also processed in sauce industries. Table 3.1 indicates that direct consumption is actually small compared to the availability of these commodities.

4.2 Demand elasticities

Various studies on rice and secondary crop demand were conducted by Rosegrant (1987), Squire (1991), Bogor Agricultural Institute (1993), and CASER (1992). These studies used secondary time series aggregate data. Table 4.2 presents estimated income elasticities and price elasticities from each study.

Table 4.2 Income and price elasticities of rice and secondary crops.

Source	Rice	Maize	Cassava	Soybean
Income Elasticity				
IPB[1]	0.34	0.31	0.35	0.56
MOA[2]	0.29	0.39	0.26	0.54
IPB[3]	0.26	0.38	0.02	0.54
Rosegrant[4]				
Altemeier and Bottema[6]	0.33	0.41	0.10	0.75
CASER[7]				
Rural				
Low	0.20	-0.10	0.20	0.80
Medium	0.10	-0.20	0.10	0.60
High	0.03	-0.30	0.05	0.35
Urban				
Low	0.15	-0.10	0.10	0.70
Medium	0.07	-0.30	0.05	0.50
High	0.02	-0.50	0.02	0.30
Price Elasticity				
MOA	-0.17	-0.19	-0.37	-0.69
IPB[3]	-0.08	-0.21	-0.17	-0.66
Squire[5]	-0.15	-2.27	-0.19	
Altemeier and Bottema[6]	-0.097	-0.33	-0.17	-0.54
CASER[7]				
Rural				
Low	-0.40	-0.60	-0.60	-0.60
Medium	-0.25	-0.40	-0.45	-0.50
High	-0.12	-0.30	-0.30	-0.40
Urban				
Low	-0.35	-0.50	-0.45	-0.60
Medium	-0.20	-0.30	-0.30	-0.50
High	-0.08	-0.20	-0.20	-0.30

Source: [1]Using time series cross sectional data: *Susenas*, 1981, 1984.
[2]MOA, using AIDS model, time series data 1968/69-1982/83.
[3]IPB, using time series data 1969-1990.
[4]Rosegrant et al. 1987.
[5]Squire 1991.
[6]Altemeier and Bottema 1991, time series 1969-1988.
[6]Assumption made by CASER (1992) in estimating demand for those crops in year 2000-2005 (Food Situation and Outlook for Indonesia).

Earlier studies by IPB (using 1981 and 1984 data), MOA (1968-1983 data), IPB (1969-1990 data), Rosegrant (1984 data) and the Altemeier & Bottema (1968 - 1988 data) found fairly high price and income elasticities. CASER estimated significantly different income and price elasticities.

CASER used lower income and price elasticities in the 1990s for estimation of the food situation in 2000-2005.

The earlier income elasticity estimates which used 1980s data are probably not accurate to represent the current situation. It is believed that the elasticities will not exceed 0.2. In this estimation simple equations will be applied to the Susenas 1993 data. With this cross sectional data, it is assumed that there is no price effect. Lack of good data on secondary crop use for feed, industry and food processing makes it impossible to estimate separate demand for feed and industry using the common model as required in the proposal of this study.

4.3 Demand projection

4.3.1 Per capita consumption of secondary crops

CBS documents detailed data on consumption of each commodity during the week prior to the interview in the Susenas survey. The survey has been conducted every three years beginning in 1981. Susenas surveys were conducted in 1981, 1984, 1987, 1990, and 1993.

In 1993 the average weekly consumption of rice, cassava, maize, soybean and sweet potato was 2.2; 0.4; 0.1; < 0.1; 0.1 kg/capita, respectively (Table 4.3). Note that the consumption data in Susenas surveys are home consumption. Processed products such as tofu and tempe are classified as prepared food. Soybean consumption is very low, because soybean is usually consumed in the form of processed products such as *tofu, tempe, kecap, or tauco*. Table 4.3 indicates that rice is regarded as the primary commodity, while other commodities are considered as inferior commodities.

Table 4.3 Per week consumption of food commodities by class of expenditure, 1993.

Expenditure Class	Mean Value of Expenditure	Food Commodity Consumption (kg)				
		Cassava	Maize	Soybean	Rice	Sweet Potato
< 10,000	5,000	1.437	0.751	0	1.058	0.335
10,000-15,000	12,500	1.041	0.472	0.001	1.507	0.235
15,000-20,000	17,500	0.434	0.286	0.002	1.956	0.101
20,000-30,000	25,000	0.471	0.143	0.002	2.259	0.103
30,000-40,000	35,000	0.715	0.072	0.002	2.407	0.118
40,000-60,000	55,000	0.244	0.035	0.002	2.373	0.106
60,000-80,000	75,000	0.179	0.02	0.002	2.258	0.084
80,000-100,000	95,000	0.141	0.019	0.002	2.428	0.090
100,000-150,000	125,000	0.115	0.014	0.002	2.060	0.071
150,000-200,000	175,000	0.868	0.013	0.002	2.027	0.059
> 200,000	300,000	0.075	0.024	0.002	1.920	0.042
Per capita weighted average		0.378	0.111	0.002	2.238	0.107

Source: CBS, Susenas data 1993.

4.3.2 Income elasticity estimation

Total income elasticity

Total consumption is equal to direct human consumption plus other uses for feed and raw material for processing industries. Total consumption of a crop or total availability in FBS data is considered to be accurate and can be used to estimate income elasticity. The real price is assumed to be constant, therefore it is not included in the model. Direct human consumption in *Susenas* survey data is used to estimate income elasticity of demand for direct human consumption. The demanded quantity for direct human consumption is simply the per week average consumption multiplied by 52, and then by total population in the respective year (1993).

The model for estimating income elasticity of total demand and human consumption demand is:

$$\ln(Q) = a + b \ln(Y) \quad (4.1)$$

where Q is quantity demanded/capita and Y is real income/capita.

The growth rate of total demand for each crop is:

$$r_q = r_p + e_y r_y \quad (4.2)$$

where r_q is the growth rate of demand, r_p is the growth rate of population, e_y is income elasticity, and r_y is the growth rate of real income per capita.

The total demand in 1995-2000 is calculated using the model:

$$Q_{t(n)} = Q_{t(0)}(1 + r_{qt})^n \quad (4.3)$$

where $Q_{t(n)}$ is the total quantity demanded in year n, $Q_{t(0)}$ is the total quantity demanded in year 0, and r_{qt} is the growth rate of total quantity demanded from equation (4.2). Similarly the direct consumption quantity demanded is calculated using:

$$Q_{c(n)} = Q_{c(0)}(1 + r_{qc})^n \quad (4.4)$$

where $Q_{c(n)}$ is the direct consumption quantity demanded in year n, $Q_{c(0)}$ is the direct consumption quantity demanded in year 0, and r_{qc} the growth rate from equation (4.2).

The industrial demand is calculated as a residual of total demand minus fresh consumption, or:

$$Q_i = Q_t - Q_c \quad (4.5)$$

where Q_i is the industrial quantity demanded, Q_t is the total quantity demanded, and Q_c is direct consumption quantity demanded.

The difference between the projected total demand and food demand is the estimate of industrial (food and feed) demand. The total quantity demanded for each commodity is estimated using time series (1960-1992) data from FBS table by regressing total availability (Q_t) with real GDP/capita (GDP/CPI in the respective year). The income elasticities of total demand are presented in Table 4.4.

Table 4.4 Estimated income elasticity of selected secondary crops.

Crop	Income Elasticity of Total Demand*
Cassava	0.1100
Maize	0.3517
Soybean	0.1282
Sweet potato	-0.0482

* Calculated from FBS data, 1968-1992, using the model ln(Q) = a + b ln(Y), where Q is total availability of the commodity in the respected year, and Y is real per capita income.

Direct income elasticity

Income elasticity of demand for direct human consumption was calculated from 1993 *Susenas* survey data in Table 4.3 by simply regressing consumption with the mean value of the class of expenditure using a double log function model. The income elasticity estimates are presented in Table 4.5. Since the consumption in Table 4.3 does not include the amount of the commodity for feed and food industries, the income elasticities in Tables 4.5 are clearly different from those in Table 4.4.

As shown in Tables 4.2 and 4.5, direct human consumption, with the exception of rice, declines as real income increases.

Table 4.5 Regression coefficients of the double log function.

Commodity	Constant	Coefficient*
Cassava	2.324611	-0.59479
		(0.178522) **
Maize	4.084088	-1.131360
		(0.139309)
Rice	-0.28752	0.124738
		(0.053071)
Sweet potato	1.086036	-0.44389
		(0.05625)
Soybean	-3.26354	0.112066
		(0.063837)

* The coefficient represents income elasticity.
** Numbers in parentheses are t statistics.

The coefficients indicate that cassava, maize and sweet potato are inferior commodities for direct human consumption (Table 4.5). Every 1% increase in income will result in a 0.59% decrease in average consumption of cassava. Similarly, 1% increase in income will cause 1.13% decrease of maize consumption, and a 0.44% decrease of sweet potato consumption. On the other hand, consumption of rice and soybean will increase with increase of income, by 0.12% for rice and 0.11% for soybean for every 1% increase in per capita real income.

4.3.3 Demand projection

The demand projection uses equations (4.1) to (4.5). The population growth according to the last population survey by CBS (1990) was 1.89%. It is assumed that in the next 10 years the population growth will be about 1.6-1.8%. The government has also targeted a population growth of 1.6% for the sixth Five Year Plan (Pelita VI). Further, GDP in dollar terms increases about 7-8% yearly. Adjusted to population growth and inflation, the per capita real income increase is about 3-4% annually.

In the calculation, population growth is assumed to be 1.6% per year and growth of real income 2.5% per year. Since the real prices of the commodities are assumed constant, the price factor from the quantity demanded estimation can be excluded. The demand growth, therefore, can be calculated and the results are presented in Table 4.6. For human consumption, the average consumption/week was multiplied by 52 and then by the total population in the respective year. The projected total population in 1993 was 187 million.

The projected total demand, direct consumption demand and industrial demand are given in Table 4.6. Note that industrial demand here is actually the apparent non-direct consumption demand. It includes all uses in households, mini, small, medium and large industries, simple processing by small food traders and other indirect consumption. More than 75% of cassava, 86% of maize and 99% of soybean is processed in various industries from household to large industries. Currently only 47% of total available sweet potato is processed. More than one-half (53%) of sweet potato production is for direct consumption.

Some preliminary conclusions can be made from these findings, namely:

- Direct consumption of secondary crops is actually slight. A large proportion of the production of these commodities is processed in food or feed industries. Therefore, the development of secondary crops should focus on marketing and processing improvement.
- The secondary crops creats substantial added value and economic activities in processing and marketing. The secondary crops have a wide diversity of possibilities for processing.

From the production-marketing-processing linkage, secondary crops have wider prospects than the traditional crop of rice.

- Effective promotion of secondary crop processed products is necessary to improve the image and status of these commodities consumers.

Table 4.6 Growth of demand and projected demand for some upland crops in 1995-2000.

Crop	Growth of Demand (%)	Projected Demand ('000 tons) 1995	1996	1997	1998	1999	2000
Total demand							
Cassava	1.7275	14,945	15,202	15,465	15,732	16,004	16,281
Maize	2.5793	5,093	8,302	8,516	8,736	8,961	9,192
Soybean	2.0205	2,462	2,512	2,563	2,615	2,668	2,721
Sweet potato	1.5795	1,999	2,030	2,062	2,095	2,128	2,162
Human consumption demand							
Cassava	1.481	3,745	3,800	3,856	3,913	3,971	4,030
Maize	1.373	1,098	1,113	1,128	1,143	1,159	1,175
Soybean	1.622	20	20	20	21	21	21
Sweet potato	1.511	1,060	1,076	1,093	1,109	1,126	1,143
Industrial demand*							
Cassava		11,200	11,402	11,609	11,819	12,033	1,251
Maize		6,995	7,189	7,388	7,593	7,802	8,017
Soybean		2,442	2,492	2,543	2,594	2,647	2,700
Sweet potato		939	954	969	986	1,002	1,019

* Industrial demand includes demand of households, mini, small, medium and large industries.

5. Domestic Demand and Market Potential

5.1 Soybean

5.1.1 Production

Soybean is an increasingly important grain in Indonesia, both as a food and as an industrial commodity. Considerable research on different aspects of soybean has been accomplished in Indonesia (Syam and Musaddad 1991; CGPRT 1992; Purwoto et al. 1993; Silitonga and Erasnita 1986). National soybean production in 1994 was around 2 million tons. In the Asia-Pacific region, soybean production in Indonesia was the third largest after China (10 million tons) and India (3 million tons). During the period of 1980-1992 soybean production grew at a rate of 9.5% per annum. This rapidly increasing production, however, could not meet the growth rate of demand for soybean in food and feed industries. The current demand for soybean increases up to 12% a year. Up to now Indonesia has been a major soybean importing country. In the last 3 years the soybean import was about 600 thousand tons annually and it is increasing steadily. In 1980 the soybean import was 193 thousand tons and in 1991 it increased more than 3 times to 673 thousand tons. The growing domestic poultry industry is the main cause of the increasing soybean meal importation.

The substantial role of this crop in the Indonesian economy has forced the government to pay special attention to soybean production and marketing. For decades soybean importation has been under the control of the government although the domestic supply/demand mechanism is not particularly regulated.

Measures to increase national production have been implemented since 1980 through various programs. The government has developed policy to increase soybean production through the area expansion as well as by market intervention to stabilize the price. The harvested area increased from 0.86 million hectares in 1984 to 1.67 million hectares in 1992 (Table 5.1). In this period, the harvested area increased about 94% with an average annual growth rate of 12.3%. Soybean production in Indonesia increased from 1.27 million tons in 1988 to 1.87 million tons in 1992, and yield increased 5.4% per annum. During Indonesia's Pelita IV (1984-1989), soybean production grew at the highest rate of 20.2% per year. In Pelita V (1989-1994) the growth rate was 10.2% per annum.

Table 5.1 Harvested area, production, and yield of soybean in Indonesia, 1970-1992.

Year	Harvested Area (ha)	Production (tons)	Yield (kg/ha)
1970	694,732	497,883	717
1975	751,689	589,831	785
1980	732,346	652,762	891
1981	809,978	703,811	869
1982	607,788	521,394	858
1983	639,876	536,103	838
1984	858,854	769,384	896
1985	896,220	869,718	970
1986	1,253,767	1,226,727	978
1987	1,100,565	1,160,963	1,055
1988	1,177,360	1,270,418	1,079
1989	1,198,096	1,315,113	1,098
1990	1,334,100	1,487,433	1,115
1991	1,368,199	1,555,453	1,137
1992	1,665,706	1,869,713	1,122

Source: CBS 1971-1993.

In the period 1984-1992, soybean yield increased by 24.4% with an average annual growth rate of 3.4%. However, the current yield is much lower than the potential yield. The current average

national soybean yield is 1.1 ton/ha while the potential yield at experimental stations is more than 3 ton/ha.

Involvement of the government in soybean marketing is focused on external trade licensing and regulation of local content for soybean meal importers. The impact of import licensing has influenced the domestic price of soybean and resulted in a higher domestic price compared to the international price. This high price, however, has not been followed by an immediate increase in domestic supply because of the constraints in biological and cultivation technology. As mentioned earlier, actual yield is still much lower than the potential yield.

Soybean farmers usually receive a good price for soybean. The price trends indicate that the floor price set by the government is always lower than the actual price prevailing in the market. The cost-revenue data recorded by CBS indicate that profit from soybean was around Rp 944,000/ha/season, or Rp 220,000/ha/month in 1992. This profit is actually higher than that of most upland crops (Tables 5.2 and 5.3). However, farmers are faced with high production risk because of high pest and disease incidence. Soybean farmers in Grobogan, Purwodadi, used more than 8 liters of insecticide for every hectare of plantation to eradicate pests. Understandably, after the irrigation system reached this area, most soybean farmers shifted to rice (FAO 1991).

Table 5.2 Profitability of rice and secondary crops in Java (Rp), 1992.

Crop	Total Cost	Total Revenue	Labor Income	B/C Ratio
Rice	555,823	1,488,917	937,094	2.70
Cassava	263,730	1,101,016	837,286	3.38
Maize	204,258	691,007	486,749	4.17
Soybean	284,762	944,049	659,287	3.32
Sweet Potato	327,905	1,240,727	912,822	3.78

Source: CBS, Cost Structures, 1992.

Table 5.3 Profitability per month of rice and secondary crops in Java, 1992.

Crop	Production Period (month)	Income (Rp)	Labor Income per Month (Rp)
Rice	4	937,094	234,273
Cassava	12	837,286	72,274
Maize	3	486,749	162,250
Soybean	3	659,287	219,762
Sweet Potato	4	912,822	228,206

Source: CBS, Cost Structures, 1992 (recalculated).

5.1.2 Domestic use and consumption

Soybean is an important source of vegetable protein in Indonesia. Many soybean products such as *tofu* and other forms of products are part of the daily diet of Indonesia families. The fermented soybean products are soybean sauce, *tauco* and *tempe*, and the unfermented products are *tofu*, sprouts, soybean milk, and other snack foods. Java, which produces 58% of Indonesia's soybean, is also its greatest consumption area. More than 80% of households in Java consume soybean. In Java, annual soybean and soybean product consumption per capita varies from 11 to 16 kg, while the level of consumption in other regions ranges from 1 to 6 kg per capita annually. The next highest consumption rate is in North Sumatra, where 55% of the households eat soybean products regularly (Rosegrant et al. 1987).

Average soybean and soybean product consumption per capita in Indonesia during the period of 1970-1982 was 4.71 kg and in 1982 was 6.45 kg (Kasryno et al. 1985). Bottema et al. (1987) reported that soybean consumption increased from 3.42 kg/capita/year in 1969 to 5.78 kg/capita/year in 1985. Consumption of *tofu* and *tempe* according to *Susenas* surveys in 1981-1993 increased in both rural and urban areas. Per capita consumption of *tofu* in 1981 was 0.055 and 0.139 kg per capita per week or 2.9 and 7.3 kg/capita/year. *Tofu* consumption in rural areas increased to

0.078 kg/capita/week or 4.1 kg/capita/year in 1991, but in urban areas was almost unchanged (Table 5.4). A similar case occurred for *tempe* consumption. There was an increase of about 50% of *tempe* consumption in the rural areas in 1991 compared to 1981, while there was no significant change of consumption in urban areas.

Based on the per capita consumption of *tofu* and *tempe*, the derived demand for soybean can be calculated with the conversion rate used by Hayami et al. (1987). Total consumption of *tofu*, *tempe* and *kecap* in 1993 was 943,228 tons, 972,400 tons, and 29,172 tons respectively. The related demand for soybean was 628,819 tons, 572,000 tons, and 17,160 tons or a total of 1,371,979 tons of soybean (Table 5.5). This was about 65% of the national production or about 50% of the supply in 1993. Other soybean uses such as feed, oil and soybean cake have not been included in the calculation.

Table 5.4 Weekly per capita consumption of processed soybean in Indonesia, 1981-1993.

Item	*Tofu* (kg)	*Tempe* (kg)	*Oncom* (kg)	*Kecap* (ml)
Rural				
1981	0.055	0.065	0.004	1.877
1984	0.050	0.067	0.004	1.057
1987	0.065	0.076	0.004	3.600
1990	0.068	0.078	0.004	na
1993	0.078	0.087	0.004	na
Urban				
1981	0.139	0.129	0.005	5.370
1984	0.119	0.103	0.004	2.492
1987	0.129	0.115	0.004	10.740
1990	0.125	0.114	0.005	na
1993	0.137	0.125	0.003	na
Rural + Urban				
1981	0.074	0.095	0.004	2.673
1984	0.066	0.075	0.004	1.363
1987	0.082	0.086	0.004	5.530
1990	0.085	0.089	0.004	na
1993	0.097	0.100	0.003	na

Source: Susenas data, 1981-1993.

Table 5.5 Estimated yearly consumption of *tofu, tempe,* and *kecap,* and related demand for soybean grain in Indonesia, 1993.

Product	Consumption (tons)	Conversion Rate (1 kg soybean =)	Related Demand for Soybean (tons)
Tofu	943,228	1.5 kg*	628,819
Tempe	972,400	1.7 kg*	572,000
Kecap	29,172	4.5 l**	17,160

* Hayami et al. 1987.
** CBS, Statistic Industry.

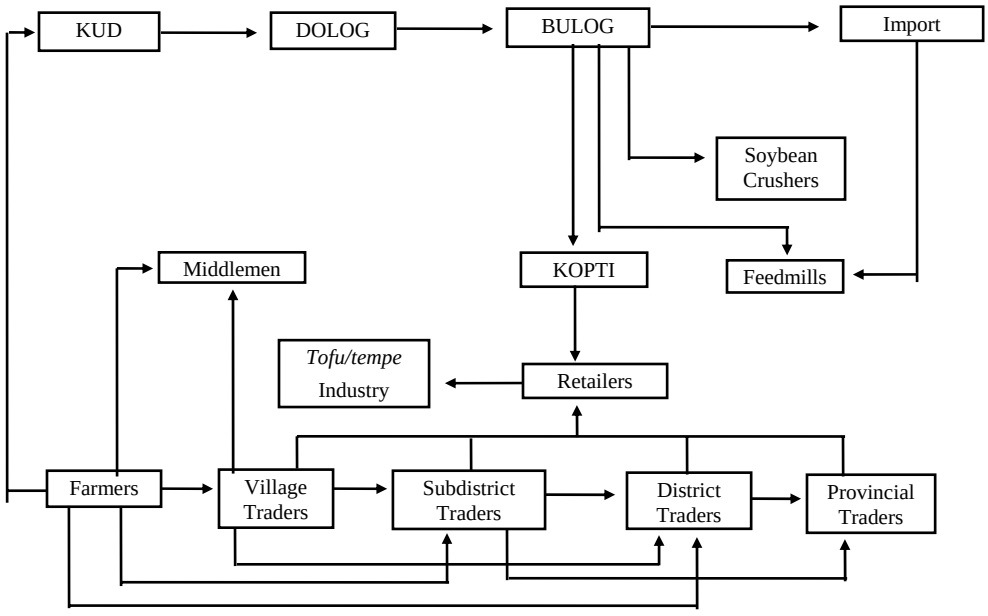
5.1.3 Marketing channels

The soybean marketing system is shown in Figure 5.1. BULOG (Indonesian Bureau of Logistics) holds a license to import soybean and to supply soybean crushers who produce soybean meal, and BULOG also acts as a primary distributor of soybean meal. In relation to import rights, local feedmills are obliged to buy soybean meal from BULOG. During 1994 the proportion of domestic to imported soybean meal was as high as 30:70 which was further reduced to 20:80 in 1995. Almost 50% of imported soybean goes to KOPTI (*Koperasi Produsen Tempe dan Tahu*

Indonesia, Indonesian *Tempe* and *Tofu* Producers Cooperative). KOPTI supplies its members, the *tofu* and *tempe* producers, who also obtain soybean from retailers as well as from wholesalers.

Although there is deep involvement of the government in soybean imports, the supply and demand mechanism works well in the domestic market. There are some variations in marketing channels between regions, but the most common channel is (a) village traders or collectors, (b) district traders, (c) wholesalers, and (d) processing industries. In Wonogiri, Central Java, for example the soybean market is limited more to the local market (Figure 5.2). Village traders usually buy the grain directly from farmers. There may be some independent traders but they are usually hired by a wholesaler to buy soybean directly from farmers and then transport it to the wholesaler's storage facility. District traders have larger operation areas and collect soybean from farmers or village traders. In Central Java soybean is usually sold by farmers at the production center area to village traders, the cooperatives or to the soybean processing industry. Village traders sell their produce to subdistrict collectors and wholesalers. Wholesalers sell soybean to retailers and to the cooperatives in Central Java and Yogyakarta.

Figure 5.1 The marketing system of soybean in Indonesia, 1994.

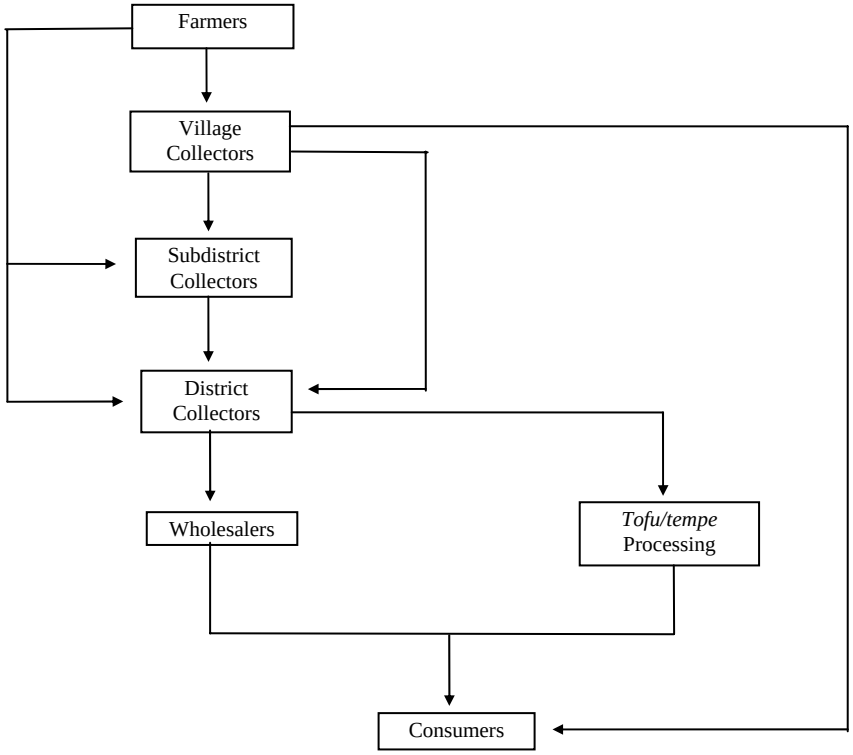


Soybean farmers are generally able to sell their product to the best offer. In Central Java and Yogyakarta most trading is performed in the market (more than 50%) and in the village (25 to 30%). A few farmers with a large amount of grain sell directly to shops in the district capital, otherwise they sell their product to local middlemen. It is not efficient for small farmers to sell the product directly to the wholesalers at the regency capital due to the high transportation cost.

Soybean processors have established marketing chains for both input (soybean) and output (*tofu* and *tempe*). Large *tofu* producers get a regular supply of soybean from wholesalers, the cooperatives or the retail market. They also established their own market outlet for their products. The market spread may be limited due to the perishability of the products. *Tofu* produced in Bandung, for instance, is marketed in Bogor and even Jakarta. *Tempe* is usually produced in home or mini industries which rely on a supply of raw materials from retail markets or wholesalers without any formal supply contract.

Tofu producers receive a minimum profit of Rp 1,300 to 2,000 for each kilogram of soybean (Ministry of Agriculture 1991). Small producers usually process 20-50 kg of *tofu* per day, but larger producers can process up to 200 kg/day. *Tofu* requires a special quality soybean which is not always sufficiently available at the market. Small *tofu* producers experience difficulty in finding a proper quality supply of raw material. However, processors are usually supplied by wholesalers. A *tofu* by-product rich in nutrients is widely used as an animal feed supplement, particularly for dairy cows, pigs, and chickens.

Figure 5.2 Soybean marketing channels in Wonogiri, Central Java, 1993.



5.1.4 Marketing margin

On average, the farm gate price is about 70% of the retail price with a total marketing margin of 30%. The Directorate General of Food Crops and Horticulture (DGFCH 1995) recorded the marketing margin as presented in Table 5.6. Since soybean is not a perishable commodity, its marketing margin is not high. Packaging and transportation are simple and inexpensive. The grain is stored in sacks and transported by truck. Post harvest treatment is not common, but the loss is generally small. Although the transportation cost, loss, and other marketing components are not itemized, there is no indication of excessive profit or exploitation of marketing participants in soybean marketing.

Table 5.6 Marketing margin at different levels in soybean marketing in Indonesia, 1993.

Item	Luwu (South Sulawesi)	Medan (North Sumatra)	Wonogiri (Central Java)	Nganjuk (East Java)
Marketing margin (%)				
Farm gate price	73	74	93	64
Village collector	77	78	95	74
Subdistrict collector	na	na	na	na
District collector	84	na	na	na
Wholesaler	94	84	97	88
Retailer	100	100	100	100
Retail price (Rp)	1,300	825	1,078	1,250

Source: Directorate General of Food Crops and Horticulture (DGFCH) 1995.

5.1.5 External trade

Indonesia's imports of soybean have increased steadily over the last 5 years regardless of the rapidly increasing domestic soybean production. This indicates that growth of demand for soybean and soybean meal is larger than production growth. In 1984, soybean and soybean meal imports were around 400 and 206 thousand tons valued at $ 129.4 and $ 52.6 million. The import declined until 1987 but since then it has risen steadily up to 190 thousand tons in 1993. Soybean meal import fluctuated up to 1990, then increased firmly. The import cost more than $ 282 million in 1993.

BULOG holds a monopoly on imports of soybean cake and grain, while the import and distribution of soybean oil are unrestricted. BULOG is exempt from fees and sales tax in its soybean trading. In the 1980s, BULOG assigned the Association of Wholesalers of Imported Raw Materials for Feed (ASBIMTI) to coordinate the distribution of about 40% of soybean cake imports. The remaining 60% of the imported soybean cake is distributed directly by BULOG to large feed mills (CGPRT 1988). Tabor and Gijsbers (1987) projected the growth of soybean demand in Indonesia at 2.7% per annum for the period 1987 to 2000.

According to DGFCH data, soybean and soybean cake imports in the 1990s are far greater than those in the 1980s (Table 5.7). The rapid development of the poultry industry is probably the main reason. The population of local chickens, layers and broilers increased by 4.7%, 9.3%, and 19.8%; and population of dairy cows and cattle increased by 3.4% and 3.5% per annum (MOA 1994). The population of broilers in 1992 was more than double that in 1988, which may explain the increase in soybean and soybean meal imports in the 1990s.

Table 5.7 Import of soybean and soybean meal, 1984-1994.

Year	Soybean (tons)	Soybean (million $)	Soybean Meal (tons)	Soybean Meal (million $)
1984	400,678	129.435	206,077	52.567
1985	301,952	79.663	175,233	30.751
1986	359,041	83.390	306,716	63.685
1987	286,702	63.145	257,000	51.885
1988	465,839	138.044	72,123	18.036
1989	384,700	126.855	114,307	33.036
1990	526,325	143.168	5,252	1.508
1991	631,038	172.732	193,349	42.421
1992	687,500	184.432	170,631	42.700
1993	700,155	190.178	361,065	91.701
1994*	513,753	153.727	362,148	88.478

Source: DGFCH, Agricultural Statistics 1995.

* Up to August 1994.

5.1.6 Policy measures

Soybean is a commodity with strong government intervention. Many studies on this commodity have revealed that the trade policy of soybean has harmed the soybean economy (Pomeroy 1995; Trewin et al. 1994; Purwoto et al. 1993; Maskus et al. 1991; Condon and Fane 1995; Maskus and Usmanto 1992). The largest burden was shouldered by consumers and processing industries. BULOG's control is aimed at guaranteeing the supply as well as encouraging domestic production. However, as the data show, imports have continually increased.

In 1979/1980 the government set the floor price of soybean Rp 210/kg. The village cooperative unit (KUD), which is assigned to buy soybean from farmers, paid on average Rp 217/kg showing that the market price is higher than the floor price. The soybean floor price is adjusted almost every year and reached Rp 500/kg in 1991. This price was lower than the market price of Rp 520. So far the floor price set by government has not been effective in increasing farmers' income.

The soybean price in Indonesia is more than 70% higher than the world price. In 1980 the CIF price was $ 304.1/ton, the floor price in Indonesia was $ 331.7/ton, and the wholesale price $ 528.5/ton. In 1991 the CIF price was $ 268.2/ton, while the floor price in Indonesia was $ 256.3/ton, and wholesale price $ 572.2/ton (Table 5.8). These data show that Indonesian consumers have to carry the burden of high prices because of the protection policy adopted by the government. The May 1995 deregulation package eliminated the tariff of soybean to nil, and feed producers are allowed to import soybean cake with a requirement of 20% domestic component (Table 5.9).

It is important to note that the strong intervention of the government in soybean marketing in Indonesia is on the import side, especially by imposing import licensing and local component requirement. The marketing of domestic production is not fully controlled. With these conditions, however, both producers and consumers are operating in a high cost soybean economy. While this policy may encourage soybean farmers to produce more and better, other related economic activities such as livestock raising will suffer.

5.1.7 Constraints in soybean development

Several important constraints in soybean development associated with natural and economic characteristics of the crop are:

- Naturally it is difficult to compete with subtropical soybean producers like USA and China because soybean grows better in subtropical regions. The current yield of 1.1-1.2 ton/ha is far lower than that in subtropical countries.
- Insufficient high quality seed and other inputs have been a significant problem for soybean development in Indonesia. The supply and distribution of seed and other inputs need to be improved.
- Soybean in Indonesia competes with rice, which has been the top priority in commodity development in the country. Unless soybean is grown in non rice irrigated fields, competition between the two crops in using land resources will continue.
- Demand for soybean for human food in Indonesia is very high. Although Indonesia is the third largest producer after China and India, the per capita consumption is higher than in China and India.

Table 5.8 The CIF, floor and wholesale price of soybean in Indonesia, 1980-1992 (US $/ton).

Year	CIF Price	Floor Price	Wholesale Price
1980	304.1	331.7	528.5
1981	294.2	377.2	507.9
1982	249.8	406.3	614.3
1983	285.7	271.5	527.5
1984	288.8	271.5	518.5
1985	232.2	268.6	512.3
1986	230.2	231.7	494.1
1987	239.6	182.0	443.4
1988	325.2	193.3	520.4
1989	306.0	197.8	488.5
1990	261.1	216.9	545.1
1991	273.7	256.3	572.2
1992	268.2	n.a.	398.3

Source: Directorate General for Food Crops and Horticulture: Agricultural Statistics 1995.

Table 5.9 Government regulations on soybean and soybean cake trade.

Year	Soybean	Soybean cake
1988	BULOG was the sole importer and sole owner of soybean crushers. Marketing of the production was not controlled.	Limited import license was given to private importers. BULOG was the sole seller; the price was determined by the Minister of Finance.
1991	BULOG was the sole importer. Marketing of domestic production was not controlled.	Import was freed to private importers, with import tariff of 5%, and surcharge of 35%. BULOG sold at a price determined by the Minister of Finance.
1993	BULOG was the sole importer. Marketing of domestic production was not controlled.	Import was freed to private importers with proof of purchase of domestic production ratio of 40:60. BULOG sold at a price determined by the Minister of Finance.
1994	BULOG was the sole importer. Marketing of domestic production was not controlled.	Import was freed to private importers with proof of purchase of domestic production ratio of 30:70. BULOG sold at a price determined by the Minister of Finance.
1995	BULOG was the sole importer. Marketing of domestic production was not controlled.	Import was freed to private importers with proof of purchase of domestic production ratio of 20:80. BULOG sold at a price determined by the Minister of Finance.

Source: Pomeroy 1995.

5.2 Cassava

5.2.1 Production

Up to the past decade, direct human consumption of cassava was limited. However, the future of cassava will depend very much on the growth of demand for food and industrial uses. In the last 10 years, the growth rate of cassava production was about 3.8% per annum (Table 5.10). However, area harvested grew by 1.39% a year. In the period of 1960-1992 the harvested area declined considerably. The increase in production was mostly due to increase in yield because of adoption of improved cassava varieties and chemical fertilizers. It is clear that increase in production resulted from the increase in yield rather than area expansion. The average yield of cassava was 12.2 ton/ha, but the potential cassava yield may be up to 20-30 ton/ha. The wide gap between potential and actual yield of cassava is due to improper adoption of modern technology by farmers. Technology adoption will increase cassava production as well as farmers' income.

Marketing experience in many cassava production centers such as Lampung and East Java indicates that the major constraint to development of this crop comes from the marketing system and infrastructure facilities (Pakpahan et al. 1990). Cassava is mostly grown in areas with poor

accessibility. This is simply a rational farmers' decision, because more accessable locations generate greater profit by growing more profitable crops. As shown in Table 5.2 and 5.3, the profit per unit of time is the lowest for cassava. On marginal lands farmers have economic reasons to grow cassava.

Table 5.10 Harvested area, production and yield of cassava, 1968-1992.

Year	Harvested Area (ha)	Production (tons)	Yield (kg/ha)
1968	1,503,410	11,355,634	7,500
1970	1,398,070	10,478,308	7,500
1975	1,410,025	12,545,544	8,900
1980	1,412,481	13,726,336	9,700
1981	1,387,536	13,300,911	9,600
1982	1,323,709	12,987,891	9,800
1983	1,220,808	12,102,734	9,900
1984	1,350,448	14,167,090	10,500
1985	1,291,845	14,057,027	10,900
1986	1,169,886	13,312,119	11,600
1987	1,222,151	14,356,336	11,700
1988	1,302,581	15,471,111	11,900
1989	1,407,880	17,117,249	12,200
1990	1,311,584	15,829,635	12,100
1991	1,319,143	15,954,467	12,100
1992	1,351,324	16,515,855	12,200

Source: Central Bureau of Statistics: *Statistik Indonesia.*

Cultivation of cassava is usually very simple and characterized by low input of labor, capital, and cash. The Central Bureau of Statistics (1993) recorded that the average fertilizer use was 128 kg/ha. In Java the fertilizer use for cassava was 200 kg/ha, Sumatra 90 kg/ha, and other areas less than 10 kg/ha. In Lampung the fertilizer use was around 150 kg/ha (Pakpahan 1992). In many places in Java, cassava is grown in a multicropping system with soybean or dry land rice. Monoculture type cassava plantations are developed in Lampung and Central Java. Around 100 cassava starch processing industries with an average capacity of 40-100 ton/day absorb the cassava produced in Pati, Central Java.

5.2.2 Domestic demand

Regardless of the high potential of the country to produce cassava, Indonesia has never fulfilled the European Union (EU) import quota of 825 thousand ton/year. In Asia, Indonesian cassava production is the second largest to Thailand's. The total production in 1992 was 16,515 thousand tons in Indonesia and 21,130 thousand tons in Thailand (FAO 1993). However, large domestic demand for food and other products reduced the ability of the country to meet the import quota set by the EU. Strong domestic demand in Indonesia now comes from industries such as feed, wood, chemical and sugar, which has made the gap between the quota and the actual export even larger.

Industrial demand for cassava in Indonesia is probably far under estimated. As presented earlier, direct consumption of cassava is actually small. According to the *Susenas* survey (1993), cassava consumption in the rural area averaged 15.8 kg/capita/year and in the urban area 6.6 kg/capita/year. Consumption of dried cassava (*gaplek*) was 2.3 kg/capita/year and 0.05 kg/capita/year; and cassava flour 1.0 kg/capita/year and 0.05/capita/year in rural and urban areas, respectively. If the conversion of cassava to starch is 7:1 and to cassava flour is 4:1, the total consumption of cassava equivalent in 1993 is 3,393,676 tons. This is only 21.5% of the total production in 1992. The rest went to industries and prepared food.

About 34-35% of total cassava available was processed in medium and large scale processing industries. By rough calculation, no less than 45% of the cassava supply is used in households, mini, small industries, and non-formal sectors such as small trade. Most fresh cassava tuber is peeled right away and sent to the starch factory. Farmers in Java usually process cassava into storable *gaplek* (dried cassava). *Gaplek* can be stored for future consumption or milled into flour. Cassava can also be processed into pellets or dried chips for animal feed. A large number of small scale cassava processing units are located in Java. A few large cassava processing facilities are established in Lampung, producing high export quality cassava starch and manioc chips.

Fresh tubers of cassava should be processed immediately, because quality of cassava decreases due to the phenolization process. Post harvest technology is very important for increasing of added value of cassava products. Actually, post harvest processing will increase added value of fresh tuber. Processed cassava products include:

- *Gaplek* or dried cassava. *Gaplek* is an intermediate cassava product for the feed industry, and for chips and pellets. Processing of fresh tuber into intermediate cassava products such as *gaplek*, pellets and chips, which are made from undersized cassava, is not profitable. Larger tubers are usually sold to the local tapioca factory. Otherwise, farmers process cassava into *gaplek* or chips to reduce the transportation cost. Farmers usually produce non labor intensive *gaplek gelondongan* which is thicker, with a higher moisture content than the common thin sliced gaplek. Therefore, the quality and price of *gaplek gelondongan* is lower.
- Cassava chips. The chip is a smaller cube than *gaplek* at around 9 cm^3. This manually made chip usually varies in size which results in low quality. The chips are made from both *gaplek* and from fresh tuber, which is better in quality. Large capacity chip factories are located in Lampung and they directly export the products. In Java, cassava processing is usually small scale with a capacity of 200-600 ton/day. Pati and Wonogiri are cassava production centers in Central Java. Processing plants in Wonogiri convert *gaplek* into chips.
- *Sawut*. *Sawut* is a raw material for cassava flour and is made of fresh tuber. Fresh tuber is peeled, sliced by machine, and dried. *Sawut* dries faster than chip or gaplek.
- Starch or tapioca. Starch is made from fresh tuber with small or large machines. A small starch plant needs around 50 ton fresh tuber/day and a large drying floor.

5.2.3 Marketing channels

There are two completely different marketing channels between cassava and *gaplek*. The difference is actually due to the level of perishability of the products. Cassava is very perishable and, therefore, the time factor is important in marketing the roots. Since cassava has to be harvested, transported and processed on a timely basis, all market participants face high risks. On the other hand, *gaplek* is a non perishable product which allows a long marketing channel. Both channels are featured in Figures 5.3 and 5.4.

In the case of cassava the channels are (a) producer - processor, (b) producer - commission trader - processor, and (c) producer - village unit cooperative - processor. From the number of institutions involved, cassava marketing can be regarded as efficient. Yet, efficiency does not necessarily mean a proper incentive to producers (Pakpahan et al. 1990). In Lampung the cassava market is highly concentrated with great potential for the buyer to determine price.

Figure 5.3 Marketing channels of cassava in Lampung (adopted from Pakpahan et al. 1992).

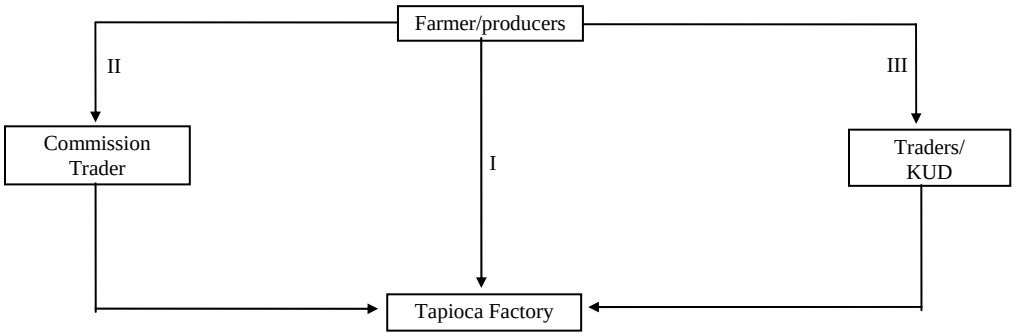
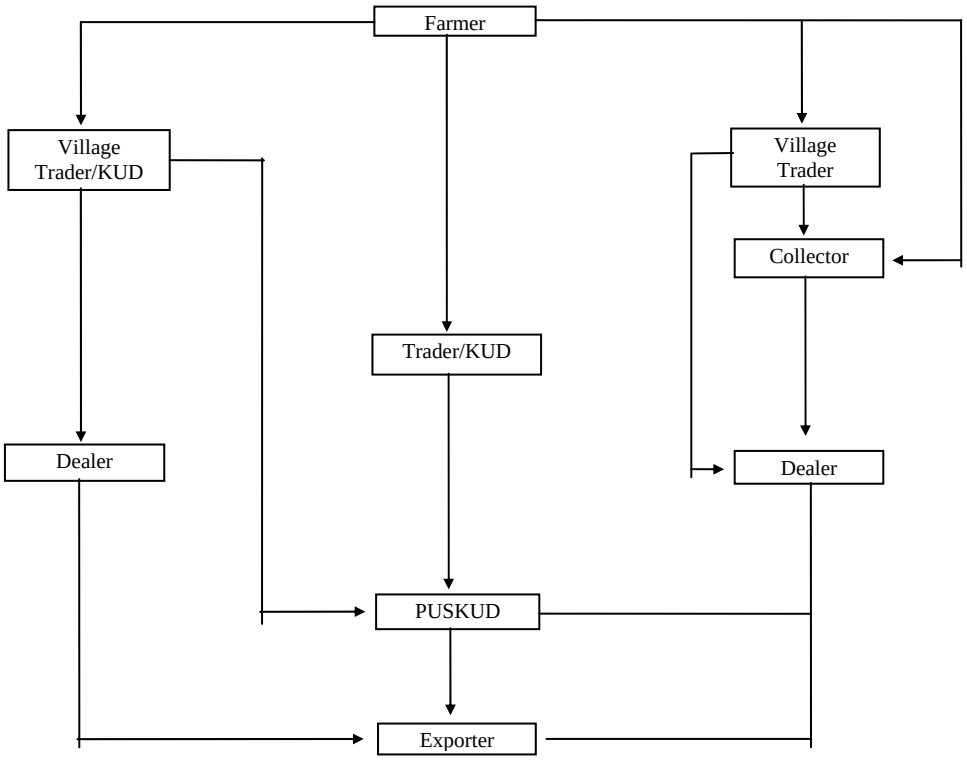


Figure 5.4 The network of gaplek marketing in Lampung (adopted from Pakpahan et al. 1990).



The *gaplek* marketing channel usually consists of the following: (a) farmer - trader/cooperative - exporter, (b) farmer - village trader - dealer - exporter, and (c) farmer - village trader - collector - dealer - exporter. The first pattern is characterized by independent relations between the traders. In the second pattern of *gaplek* marketing, most traders and cooperatives are involved in *gaplek* processing, besides buying *gaplek* from farmers. When the price of cassava drops in a particular month, farmers cease to process cassava into *gaplek*, and cooperatives and traders begin *gaplek* processing activities.

Although there is no government intervention in the cassava market in Indonesia, the cassava market is highly characterized by an oligopsonic market structure and high price fluctuation. In Lampung the market is highly concentrated. There are only a few large cassava processors which

absorb the local production. In many ways these plants are able to bring down the cassava price during harvest season. The nominal price of cassava in Lampung in 1984 was Rp 20 at the factory, increasing to Rp 52/kg in 1987 and to Rp 60/kg in 1988. The price declined to Rp 33/kg in 1989 then increased again to Rp 60-80 in 1992. The average price in 1994 was Rp 85/kg (DGFCH 1995). Observations in the field, however, showed a larger fluctuation. Pakpahan et al. (1992) observed that the cassava price at the production center ranged between Rp 9/kg (1987) to Rp 51 (1985). The market situation can be summarized as follows:

- Regardless of the existence of large cassava processing industries in production areas, there is no market arrangement between farmers and processing industries to guarantee the continuity of raw material supply.
- The oligopsonic market structure has eliminated economic incentive to farmers to increase production and yield.

5.2.4 Marketing margin

Marketing margin includes cost and profit associated with certain marketing activities carried out by particular market institutions. The marketing margin of cassava is large because cassava is bulky. The costs of transportation, loading and unloading are high. In Central and North Lampung, according to a study by Pakpahan et al. (1992), the marketing margin at the trader level was 51 and 52%. The farm gate price in Lampung in 1989 was Rp 13.6-13.8, and the traders' selling price was Rp 27.9-28.7 (Table 5.11). Harvesting and truck loading costs were Rp 5/kg (35% of traders' selling price), transportation Rp 5/kg, and traders' profit Rp 3.8/kg. The buyer (trader) had to carry out the harvesting because cassava was usually marketed under the *tebasan* system (farmer sells the standing crop). This is actually the method farmers use to manage the risk of selling a perishable crop, because once it is harvested, farmers face a greater risk of an unsold, spoiled crop. *Gaplek* producers' price was Rp 55/kg, and traders' selling price Rp 80/kg. The marketing margin was 42%. Out of this, loading, unloading and weighing was 11%, transportation 28%, packaging 20%, loss 11%, and traders' profit 18%.

In East Java the prices of cassava and *gaplek* are usually higher than in Lampung because (a) the demand for these commodities is higher, and (b) the market structure is more competitive. The cassava and *gaplek* price difference in Lampung and East Java is generally not enough to generate flow of the commodity between the two location because of high transportation costs. Lampung can supply cassava starch to East Java because per unit weight transportation cost of starch is much lower than that of fresh cassava and gaplek.

In Malang and Kediri the farm gate price of cassava in the *tebasan* system was Rp 32-36/kg and at the processing factory level Rp 48-49/kg (Table 5.11). The marketing margin was 26-35%, of which profit to the traders was 52-63%. The farm gate price of *gaplek* in Kediri was Rp 70/kg, the subdistrict traders' selling price Rp 75/kg, the dealers' procurement price Rp 90/kg, and the price at sea port Rp 120/kg. The profit of each market institution ranged between Rp 3.6-8.2/kg or 3-6.8% of the end consumer (sea port) price.

5.2.5 External trade

Indonesia is the second largest cassava exporter after Thailand. Cassava production in Indonesia is about 33% of Asia's production, but Indonesian export is only about 10% of Thailand's. In the period of 1988-1990 Indonesia exported 1,159,000 tons of cassava and Thailand 8,974,000 tons. The primary destination of cassava export for animal feed is the European Union. The largest export of Indonesia was during the period 1988-1990 with a total volume of more than 1 million tons of chips (manioc) and pellet. Beginning in 1991 total export declined due to the increasing domestic demand. In 1994 the cassava export was less than 500,000 tons.

Table 5.11 Cost of cassava marketing in the *tebasan* system in Lampung, 1989.

Cost Item	Central Lampung		North Lampung		Malang		Kediri	
	(Rp/kg)	(%)	(Rp/kg)	(%)	(Rp/kg)	(%)	(Rp/kg)	(%)
Farm gate price	13.6	-	13.8	-	32.0	-	36.0	-
Traders price	27.9	-	28.7	-	49.3	-	48.3	-
Margin	14.3	-	14.9	-	17.3	-	23.4	-
Distribution	5.0	35.0	5.5	36.9	3.0	17.3	3.0	24.2
Harvesting	5.0	35.0	6.0	40.2	3.5	20.2	3.0	24.2
Transporting	0.5	3.5	0.5	3.4	10.8	62.5	6.4	51.6
Traders' profit	3.8	26.5	2.9	19.5				

Source: Pakpahan et al. 1992.

The supply of cassava to the international market will probably decline because Thailand, the largest supplier ever, has started converting parts of cassava area into tree crops such as rubber and oil palm. In the meantime, domestic demand in Indonesia has increased tremendously because cassava products have many different uses such as feed, and in the plywood industry, fructose and glucose industries. Rapid conversion of agricultural land in Java has also contributed to the diminishing cassava production. About 16-35 thousand hectares of agricultural land in Java are converted into non agricultural purposes such as public facilities, housing and industry. However, the primary problem is that market structure and market institutions have not developed to support cassava development and do not provide an economic incentive to farmers.

Cassava exported from Indonesia is usually shipped from Bandar Lampung, Sumatra. The Netherlands was the largest importer of Indonesian *gaplek* chips in 1993 (195 thousand tons), followed by China (90 thousand tons), Germany (55 thousand tons), and France (41 thousand tons). Germany was the largest buyer of pellets in 1993 (132 thousand tons), followed by the Netherlands (92 thousand tons), Spain (42 thousand tons), and Taiwan (34 thousand tons). Total export of tapioca in 1994 was 21 thousand tons with Taiwan, Hongkong and Japan as the main country destinations. In the period of 1984-1994 Indonesian cassava products were mostly marketed to European countries. However, a large portion of the export was shipped to other countries, namely Hongkong, China, Taiwan, Singapore, Malaysia, Korea, Japan, England, Poland and Italy. Export of chips to other countries was only 3.1% of the total cassava export in 1990, increasing to 4.94% (1991), 39.4% (1992), 34.9% (1993), and 66.0% (1994). Similarly, export of pellets to other countries increased from 3.8% (1991) to 10.4% (1992), 24.4% (1993), and 19.7% (1994) of total cassava export. In other words, the market of cassava has diversified in the last 5 years. Import of cassava is relatively small; it is occasionally undertaken by cassava processing plants during the slack season.

Table 5.12 Indonesian export of cassava chips and pellets, 1984-1994.

Year	Chips (tons)	Chips (million $)	Pellets (tons)	Pellets (million $)
1984	93,552	6.196	291,609	26.001
1985	244,529	19.611	298,769	26.014
1986	204,968	23.871	219,623	25.944
1987	451,434	50.147	331,705	39.638
1988	583,913	67.647	502,140	58.523
1989	833,851	47.840	310,337	29.434
1990	677,329	70.725	520,457	70.051
1991	492,508	53.729	364,264	50.477
1992	368,869	40.626	501,304	67.027
1993	516,585	47.904	408,447	42.625
1994	280,349	21.549	210,926	18.343

Source: DGFCH 1995.

5.2.6 Constraints

Market development constraints of cassava can be summarized as follows:

- Cassava is a low profit commodity. For farmers, cassava is usually the lowest priority crop to grow. Current agricultural technology improvement is moving to high price intensive and non-land based commodities. Coupled with increasing land rent, cassava cultivation will face a high opportunity cost.
- Cassava is usually grown in marginal land areas, hence it requires high fertilization to maintain soil nutrients. This environmental concern conflicts with the fact that cassava is a low profit crop.
- Cassava farmers have to assume the market risk associated with the naturally bulky cassava. To manage this, farmers usually keep the crop in the field until they fix a selling price with the buyer. Therefore, farmers prefer to sell under the *tebasan* system.
- Traders and processors of fresh cassava gain much higher profit per unit weight and time than farmers do. Fresh cassava traders and processors also gain higher profit than *gaplek* traders and exporters. This is actually an indication that traders and processors take advantage of the risk associated with the perishability of cassava. While cassava farmers have to carry the burden of risk and price fluctuation, traders and processors will always get a positive profit margin regardless of the farm gate price. In other words, although the cassava marketing system involves only a few marketing channels, the system has not guaranteed the distribution of risk and benefit evenly among the market participants. Farmers have low bargaining power, carry all the market risk, and obtain the lowest benefit from the whole marketing system. This is the constraint for cassava economy development in Indonesia.

5.3 Maize

5.3.1 Production

Maize is the second most important food commodity in Indonesia after rice. For the Madurese and some of East Javanese ethnics, maize is the main foodstuff. However, consumption is declining as real income increases. Since the expansion of the poultry industry in the early 1980s, a substantial amount of maize has been used for feed. Total production of maize in 1992 was more than 7 million tons, which was the third after China (95.34 million tons) and India (9.74 million tons). In the past Indonesia was a maize exporting country, but now the export is declining and import is increasing.

The harvested area of maize fluctuates in a range of 2 to 3.2 million ha. However, production is increasing. For example, in the early 1960s production was around 2.3-2.5 million tons but by the early 1990s it had increased to around 6.2-7 million tons. Yield has increased firmly from less than 1 ton in 1960 to more than 2 tons grain/ha (Table 5.13). In the last 10 years production grew at a rate of 9.9% per annum.

The maize yield can be improved significantly by use of improved varieties of seed and proper application of new technologies. In Central Java 59% of farmers use a local maize variety, 11% use old national improved varieties, 26 % use a new national variety, and only 4% use hybrid seed.

Java produced 70% of the total maize in Indonesia in 1992. East Java was the largest producer (4.0 million tons), followed by Yogyakarta (3.0 million tons), West Java (2.0 tons), South Sulawesi (0.59 million tons), and Lampung (0.53 million tons). There are some minor differences between data of commodity production in CBS and MOA, however, in general this will not affect the analysis significantly. There are also some differences in maize yield between regions in Indonesia. Maize yield in Java in general is higher than outside Java because of differences is input

use intensity. Maize yields in Java, Lampung, and South Sulawesi are similar, i.e., around 2-2.3 ton/ha, but in Kalimantan and other areas it is about one half of this.

Table 5.13 Harvested area, production and yield of maize, 1960-1992.

Year	Area (ha)	Production (tons)	Yield (kg/ha)
1960	2,639,671	2,460,117	932
1965	2,507,071	2,364,517	943
1970	2,938,611	2,825,215	961
1975	2,444,866	2,902,887	1,187
1980	2,734,940	3,990,939	1,459
1981	2,955,039	4,509,302	1,526
1982	2,061,299	3,234,825	1,569
1983	3,002,173	5,087,235	1,695
1984	3,086,246	5,287,825	1,713
1985	2,439,966	4,329,502	1,774
1986	3,142,759	5,920,264	1,884
1987	2,626,033	5,154,735	1,963
1988	3,405,751	6,651,917	1,953
1989	2,944,199	6,192,512	2,103
1990	3,158,092	6,734,028	2,132
1991	2,909,100	6,255,906	2,150
1992	3,248,250	7,995,459	2,167

Source: Directorate General of Food Crops and Horticulture.

The potential yield on research stations is around 4-5.6 ton/ha with the proper application of fertilizer and good cultivation techniques (Malang Research Institute for Food Crops 1989). Hybrid maize seeds are currently available in the market, which opens more opportunities to increase production. The world average yield of maize is 3.98 tons/ha, for Asia-Pacific region 3.36 tons/ha, for developed countries 5.24 tons/ha, and for developing countries 3.35 tons/ha. Simatupang (1989) concluded that Indonesia has a comparative advantage in maize due to the country's weather and geographical situation.

5.3.2 Domestic market

Market prospects of maize will emanate from the rapid increase in industrial demand. The discussion on demand for maize in Chapter III showed a negative correlation between consumers' real income and level of direct maize consumption. Maize is an important raw material for several factories in Indonesia. The stem and leaf can be processed into paper and panel board. The cob can be used as raw material of fuel and fermented animal feed. Maize meal, and "maize meal grit" can be used for glue products, textiles, and soap. Maize starch can be used for producing dextrin, lemon syrup, and as a raw material of paint. Maize is also important in the food industry, for beverages, chemical materials, pharmaceuticals, and in the animal feed industry.

As a food, maize can be processed into rice maize, maize meal, maize starch, maize syrup, maize candy, and maize oil. Maize oil is an important vegetable oil with high nutritional value with low cholesterol. Demand for maize oil increased rapidly due to increasing health awareness. Maize starch is increasingly popular in food. One hundred kilograms of grain maize produces 64 to 67 kg of maize starch.

Maize marketing channels in general are similar to other grain marketing channels with little variation between regions. The existence of commodity collectors in the village, for example, is usually quite effective in agricultural commodity marketing from the point of view of accessibility to the farmers, economics of scale, and the overhead cost to large traders. It is easier and more efficient to large traders to buy from village collectors than directly from farmers because of the small amount of product located at scattered farms. The collection cost and time are usually too high

for large traders. In the case of maize, village collectors manage the product easily because maize is not a perishable commodity.

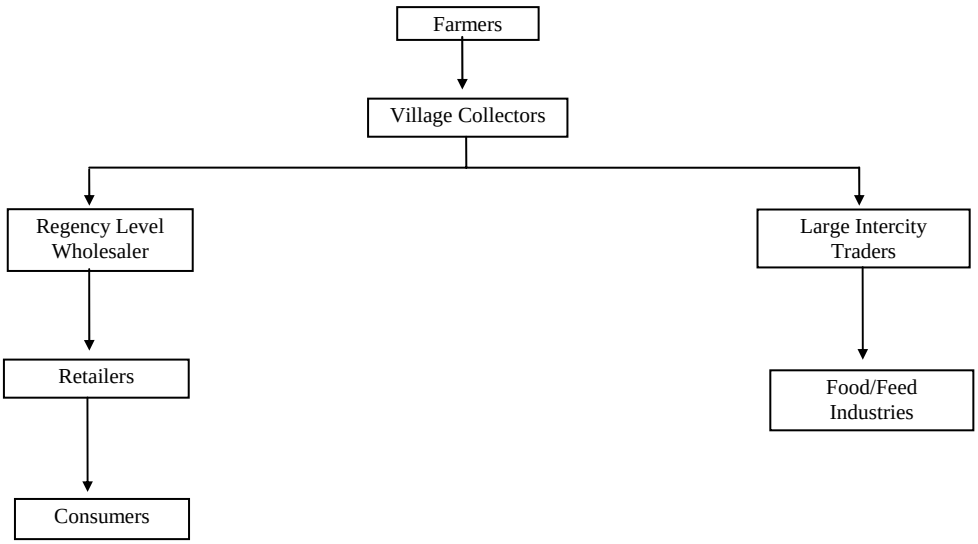
The village collector is characterized by small capital holdings, a limited operation area, and a close relationship with farmers. Village collectors in Lampung, West Java, and Central Java purchase 1.5 to 30 tons of grain per month. Due to their limited capital, village collectors usually receive financial assistance from large traders about 2-4 months before harvesting time. This condition has created inter-dependencies between farmers - village collectors - large traders in the maize marketing system.

The close relationship between farmers and village collectors is usually maintained for years. Although in principle farmers will sell their maize to those who offer the best price, they also develop informal contracts through the good relationship with collectors. In the case of Lampung province, around 75% of producers or farmers sell their grain to the village collector and only around 25% sell the grain the outside the village collector. Around 50% of the collectors in turn sell their maize to subdistrict retailers and the rest to the wholesaler in the same district.

In Central Java and Yogyakarta, 50% of farmers sell maize to village collectors. The village collectors usually resell the grain to larger traders and wholesalers who further sell to exporters in Semarang and Surabaya. Large traders and wholesalers at the district level sell around 75% of the maize to exporter or large traders and around 25% to animal feed factories in Semarang and Surabaya.

The maize marketing channels in Bulukumba, South Sulawesi and in Central Java are presented in Figures 5.5 and 5.6. Small traders at the subdistrict level usually obtain their grain from village collectors. Subdistrict retailers usually own a retail shop in the district market and they have a good channel to the district wholesaler.

Figure 5.5 Maize marketing system in the Regency of Bulukumba, South Sulawesi.

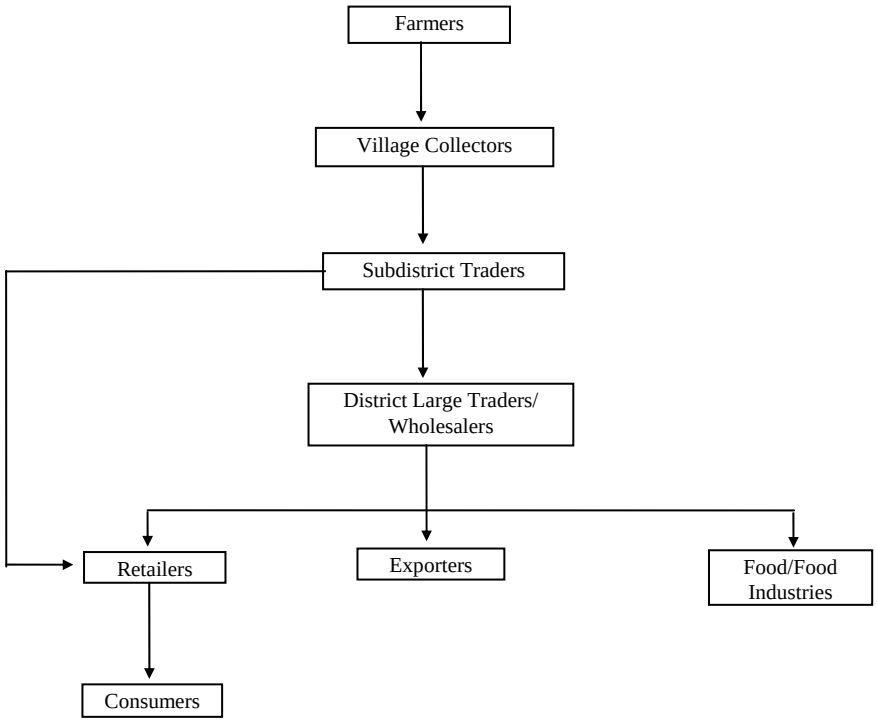


Market structure

The maize market structures in production centers in Java and in the outer islands are quite different. While the market structure in Java is characterized more by a large number of small consumers, in the outer islands, particularly in Lampung and South Sulawesi, the market is characterized by a few large buyers. A large number of buyers in Java are the end users or direct

consumers, but in the outer islands they are large scale processing factories or inter island traders. The maize market structure in Java is usually more competitive than in the outer islands.

Figure 5.6 Marketing system of maize in Java.



The maize farm gate price is around 75-87% of the retail price. With four marketing participants (village collector, large trade, wholesaler, and retailer), the magnitude of each marketing margin is not large. The Directorate General of Food Crops and Horticulture (DGFCH) recorded the profit of the village collector at around 5-10%, and wholesaler and retailer 5%. According to CBS data, family labor income from maize was Rp 450,000/ha. Simatupang (1989) identified the important factors why maize farmers did not achieve a high profit, namely: (a) especially in Java, maize is grown in a multi cropping system which is intended for own consumption, (b) there is low economic motivation for maize farmers, and (c) the maize market structure and price fluctuation do not provide an incentive to farmers to increase production.

There is a gap between the farmers' traditional motivation and marketing institution and the rapidly increasing demand for an agricultural commodity like maize which, to some extent, creates a barrier to entry into a relationship and interdependency between farmers as raw material producers and processing industries as processors and users. The existing market uncertainty is actually arising from separate and disintegrated decisions of the market participants in the whole economy.

5.3.3 External trade

Central production areas of maize in Indonesia are West Java, Central Java, East Java, Lampung, Bali, Nusa Tenggara, South Sulawesi, and Kalimantan (Rosegrant 1987). Maize import and export balance data indicate that Indonesia is no longer an important maize exporting country as it was in the past. Although there were some exports, the maize import has risen every year for the last three years.

Fluctuation of the maize market is a reflection of unstable domestic production. Farmers do not have any price guarantee due to poor marketing arrangements between farmers and maize utilizers and consumers, especially the processing industries. This particularly weak position also occurs with other CGPRT crops. The low price of cassava in Lampung in 1994 resulted in a loss to cassava farmers. The following year farmers shifted to maize which brought about an over supply of maize and a shortage in cassava.

Table 5.14 shows that maize export declined to less than 29,000 tons in 1994 from the peak of 232,000 tons in 1989. On the other hand, the import increased to more than 517,000 tons in 1994. Maize demand for industrial purposes increased tremendously. Various policy measures to anticipate this situation were taken and in 1994 the import deregulation tariff of maize was reduced from 10% to 5%. In May 1995 the tariff was completely eliminated and the import license was also eliminated. This is probably one explanation why the maize import increased in 1994. It is expected that the volume of import in 1995 will further increase in response to the 1995 deregulation.

The world price (CIF) of maize is generally higher than the wholesale price with a nominal protection rate (NPR) between -8 and -48. Only in 1976, 1977 and 1984 was the CIF price higher than the wholesale price. Since 1985 the NPR increased from -11 to -27.8, decreasing to -23 in 1989 and -8 in 1990. In 1994 the estimated CIF price was Rp 310/kg. According to DGFCH, the wholesale price in Jakarta, Surabaya, Tanjungkarang, Mataram and Manado was Rp 323-388. Some feed industries also perceived that importing was more profitable due to the fact that the domestic price of maize was higher than the international price. In 1995, due to high production in Lampung, the price of maize dropped to Rp 250/kg.

In general the maize external trade situation can be summarized as follows:

- Export and import volumes are very irregular due to the unstable domestic production. This results in poor market institutions, providing less price certainty to farmers.
- Indonesia will be soon to be a net maize importer. The rapid development of the processing industry and its demand for maize cannot be supported by high growth of maize production. The average yield of maize is still lower than the yield in the other main maize producing/exporting countries.

Table 5.14 Export and import of maize in Indonesia, 1984-1993.

Year	Export		Import	
	Volume (tons)	Value ($ '000)	Volume (tons)	Value ($ '000)
1984	159,853	21,808	59,251	9,530
1985	3,489	601	49,863	69,965
1986	4,433	733	57,369	5,796
1987	4,680	664	200,998	24,784
1988	37,404	4,710	63,454	8,227
1989	232,093	27,984	33,340	4,597
1990	136,641	16,036	515	217
1991	30,742	3,502	323,176	45,686
1992	136,664	17,288	55,498	7,687
1993	52,088	6,772	494,446	67,600
1994	28,883	3,960	517,623	68,309

Source: DGFCH 1995.

5.3.4 Marketing constraints

Market development constraints are associated with technical and institutional aspects. Since the import market is completely open, domestic production faces a difficult position competing with imported maize, particularly if the yield is not improved through cultivation and biological technology. Hybrid maize seeds are now available in the market but the price is still considered expensive and many farmers can hardly afford the seeds. Fertilizer prices continue to increase, although currently the price is less than in neighboring countries. Phosphate fertilizer is no longer subsidized, and the nitrogen fertilizer subsidy has been significantly reduced.

Another important constraint is the unstable price which has increased farmer's uncertainty. The weak bargaining position of farmers in the market results in a great loss if production increases. The poor marketing institution does not provide economic incentive to farmers to produce a larger quantity and better quality of maize. This cycle occurs continually and will improve only with the existence of a mechanism that guarantees a good price to farmers.

5.4 Sweet potato

5.4.1 Production

In the secondary crop group, sweet potato harvested area is the lowest. In 1991 sweet potato harvested area was only 224,000 ha, much lower than that of mungbean, soybean, maize, and cassava (Table 2.4). Apart from high family labor income from sweet potato (see CBS: Cost Structure), its production, harvest and planting area have not greatly expanded. Sweet potato harvested area declined from more than 300 thousand ha to around 200 thousand ha in the 1980s and 1990s. Yield increased from 8.7 tons/ha in 1988 to 9.5 tons/ha at a rate of 1.79% per year. Productivity flattened since 1991 at 9.5 tons per hectare (Table 5.15). Total production is almost unchanged with a growth rate of 0.03% per year, which indicates little incentive and demand for sweet potato, regardless of increasing uses of sweet potato for various industries.

5.4.2 Marketing

There is no immediate change in market prospects for sweet potato under current use and technology conditions. Although sweet potato is mostly for direct consumption and the processing sector for it is very limited, some processing industries started using sweet potato since the mid 1980s in the production of chili sauce, tomato sauce, chips and cookies. The amount is unrecorded, but it is believed to be increasing. Gunawan et al. (1995) estimated that no less than 450 thousand tons of sweet potato is currently being processed in various industries including household, small, medium and large industries. Table 4.7 also indicates that about 45% of sweet potato is processed, much less than the proportion of other commodities which amounts to more than 75%.

The demand for sweet potato will increase considerably if it can substitute for other raw materials, especially cassava, in sugar, fructose, and maltose industries. These industries are currently facing shortages of raw material. Sweet potato is a perfect substitute commodity for these industries, because it requires less time for production, yields higher and contains a better nutritional composition. This, however, needs to be supported by market institutions because the current marketing system is very inefficient. At the farm level, the role of middlemen has been exceptionally large and puts farmers in a weak bargaining position. Sweet potato farmers sell their product by the *tebasan* system (selling the crop before harvest) simply to reduce the risk from loss because of spoiled, unsold crop.

Table 5.15 Harvested area, production and yield of sweet potato in Indonesia, 1960-1992.

Year	Harvested area (ha)	Production (tons)	Yield (kg/ha)
1960	393,000	2,669,600	-
1965	416,000	2,651,200	-
1970	357,568	2,175,317	6,100
1975	310,917	2,432,614	7,800
1980	276,048	2,078,767	7,500
1981	274,905	2,093,572	7,600
1982	219,655	1,675,657	7,600
1983	280,173	2,213,027	7,900
1984	263,854	2,156,529	8,200
1985	256,086	2,161,493	8,400
1986	253,067	2,090,568	8,300
1987	229,070	2,012,846	8,800
1988	247,822	2,158,629	8,700
1989	240,178	2,224,346	9,300
1990	208,732	1,971,466	9,400
1991	214,316	2,039,212	9,500
1992	229,786	2,171,036	9,400

Source: CBS.

Theoretically, marketing utility or value added can generally be divided into: (a) space utility through transporting the commodity from the production area to the consumption area, (b) time utility through storing the product for future consumption during the off season, and (c) form utility through quality improvement and processing. The bulky and perishable characteristics of the product and the limited use of sweet potato in downstream industries have constrained the commodity from achieving added value.

It is generally accepted that sweet potato has good prospects as a source of food. It contains more calories per unit weight than potato (113 vs 75 calories/100 grams), it is rich in vitamin A (100 grams provides 7,100 IU), ascorbic acid, thiamin, riboflavin, niacin, and minerals. Chips, flakes, flour, starch, glucose and alcohol are probably the commodities which could utilize sweet potato as a raw material in large quantity.

The future of sweet potato seems to be related to several conditions such as:

- the advantage of this crop over the nearest substitute for cassava in terms of maturity, high yield, cultivation techniques, and high profitability to farmers and processing industries; and
- the ability to substitute for cassava flour/starch and wheat flour for many different processed products.

Processing technology is most crucial to improve the role of sweet potato as a source of food and in the food industry. Based on the data on food processing capacity as recorded by MOI (Gunawan 1995), and assuming that sweet potato can substitute 5% of wheat flour and cassava in glucose and fructose industries, and considering that 80% of tomato or chili sauce contains sweet potato, a rough estimate of large industry's demand for sweet potato is about 1.7 million tons. This means the total demand including that for human consumption will be about twice the current national production.

Sweet potato marketing channels are usually simple and short. Farmer - wholesaler - retailer or farmer - wholesaler - processor industry are the most common channels in sweet potato marketing. In producing areas few village traders are interested in marketing because of the product's bulky and perishable characteristics. However, commission traders or middlemen play a significant role and have become a barrier to an efficient marketing mechanism.

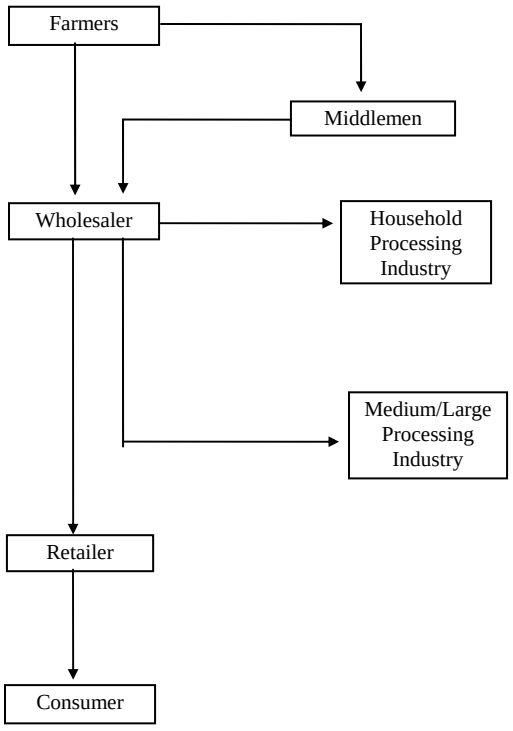
Two common marketing mechanisms are found in the sweet potato market, namely:

- Commission agents or middlemen play a significant role in the transaction between traders and farmers, since traders buy the crop through commission agents and price negotiation is also made through the commission agent. With this mechanism, buyers may pay an unnecessarily high price and farmers may receive an unnecessarily low price. The exceptional profit to the commission agent may result in low economic incentives to both farmers and traders.
- Wholesalers or processing plants buy the product directly or from farmers through their hired agents. This mechanism usually applies if the farmer has had a long relationship with the wholesaler or processing industry.

In the marketing of most agricultural produce, small village traders play an important role, but this is not the case for a perishable crop such as sweet potato. Sweet potato should be sold usually no more than 2 days after harvest, otherwise the price drops substantially due to reduced quality. In general farmers sell sweet potato directly from the field to small or village traders. The common marketing chain for sweet potato is presented in Figure 5.7.

In the case of grain, small traders usually operate at the village level and buy grain from farmers and then resell to larger sellers or wholesalers. In the sweet potato market, the role of small traders is not substantial. Because of its bulky feature, a high transportation cost from the field to the trader's house hampers collection of this commodity. Traders transport the sweet potato directly from farms to regional markets before distribution by large wholesalers to other cities and retailers. In Indonesia there is no, or very little, inter-island market for sweet potato.

Figure 5.7 Marketing channels of fresh sweet potato in production center of Kuningan and Cianjur, 1995 (observation in February 1995).



5.4.3 Marketing functions

By definition, market functions include grading and sorting, storage, transporting and distribution, and processing. Market functions may not perform well for several reasons. Demand for sweet potato is very limited and, therefore, the market for this commodity can easily be saturated.

For a low priced and subsistence commodity, grading is too expensive. Sweet potato grading and quality improvement include cleaning, washing and sorting. At the farm level, farmers sell the roots without any post harvest treatment. In the *borongan* (wholesale) system, the buyer directly transports the commodity to his storage place or to market. Grading is usually limited to separating the commodity by size.

In relation to storage of the product, few farmers own special space to store agricultural products, especially for a commodity like sweet potato. It is not uncommon that any part of farmers' house becomes storage space during the harvesting season.

In relation to transportation, one constraint is the availability and quality of the infrastructure. Marketing problems arises from two major causes: (a) poor availability of infrastructure, the mode of transportation and transportation facilities, sanitation and market conditions and (b) the nature of small and scattered sweet potato farms which causes high collecting time and cost.

Coupled with inappropriate packaging during transportation, substantial loss due to physical and quality damage might occur during the transportation process. The dispersed location of production and the natural characteristics of the product cause transportation costs to be a major component of the sweet potato price. In 1987 the transportation cost in Java was Rp 50-90/ton/km which contributes 5-15% of the Jakarta wholesale price. Interinsular transportation was Rp 50-150/kg. In 1994 the transportation cost from Bandung to Jakarta was about Rp 30-50/100 km or Rp 300-500/ton/km. This did not include transporting the product from the field to farmers' house which cost Rp 500/50 km.

5.4.4 Marketing margin

As occurs in many other agricultural product markets, distribution of the marketing margin in the sweet potato economy is biased towards traders. Table 5.16 shows that the profit margins to farmers, middlemen, trader or wholesaler are Rp 75/kg, Rp 22.5/kg, and Rp 20/kg, respectively. Although farmers acquired the highest profit margin per kg, in terms of unit of time the profit margins of middlemen and wholesaler are higher. Middlemen usually possess a very strong position in the sweet potato market. They actually control the market. During a price collapse, the price may be less than Rp 50/kg. Farmers may lose severely but traders and middlemen still manage to make some profit.

Table 5.16 Distribution of profit margin among market participants in Mandirancan, Kuningan, 1995.

Marketing Agent	Price (Rp)	Cost (Rp/kg)	Profit (Rp/kg)
Farmer	125	50	75
Middleman	150	2.5*	22.5
Wholesaler/Trader	200	30**	20

Source: Group interview in producing area of Mandirancan, Kuningan, April 1995.

Note: In April the price of sweet potato in this area is higher than average because of the small area of sweet potato production at this particular time.

* Harvesting cost was Rp 60,000/ha; production was 2.4 ton/ha.

** Transportation cost to Jakarta was Rp 150,000/5 ton.

In Turi, East Java, the farm gate price was Rp 114/kg (*Yayasan Mitra Tani* 1995). With the transport cost to Jakarta of Rp 60/kg and the price in Jakarta of Rp 400/kg, farmers have a good

opportunity to gain higher profit by selling the crop to the Jakarta market. This study estimated that the profit margin to local traders was Rp 50/kg, and Jakarta traders may gain a profit margin of more than Rp 100/kg. However, due to limited knowledge, access, capital, and information, it is almost impossible for farmers to directly market their product to consumer areas.

Price is determined by supply and demand mechanisms. However, as can be observed in any agricultural product market, an oligopsonic market (large number of sellers and few buyers) is very common. Up to the present time, few sweet potato studies have been done.

5.4.5 Constraints

Several conclusions can be drawn regarding sweet potato marketing:

- The market for sweet potato is relatively small and, therefore, does not create incentive to farmers. Increasing production under the current consumption pattern will result in a price decrease, primarily because of the oligopsonic power.
- Fresh root consumption of this crop is declining. Creating demand for further processing is essential to develop a better sweet potato market.
- Current methods of transaction and marketing are considered a disincentive for sweet potato market expansion. The degree of uncertainty in sweet potato transactions has kept the farm gate price low and there is no incentive for quality improvement.
- The highly concentrated market structure results in a weak bargaining position of farmers. This condition may lead to exploitation and hampers sustainable market expansion.

A common problem in sweet potato processing industries is the lack of raw material in terms of quantity, quality and continuity. The Indonesian farm structure is not only small, but also scattered, which makes the collection cost, collection time and post harvest damage exceptionally high.

Non continuity of supply is the main constraint for agroindustrial development and sweet potato processing. The sweet potato processing industry often fails to meet the agreed delivery time in the export market. Weak vertical coordination in the raw material market has hampered the processing industry. In the absence of economic incentive to farmers, production and quality of the product are difficult to improve. It is obvious that institutional aspects are dominant in this situation. A mutual and beneficial relationship between farmers and the processing industry has to be established to improve the farm-industry linkage. Poor marketing institutions such as the market structure, price information, and pricing mechanism have put farmers in a weak bargaining position in the marketing of their product. Although price information may be available at the price information center or announced over the radio, the prevailing price is usually to the advantage of the buyer.

6. Emerging Upland Commodities

6.1 Cabbage

6.1.1 Production potential

Cabbage has good prospects for the export market for several reasons: (a) a considerable potential area suitable for cabbage growing exists in Indonesia; (b) there is increasing demand for cabbage and Indonesia is close to importing countries such as Singapore, Malaysia, and Hong Kong; and (c) the government strongly supports horticulture development. Cabbage grows in many parts of Indonesia, such as Brastagi (North Sumatra), Bogor and Bandung area (West Java), Dieng area (Central Java), Malang area (East Java), and North Sulawesi. A new production area was established in South Sulawesi a few years ago and it has changed South Sulawesi from a vegetable importer to an exporter.

The harvested area increased more than twofold from 30,000 ha in 1982 to 61,000 ha in 1993 (Table 6.1). In the same period, yield increased from 11.0 tons/ha to 21.0 tons/ha, and production increased from 349 thousand tons to 1,282 thousand tons. Domestic consumption increased about 1.5 times from 2.25 to 3.49 kg/capita/year (DGFCH 1995).

Cabbage is a high risk commodity because of its sensitivity to climatic change, pests and diseases, besides its perishable and bulky characteristics. Long rainy periods stimulate mold diseases and pests. Farmers also tend to use a large amount of insecticides, which could be a disadvantage in the long run.

The yield of intensively-cultivated cabbage is 22-40 tons per ha, the total production cost Rp 6.0 million per ha (not including land rent), and the sale price Rp 200 to 250 per kg. Profit varies between Rp 0.5 and 1.2 million per hectare of harvested area depending upon the sale price of the product. The high production cost is the primary constraint, due to farmer's limited capital.

The handling cost is usually high and there is a large price difference between production and consumer areas. The price at the production area (the farm gate price) ranged between Rp 196 and 393/kg in 1994, and the consumer market price was Rp 197-993/kg (DGFCH 1995). Product damaged during transportation is around 20% at the village market, and 20% at the consumer market due to poor handling, packaging and transportation facilities.

Table 6.1 Harvested area, production and yield of cabbage in Indonesia, 1981-1993.

Year	Harvest Area (ha)	Production ('000 tons)	Yield (ton/ha)
1981	40,086	349.0	8.71
1982	28,920	317.1	10.97
1983	33,168	391.3	11.80
1984	39,999	584.1	14.60
1985	39,713	665.4	16.76
1986	44,342	820.4	18.50
1987	44,963	835.6	18.58
1988	43,134	771.3	17.88
1989	47,859	926.1	19.35
1990	52,237	1,071.8	20.52
1991	52,675	974.6	18.50
1992	55,316	1,213.4	21.94
1993	60,957	1,281.9	21.03

Source: DGFCH 1995.

Regardless of its physical features and price risk, cabbage is a highly profitable crop. On average, it generates Rp 2.3 million/ha (Table 6.2). Although this amount is lower than profit for tomato, cauliflower and green beans, its production and price risk are also lower.

Post harvest handling needs immediate improvement. There is very little incentive for better handling. However, farmers could obtain more income from vegetables like cabbage compared to traditional secondary crops.

Table 6.2 Average cost and revenue per hectare in vegetable cultivation in Lembang, 1993.

Commodity	Production Cost (Rp '000/ha)	Revenue (Rp '000/ha)
Cabbage	4,178	6,375
Tomato	8,478	11,550
Cauliflower	3,616	6,300
Green beans	4,456	7,715

Source: Computed from field data from *Gabungan Kelompok Tani Lembang Segar*, Lembang, 1995.

6.1.2 Marketing

Cabbage and other vegetable markets are competitive. There is no government intervention in horticultural markets and, since the buyers are relatively small in number compared to the number of farmers, the market structure tends to be oligopsonic. The market institution is generally very poor, and puts farmers in a weak bargaining position. In production areas, if there is no contract farming between farmers and buyers, farmers always sell the standing crop. Transactions and bargaining are made under uncertain conditions because both farmer and buyer do not possess accurate information on yield and quality. The market structure tends to be very concentrated, which discourages farmers from producing a high quantity and quality product due to the following reasons:

- The distribution of marketing margin is biased to traders.
- Farmers have to carry all production and marketing risks.
- Price fluctuation may cause a loss to farmers, but traders always gain a profit.

The government has attempted to improve the horticultural market by developing marketing arrangements which create mutual benefits between farmers and buyers. Supermarkets, hotels, restaurants, and exporters are among the potential private businesses that can establish marketing arrangements with farmers. This marketing scheme is in the initial phase of development but is already showing an increasing adoption.

The per capita availability (FBS data) increased from 2.01 kg/capita/year in 1981 to 3.49 kg/capita/year in 1990, although the average contribution to daily calorie consumption is very low (2 calorie/capita/day). The prospects for cabbage in domestic and international markets is mostly due to general increasing trends of vegetable consumption in almost all parts of the country. The price in consumption areas varies considerably. In Bandung and Medan the cabbage price in 1994 was Rp 295/kg, but in Pontianak and Banjarmasin it was around Rp 429-793/kg. Cabbage has to be exported from production areas in West Java, Central Java and North Sumatra to East Nusa Tenggara, Kalimantan, Sulawesi, Maluku and Irian Jaya. North Sulawesi has been an important production area, and South Sulawesi is becoming a new production center to supply eastern Indonesia.

6.1.3 External trade

Cabbage has been exported in large quantity especially from Medan (North Sumatra) to Singapore and Malaysia. The rich soil and suitable climate in the highlands of North Sumatra have made this area a production center of vegetables, fruits, and flowers. Exports have increased consistently as shown in Table 6.3. In 1985 the export of cabbage was 34,802 tons with total FOB value of $ 3.756 million. It declined until a recovery in 1988. Since then the volume of export has more than doubled and its value multiplied almost three times, which indicates an increase in per unit price, probably due to increase in quality or short supply of cabbage in Singapore and Malaysia. With the current domestic market structure, farmers receive a small portion of the profit margin. It is also reported that the quality of Indonesian cabbage in the Singapore market is low compared to other imported cabbage. More than 1/3 of the product is wasted and unsold due to improper packaging and transportation.

Table 6.3 Export of cabbage 1985-1993.

Year	Net Weight (tons)	Value FOB (US $)
1985	34,802	3,758,666
1986	24,937	2,560,390
1987	16,106	1,778,253
1988	29,170	3,857,798
1989	32,111	3,898,000
1990	27,066	3,737,563
1991	28,175	3,811,467
1992	56,988	7,265,482
1993	70,295	9,294,400

Source: CBS 1994.

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North Sumatra supplies 97% of the cabbage export. Its potential could be further improved since Indonesia can produce horticultural crops all year around and Indonesia exports cabbage all year round with a peak season in June and July. The current export destinations of Indonesian vegetables are Malaysia, Singapore and Hongkong. In 1985-1986 Singapore was the only importer of Indonesian cabbage. Since 1987 Malaysia and Hongkong also became important importers. Malaysia was the largest importer in 1987 (67.1%), and Singapore the second (35.5%).

Strategy to improve cabbage exports and horticultural crops in general should emphasize the improvement of cultivation technology and marketing institutions. The main constraints to this vegetable market are:

- Limited capital hampers cabbage farmers from using the best technology available, and does not allow farmers to escape the detrimental system of illegal financial markets.
- Seed and planting materials are expensive and not easily available at the production areas.
- The market structure tends to be oligopsonic and gives farmers little bargaining power in the produce market. This condition discourages farmers from improving both quantity and quality of the product.
- The supporting facilities such as transportation, packaging industries and cold storage facilities are inefficient.

6.2 Mango

6.2.1 Production potential

Mango is a promising fruit to cultivate for several reasons. Besides Indonesia's suitable climatic conditions, the market for exotic tropical fruits is increasing. The large number of mango varieties in Indonesia has been an advantage as well as a disadvantage. Some varieties are highly respected as exotic tropical fruit, while others are more suitable for juice. The sweetness, aroma and

the color of the fruit also vary. Consumer preferences also differ considerably. However, the fruit's genetic characteristics developed in research and development have not been focused for a particular market, which usually demands standardized size, sweetness, color, and performance. Mango is usually not commercially grown but is grown in home yards. Mango production is very seasonal with the peak season varying between Java (July-September) and South Sulawesi (August-January).

Demand for mango is increasing rapidly. Except for occasional and location specific peculiarities, demand outstrips supply, resulting in high prices, particularly at the beginning and the end of the season. In the near future, demand for high quality mango will increase and consumers will be willing to pay a premium for quality fruit. Good varieties such as *golek, harummanis, gedong, and manalagi* are highly demanded in the domestic market. Most of the genetic improvement was focused on improving the sweetness and aroma to meet domestic consumer preference. Most varieties have a green peel and off white meat which is not preferred in the world market. Some have red and yellow colored skin and meat (such as *gedong* and other low quality mango which are good for juice) with potential for further improvement for the world market.

Mango production doubled in 10 years from 325 thousand tons in 1980 to 620 thousand tons in 1992 (Tables 6.4 and 6.5). However, there is no single key responsible for the market expansion. The dominant characteristic of the mango sector in Indonesia is its diversity. Production areas are scattered throughout a large area, often with difficult access to the markets, transport networks, and the existing infrastructure.

Table 6.4 Production of mango, 1980-1992.

Year	Production (tons)
1980	325,225
1981	308,601
1982	423,139
1983	444,534
1984	442,244
1985	416,444
1986	415,041
1987	515,949
1988	531,968
1989	445,042
1990	508,889
1991	640,457
1992	615,653

Source: DGFCH 1995.

Table 6.5 Fluctuation of mango production by region (ton), 1991.

Region	Quarter I	Quarter II	Quarter III	Quarter IV	Total
East Java	7,053	7,046	124,358	152,679	291,136
West Java	16,871	3,171	47,543	109,568	177,153
Central Java	2,550	1,532	45,956	33,422	83,460
Sumatra	4,443	3,912	4,013	7,098	19,466
Kalimantan	792	149	410	3,006	4,357
Sulawesi	6,869	1,105	101,797	7,880	17,651
Indonesia	43,031	18,408	232,102	346,916	640,457

Source: Central Bureau of Statistics, Agricultural Survey: Fruit Production in Indonesia, 1991.

Java is the largest producer, accounting for more than 86% of the total production in 1991. East Java contributed almost one half of the national production that year. The pattern of production in Java, Sumatra and Kalimantan is similar, but Sulawesi shows a different pattern (Table 6.5). In general Indonesia has an advantage in supplying the world market because of its different mango season from Thailand, the Philippines and Australia. During the slack season in those three countries, Indonesia supplies the Singapore market.

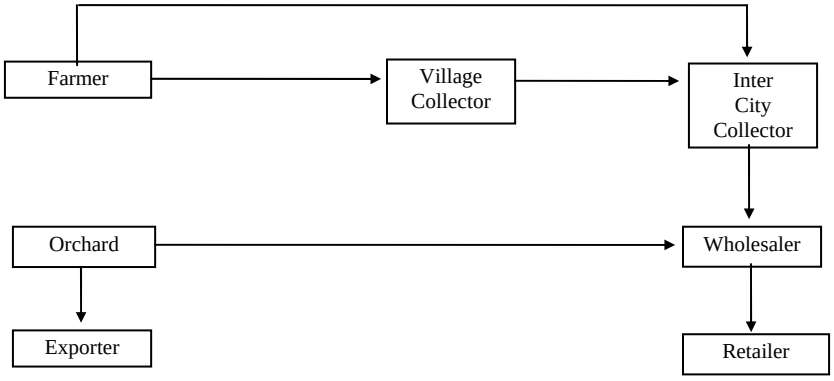
Beginning in the early 1990s the government designed a special program to establish mango and fruit production centers throughout the country. The production centers are expected to produce a sufficient amount of fruit in a large contiguous area for processing and marketing in an agribusiness scheme. At the same time, some small and medium (150-600 ha) orchard type mango plantations started growing especially in East Java. The export of mango is beginning to increase. Grading, quality standards and processing are given intensive support by the government.

6.2.2 Domestic market

Marketing channels in the mango market are presented in Figure 6.1. In East Java the marketing channel includes: farmers, village collectors, intervillage large traders, wholesalers, exporters, and retailers.

Individually, mango farmers are usually weak in terms of bargaining, marketing, information, and access to the consumer market. With limited access, the best approach for farmers is to sell the produce to village collectors who are frequently hired by wholesalers. Most farmers sell their mango in *tebasan* or bulk system when the fruit is still on the trees.

Figure 6.1 Marketing channels of mango in East Java, 1994.



The domestic market of mango is highly seasonal and mango is only available in the market during the season. Cool storage for mango is not common due to the rapid change in aroma and flavor. The price of high quality mango in Indonesia is higher than the FOB price (ADP 1995). Income elasticities of demand for mango in South Sulawesi and East Java in 1993 were 0.76 and 3.06 (Table 6.6). As indicated by income elasticity, a 1% increase in real income in East Java will increase mango consumption by more than 3%. Inelastic income elasticity in South Sulawesi may be related to low quality mango in this area.

Table 6.6 Income elasticity of demand for fruit in South Sulawesi and East Java, 1993.

Commodity	South Sulawesi	East Java
Citrus	1.525	4.51
Mango	0.758	3.06
Rambutan	1.445	4.43
Durian	1.560	4.66
Salak	1.093	3.73
Banana	0.423	2.39

Source: ADP 1995.

6.2.3 External trade

Over 1987-1993 exports of mango fluctuated with an increasing trend. In 1987 export of mango was 307 tons with a total value of $ 231,665. In 1992 the export reached 966 tons, then declined slightly in 1993 to 929 tons (Table 6.7). The value, however, increased from $ 1,221,773 in 1992 to $ 1,417,291 in 1993. There was a large increase in price of mango in 1993 (Table 6.8).

The unstable export of mango is related to several factors. The primary factor is that the mango export destination relies on one country. Singapore so far absorbs more than 80% of Indonesia's mango export. In Singapore the demand for sub tropical fruit such as apple, pears, and tangerine is far larger that for mango. In addition, the Philippines and Thailand have dominated the mango market in Singapore. The second factor is that genetic, processing and other product development of mango in Indonesia began just recently. Genetic improvement of Indonesian mango has not been directed to the world market preference which demands good color, flavor and performance (ADP 1995). Third, mango production has relied on small scattered production areas resulting in low quality, and high transport and collection cost and time. Non continuous production of mango has constrained the establishment of processing and marketing industries.

Table 6.7 Export of mangoes, 1985-1993.

Year	Net Weight (tons)	Value FOB (US $)
1987	306.583	231,665
1988	738.066	552,041
1989	301.193	402,203
1990	572.649	579,465
1991	722.820	613,474
1992	965.958	1,221,773
1993	929.061	1,417,291

Source: Calculated from Central Bureau of Statistics, 1987-1994.

Table 6.8 Average FOB price of East Java mango, 1985-1993.

Year	FOB, Juanda (US $/kg)
1985	0.32
1986	0.17
1987	2.07
1988	0.55
1989	1.16
1990	1.04
1991	1.00
1992	1.72
1993	1.98

Source: *Statistik Jawa Timur* 1994.

The market prospects of mango are also related to the increasing orchard type plantation using high quality varieties and professional cultivation. A significant improvement in mango exports is due to:

- high quality orchards which have been developed in East Java;
- establishment of new production centers all over the country;
- new marketing arrangements being developed by these orchards with farmers; and
- new marketing methods such as mail order, which have also been developed in East Java.

6.3 Potato

6.3.1 Production potential

Potato is an important vegetable in Indonesia and in the export market. Potato production increased at a rate of 4% annually during 1988-1993. In 1981 the harvested area was 30,278 ha, production 216,713 tons, and yield 7.16 ton/ha. In 1984 demand for potato grew 17.6% per year, while production growth was 13.2%. Potato market prospects have received sufficient response from farmers. The harvested area increased, and planted area expanded not only on the highland plateau but also at lower altitudes. The harvested area remained around 30-32 thousand ha until it increased rapidly in 1988. In 1988 the harvest area was 38,983 ha and production 418,154 tons, almost double than in 1981. In 1993 harvested area was 54,802 ha, production 866,840 tons and yield 15.8 ton/ha (Table 6.9). The largest potato producers in 1993 were West Java (12,339 ha), Central Java (12,991 ha), and North Sumatra (11,766 ha).

During the last decade potato production multiplied as much as four times due to the increase in harvested area (almost doubled) and yield (more than doubled). This large increase in production is just about parallel with the increase in demand of about 20% per year. The government has actively supported this market expansion. In general the government's intention to support the development of horticultural crops is due to:

- The development of horticultural crops has been far left behind compared to cereal crops.
- Horticultural development has a large potential because of the area availability, climatic condition and market prospects.
- Horticultural crops have potential as new sources of agricultural growth as rice and traditional crops approach the leveling off stage.

Table 6.9 Harvested area, production and yield of potato in Indonesia, 1981-1993.

Year	Harvested Area ('000 ha)	Production ('000 tons)	Yield (ton/ha)
1981	30.3	216.7	7.16
1982	21.0	164.8	7.85
1983	30.3	250.0	8.25
1984	33.0	371.6	11.25
1985	32.4	372.8	11.53
1986	37.2	446.3	12.01
1987	32.1	369.0	11.52
1988	39.0	418.2	10.73
1989	39.2	559.4	14.26
1990	44.9	628.7	13.99
1991	39.6	525.8	13.27
1992	48.9	702.6	14.38
1993	54.8	866.8	15.82

Source: DGFCH 1995.

The government's effort to increase production and marketing of horticultural crops including potato has been comprehensive, extending from research to processing and marketing. A significant change in research strategy is the integrated research, beginning from input supports and marketing, production technology, processing and marketing. Studies on fruits, for example, have

focused on tropical fruits which have a comparative advantage compared to subtropical fruits such as grape and apple.

Local varieties of potato such as Granola, Cipanas, and Segunung are widely used by farmers. Recently, new varieties from the Netherlands, called Monza and Alpha, have proven to be superior to local varieties in both quality and yield. Cultivation techniques of potato are developed in research stations and disseminated by the extension service of the Ministry of Agriculture.

To improve cultivation techniques, the government should pay more attention to integrated pest management. Although particular types of pesticides and herbicides have been banned in rice cultivation, they are still used on vegetable farms. High application of these chemicals on vegetables is due to the high risk of pest and disease infestation.

The marketing institution is probably the last crucial factor in horticultural growth in Indonesia. Guaranteed price and supply are essential to provide an economic incentive to both farmers and buyers. Cooperatives and contract farming are being implemented in many production centers, with substantial impact on farmers' income and supply continuity. The pioneers of this marketing arrangement have benefited from the cooperation with farmers.

6.3.2 External trade

The current increase in domestic demand comes from the booming food industries and restaurants. For the domestic market, daily supply of potato from production centers in Bandung and Bogor areas to the surrounding areas is quite large. Demand for potato in Singapore, Malaysia, Taiwan, Hongkong, Korea and Japan is large but the Indonesian market share is still small.

The volume of export steadily increased since 1984. In 1993 the volume of export was 126 thousand tons or about 10 times than that in 1984. However, the export has been mainly to Malaysia and Singapore. Other export markets such as Japan, Korea, Hong Kong, and Taiwan are supplied by other countries such as Australia, New Zealand and Thailand.

The current export is not large but it shows prospects for improvement in the future. The volume of export in 1984 was 12,295 tons which was about 3% of the national production of 371,546 tons. In 1993 the total export was 126,584 tons, accounting for 14.6% of the national production of 866,840 tons. Total foreign exchange earning from potato exports in 1993 was $ 19.05 million which was an increase from $ 1.36 million in 1984 (Table 6.10).

Table 6.10 Export of potato, 1984-1994.

Year	Production (tons)	Export (tons)	Export ($ '000)
1984	371,546	12,295	1,356
1985	372,825	19,288	2,023
1986	446,295	21,872	2,176
1987	368,961	34,297	2,685
1988	418,154	57,045	6,225
1989	559,396	71,350	10,020
1990	628,727	76,775	10,266
1991	525,839	98,177	13,932
1992	702,584	96,470	15,555
1993	866,840	126,584	19,050

Source: DGFCH 1995.

The potato for export is high quality potato which meets quality standards determined by the importer. However, for a larger export promotion, the marketing system has to be significantly improved. In general there are two models of vegetable exports, namely:

- export that is based on daily order which occurs from Bandung to Singapore. The exporter has to buy and collect potato from farmers, select and grade, clean, pack and ship directly to Singapore. This model of export does not guarantee the quantity, quality and continuity. Therefore, this system should be improved gradually.
- export that is based on contract farming. This trading model is adopted by large companies which also produce or directly cooperate with farmers in contract farming. High quality potato is grown in Central Java (Wonosobo) under the supervision of a large company. High quality seed and sufficient inputs are supplied to farmers who, in turn, supply the company under a legal contract. The product is not for domestic market but only for export.

The import of potato is very small and has continually declined in the period 1984-1993. In 1984 the volume of import was only 625 tons or 5% of the export with value of $ 425 thousand. Import of potato seed is larger than the import of potato and shows an increasing trend. In the 1980s the import of potato seed averaged 240 tons with an average value $ 162 thousand. Beginning in the year 1991 the import of potato seed increase 2-3 times to more than 600 tons with an import value of around $ 600 thousand. This is an indication that potato farms have used better quality seed besides implementing better cultivation techniques. As shown in Table 6.9, the yield increased from 7.16 t/ha in 1984 to 15.82 t/ha in 1993.

6.3.3 Strategy for further improvement

The weakness in the marketing system which has been identified in many studies (see Pakpahan et al. 1992) can be summarized as: (a) limited capital of farmers, (b) weak marketing institution, and (c) inadequate facilities. Potato cultivation is costly and risky. With limited capital, the application of better farming practices is usually difficult. The production cost per ha is about Rp 6 million which is too much for most farmers. In addition, physical risk such as climatic conditions, pests and diseases, and market risk are important factors the farmers have to face.

Regardless of the absence of government intervention in the vegetable market, the domestic market does not provide sufficient economic incentive to farmers to improve vegetable quality. Post harvest treatment such as cleaning, storing, and packaging is too expensive and does not generate sufficient added value. The market structure which tends to be oligopsonic gives farmers little bargaining power. Pricing is a crucial factor because there is no process to ensure fair and secured pricing.

Potato export has potential and will become a large source of foreign earning. Greater efforts to improve export include: (a) auction markets at production areas, which are important to improve market efficiency; (b) credit provision for farmers to encourage the implementation of cultivation technology; (c) provision of transportation, storage, and packaging facilities at production centers, and (d) improvement of the process and pricing procedure at the central market.

7. Successful and Failed Domestic/Export Market Attempts

7.1. Cacao

7.1.1 Cacao area expansion

Cacao, a relatively new estate crop in Indonesia, was established in 1976. The planned expansion of cacao area during the cacao market boom in the 1970s has brought success to cacao market development, which has further promoted cacao to a rapid production increase. More than 60% of the cacao area in Indonesia was under smallholder plantations. In 1985 the smallholder plantation of cacao was 51,765 ha, state owned plantation 29,198 ha, and private large plantations 11,834 ha. The state owned plantations were located mainly in North Sumatra and East Java, which accounted for 70% of the total state owned plantation. By 1994 the state owned cacao plantation had more than doubled (68,551 ha) but North Sumatra and East Java remained as the center of state owned cacao plantation.

In the early development of large private plantations in 1979, Maluku and East Java shared the largest area accounting for 75% of total large private cacao plantation. The share changed rapidly when more large plantations were opened in North Sumatra, Lampung and Bengkulu. In 1994 the cacao plantation area in these provinces was 20,616 ha, 10,950 ha, and 15,520 ha, respectively, or about 47% of the total area. Large private plantations were opened in almost all parts of the country, except in South Sumatra, Yogyakarta, North Sulawesi, Bali, NTB, DKI Jakarta and Timor Timur. Large private plantations area increased from 8,033 ha in 1979 to 11,834 ha (1985), 47,653 ha (1990), and 99,505 (1994).

Smallholder cacao area has increased tremendously from 10,722 ha in 1979 to 51,765 ha (1985), 252,237 ha (1990) and 389,946 ha (1994). The incredible expansion of smallholder plantations was a consequence of local government initiatives in cacao plantating. In the early years of cacao development (1979), East Nusa Tenggara, Maluku and Irian Jaya had the largest cacao region. In the 1980s more aggressive expansion of this commodity made Sulawesi a leading region of cacao plantation. In 1994, South Sulawesi smallholder cacao plantations covered 100,250 ha (25.7%), South-East Sulawesi 71,415 ha (18.3%), and Central Sulawesi 24,184 ha (6.2%). Other important production centers are East Kalimantan, East Nusa Tenggara, Maluku, and West Sumatra (about 20,000 ha each), and Lampung (11,910 ha).

Some current cacao plantation is not yet producing. The production of state owned plantations in 1994 was 42,122 tons (North Sumatra and East Java accounted for 80%), large private plantation 32,770 tons, and smallholder plantations 196,235 tons. The plantation area is still expanding, and production is expected to continually rise.

7.1.2 The local government policy

South Sulawesi is probably the most active in expanding the cacao plantation area. The local government encouraged farmers to grow cacao for a simple reason, that the demand for cocoa at that time was increasing. Local people returning from cacao plantations in Malaysia brought home some technical and market knowledge about cacao and became pioneers of the cacao plantation expansion in Sulawesi. Cacao was planted on large areas of uncultivated agricultural dry land. Southeast Sulawesi which regarded the commodity as a regional development priority was also a rapidly developing cacao production area.

Cacao beans are directly exported or processed to export. Processing produces cocoa butter and cocoa powder. Roasted cocoa nib is ground into cocoa liquor. The cocoa butter and cocoa cake are separated using a hydraulic press. Further processing of cocoa cake produces cocoa powder. Cocoa butter is the main product of cocoa processing, and provides most of the profit of cocoa bean processing.

In the current supply and demand situation, the cocoa bean market seems to be fairly competitive. Processing industries in Jakarta, Medan, Surabaya and other large cities have to compete with the export market to obtain cocoa beans from farmers. At present market conditions, farmers sell unfermented or semi-fermented beans although the fermented beans carry a premium of Rp 200/kg compared to unfermented beans. Quick sale is still preferred due to the farmers' immediate need for cash.

Cocoa beans produced by smallholders generally have lower quality compared to those produced by larger estates. The larger cocoa estates usually sell under contract with predetermined quantity and quality. The smaller processing companies usually purchase cocoa beans directly from farmers. There are also importers who directly contact cocoa farmers and inspect the quality and post harvest processing. The quality standards for high quality chocolate products are very strict. Some importers prefer to buy unfermented beans because it is easier for them to control the processing.

7.1.3 Demand and market prospects

Demand for cocoa beans by importing countries is rising steadily. The cacao development program in Indonesia seems to have good momentum to gain in the market. As expected, with the current growth of the plantation area, Indonesia will be soon become the world's second largest cacao producer and exporter after the Ivory Coast. Import of cacao beans during 1988-1990 exhibited an increasing trend with European countries being the largest importers followed by North American countries and USSR. The developing countries, with a population double that in developed countries, imported only one tenth (Table 7.1). Ivory Coast cacao is believed to be the best quality with a premium price. However, with further cultivation and post harvest processing, Indonesian cacao will achieve the same quality.

Table 7.1 World import of cacao beans, 1988-1990 (tons).

Country	1988	1989	1990
Developed Countries	1,409,016	1,536,066	1,644,474
North America	259,146	286,482	360,569
Europe	965,296	1,021,022	1,110,118
Oceania	1,049	137	78
USSR	138,535	179,438	120,000
Other	44,990	48,987	53,599
Developing Countries	135,093	124,121	131,627
Total	154,109	1,660,187	1,776,101

7.1.4 Export

Indonesian cacao export has increased at a high rate. In 1983 the export of cacao beans was 15,885 tons valued at $ 26.350 million with Belawan in North Sumatra as the primary port of cacao shipment. By 1993 it had increased more than ten-fold to 200,111 tons valued at $ 165.679 million, with the largest shipment from Ujung Pandang (South Sulawesi) where the largest plantation was now located.

Indonesia also exports cocoa butter. Total export of cocoa butter in 1991 was 10,509 tons worth $ 22.883 million (Table 7.2). USA was the largest importer of cocoa butter, followed by the Netherlands, Sweden, Japan, Spain, Singapore, and other countries.

The only competitor for Indonesian cacao in Asia is Malaysia. Although the current Malaysian plantation area and production are probably lower than Indonesia's, its processing improvement has prompted the country to export processed cocoa butter and other cocoa products of better quality.

Table 7.2 Importers of Indonesian cacao butter, 1991.

Country	Volume (tons)	Value ($ million)
USA	5,330	13.222
Netherlands	2,658	6.207
Sweden	1,480	1.028
Japan	574	1.678
Spain	200	0.152
Singapore	84	0.295
Others	183	0.301

Since a large percentage of the cacao plantation in Indonesia is still in its growth phase, production is expected to increase in the near future. About 16% of state owned plantation, 52% of large private cacao plantation, and 35% of smallholder plantations were under 4 years of age in the year 1994. In the next four years, production is expected to increase by at least 40%.

Cacao processing industries have been assisted by various government measures. Improvement of bean quality and product diversification have become the main focus to increase the competitiveness of Indonesian cacao beans and cacao products. However, there are other factors that jointly induce successful cacao development in Indonesia. These factors are:

- low labor cost;
- suitability of cacao for smallholder plantations. It is manageable by small farmers, not bulky, so transportation cost is low, with easy post-harvest processing at the farm level. All year round production of cacao secures farmers' income;
- the right timing for expansion of cacao plantation when the market for cacao was about to increase; and
- the development of cacao plantations was also followed by increasing development of domestic confectionery industries.

7.2 Palm oil

7.2.1 Measures on oil palm development

The establishment of state owned oil palm plantations started in early 1960s. The state owned plantation area increased only 15% in the last 10 years from 340,511 ha in 1984 to 393,696 ha in 1994. Large private oil palm plantations expanded rapidly from 130,958 ha in 1984 to 818,979 ha in 1994. Smallholder plantations increased from 40,552 ha to 564,597 ha in the same period. These rapid changes are due to active measures of the government in supporting estate development through the NES (Nucleus Estate Smallholder) and PIRTRANS (Transmigration Smallholder Nucleus Estate) programs. The following factors are responsible for the success of oil palm development:

- expansion of oil palm plantations through the PIRTRANS (Transmigration Smallholder Nucleus Estate). The government credit policy for oil palm development boosted the oil palm estate plantation, especially the private plantation. The PIRTRANS has some advantage compared to traditional smallholder tree/estate crop plantation due to good vertical coordination between production activities by farmers and processing/marketing by the nucleus enterprise. This program became the model for estate crop development in new areas, especially Sumatra, Kalimantan, and Eastern Indonesia. The same model has been widely used for rubber, coconut, and cacao.

- the establishment of domestic cooking oil industries has been fully supported by raw material from oil palm plantations. Domestic demand for cooking oil increased steadily and prompted the government to set a policy to secure the supply of crude palm oil (CPO) for the cooking oil industry. Indonesia also occasionally imports CPO from Malaysia to supply the cooking oil industry. As demand for cooking oil increases, the market for oil palm will be secured for years in the future.
- the government also takes some measures to encourage the establishment of complementary activities in palm oil production centers such as cattle raising and fattening using oil palm by-products as cattle feed.

7.2.2 Market prospects

Table 7.3 shows the rapidly increasing domestic demand for palm oil products. Total demand for palm oil doubled every 5 years in the period of 1978-1992. Demand for palm oil in 1992 was projected to be 1,291 thousand tons.

Table 7.3 Trends and projection of vegetable oil consumption in Indonesia, 1978-1992.

Item	1978/82	1983/87	1988/92
Total palm oil ('000 tons)	309.0	754.0	1,291.0
Vegetable oil (kg/capita/year)	6.4	8.4	10.4
Palm oil (kg/capita/year)	2.0	4.5	7.0
Palm oil as percent of vegetable oil (%)	32.0	54.0	67.0

From the market prospect, palm oil is a competitive edible oil compared to the earlier well known soybean, coconut, and sunflower oils. The climate, temperature, humidity, and sunlight duration of tropical Indonesia provide a perfect milieu for oil palm development. Currently, oil palm is probably the most important estate crop for Indonesia and its demand is always increasing due to the wide use of this commodity. Besides its use as cooking oil, a wide variety of products from CPO include olein, stearin, cosmetics, pharmaceuticals, detergents, and sweeteners. The large populations in Indonesia and other importing countries such as China, India, Pakistan, Eastern Europe, and African countries constitute potential markets for palm oil in the future.

World production of palm oil and kernel oil in 1992 was 12,024 thousand tons and 1,532 thousand tons. The largest producers of CPO are Malaysia (39.4%) and Indonesia (23.9%). Similarly, the largest palm kernel oil producers are Malaysia (53.0%) and Indonesia (17.8%). The world export market of CPO is 8,574 thousand tons, and for palm kernel oil 831 thousand tons. The share of Malaysia is 66.8% and 56.9%; and for Indonesia 16.3% and 26.7%, respectively. West Europe is the largest importer of CPO (21.2%), followed by China (10.0%), Pakistan (10.7%), and Singapore (8.9%). The largest importers of palm kernel oil are West Europe (45.2%) and USA (19.8%).

The market for palm oil is not only increasing but also becoming more diversified. Many countries import palm oil for different uses. Among the importing countries, China is the largest potential market (Table 7.4). China is a big country with the largest population in the world and it is a temperate zone country where oil palm plantations cannot survive.

7.2.3 Export

Indonesian CPO export has to compete with the domestic demand. Since cooking oil is an important food commodity, the market supply is usually secured to avoid substantial price increases. Since it contributes significantly to inflation, the cooking oil price is always regulated and stabilized. The increase in domestic demand for palm oil is also due to the decreasing role of coconut oil. Since 1981 around 70% of palm oil production was allocated for domestic consumption.

Indonesian CPO export has tripled in 10 years (Table 7.5). In 1983 the CPO export reached 345,770 tons and in 1993 it was 1,221,800 tons. The export value increased from US $ 111.46 million to US $ 413.32 million. The kernel oil export in 1986 was 62,380 tons and in 1993 150,270 tons with export values of US $ 15.77 million and 59.12 million, respectively (Table 7.6).

The main market of Indonesian palm oil is Europe. In the 1987-1990 period, export to European countries was around 50-80% of the total palm oil export.

Table 7.4 Palm oil importers in the world market ('000 tons).

Country	1987	1988	1989	1990
EU	1065	1,098	1,266	1,556
China	255	445	734	1,133
Singapore	633	664	757	880
India	1,174	946	456	668

Source: Central Bureau of Statistics 1994.

Table 7.5 Export of Indonesian palm oil, 1983-1993.

Year	Volume ('000 tons)	Value ($ million)
1983	345.77	111.46
1984	127.93	63.27
1985	519.06	189.39
1986	504.49	97.14
1987	452.04	120.44
1988	661.09	247.23
1989	661.26	200.65
1990	681.99	164.89
1991	1,084.50	308.42
1992	970.63	332.74
1993	1,221.80	413.32

Source: Central Bureau of Statistics 1994.

Table 7.6 Export of Indonesian kernel oil, 1985-1993.

Year	Volume ('000 tons)	Value ($ million)
1986	62.38	15.77
1987	80.23	23.17
1988	70.02	28.30
1989	120.57	43.98
1990	133.38	38.60
1991	83.18	26.95
1992	59.62	23.76
1993	150.27	59.12

Source: Central Bureau of Statistics 1994.

7.2.4 Future production and market share

Increasing investment of both domestic and foreign capital prompted the rapid oil palm production. To anticipate the more open market, new plantation areas of 100,000 hectares in West Kalimantan will be opened soon. The local government has taken some important measures related to infrastructure and facilities required to develop this commodity. The smallholder plantation under five years of age in 1994 was about 235,000 ha or 42% of the area, while for large private plantations, it was 532,000 ha or about 65% of the total area of oil palm plantation. These figures

indicate that future production will be large and, consequently, will need immense supporting transportation and processing facilities.

In 1992 Indonesian palm oil production was half of that of Malaysia. Indonesia's palm oil production growth was 13.4% compared to 7.7% for Malaysia's production. With the enormous effort to boost production, Indonesia will probably become the world's largest palm oil producer in the next 10 years.

The successful development of palm oil production is due to several prominent factors, including:

- institutional marketing development through PIR (*Perusahaan Inti Rakyat* = Nucleus Estate Smallholder). The PIR concept, introduced in the early 1970s, is basically social engineering to combine technical, economic and social institutions in solid vertically integrated economic activity. The palm oil industry relies heavily on a large processing investment. A PIR or NES program is considered more appropriate to rapidly develop the palm oil industry in the country.
- technological advancement in palm oil processing. A wide range of product development helps to accelerate market development.

7.3 Canned pineapple

7.3.1 Models of the pineapple processing industry

Two basic models of fruit and vegetable processing exist in Indonesia. The first model, called the *vertical integration model*, is an integrated production model where all economic activities such as production of raw materials, processing and marketing are established under one management because the processing plant has its own raw material plantation. The second model, called *the vertical coordination model*, is where a large processing plant does not have its plantation, but relies on supply from a large number of farmers.

The *vertical coordination model* is faced with management and synchronization problems between the separate objectives of farmers and the processing industry. The vertical coordination processing model is characterized by the following conditions:

- different objectives between farmers and the processing industry. In this situation, farmers and the processing company intend to maximize profit from their enterprises. These objectives are not necessarily compatible in the sense of quantity, quality, and supply continuity of products. The optimal size of a pineapple farm for farmers is different from the optimal size for supply of raw material to the processing plant. Large price fluctuations limit farmers from producing at a secure level to avoid a great loss from a price drop. This rational economic behavior of farmers is a disadvantage to the processing company, which demands a high supply of raw materials.
- this model provides diverse markets for the raw material. Besides the processing plants, other markets for pineapples are restaurants, hotels, and direct consumers. Lack of coordination in a contract and marketing arrangement may cause an uncertain supply of raw materials.
- market structure of pineapple is an oligopsonic market. In a vertical coordination model, the processing company has potential power to create a monopsonic power and enforce its ability to determine price. In such a case, farmers have no more economic incentive to produce a large quantity of good quality to continually supply the factory.
- separate and non synchronized management at farmer and processing levels has created inefficiency in production-processing-marketing activities. Delivery contracts to importing countries are frequently delayed due to the lack of raw materials which further ruined the reputation of some of Indonesia's canned fruit exporters.

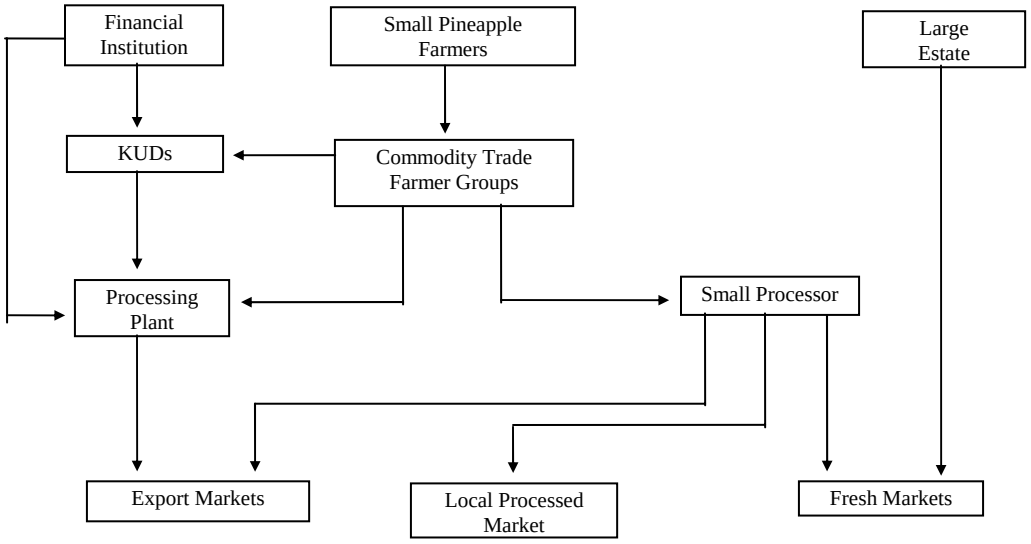
7.3.2 A story of failure in pineapple canning

This case of unsuccessful pineapple canning company in West Java is characterized by management and interest synchronization problems. A modern processing plant with 80 ton/day processing capacity was built with the financial support of national and private banks. The banks advanced funds to several village cooperative units (KUDs) to purchase pineapple from small farmers and supply the processing plant. The plant has no nucleus estate to provide the minimum input requirement for its operation or to stabilize its cost of raw materials. This failure is believed to be caused by the following:

- low land holding by participating farmers. Farmers on average own less than 1 ha of land, and grow a variety of crops to reduce financial risk and insure production of necessary food crops. It is not likely that they will be easily convinced to grow monoculture pineapple no matter what incentives are offered.
- complicated marketing channels.
- the role of the village cooperative in this credit and marketing scheme was very important (Figure 7.1). However, it was not completely supported by good management and skilled personnel.

The entire operation was to be overseen by a "Pineapple Forum" which included representatives of all the parties to the agreement and was to meet every three months under the leadership of the government.

Figure 7.1 Flow of funds and commodity to a pineapple cannery in West Java, 1992.



7.3.3 A success story: the vertical integration large plantation model

The rapid development of Great Giant Pineapple in South Sumatra is an example of a success story of the vertical integration model as found in other large plantations of rubber, palm oil, tea, coffee or cacao, where the whole planning process covers all subsystems and adequate control over the production of raw materials. The company cultivated 13,000 ha and since then the company developed into a highly competitive pineapple canning industry. In this case, the entire production and processing technology belonged to the company. The development of an estate type plantation was encouraged by deregulation of land utilization rights in 1993 which allows large investors to utilize land for up to 30 years, with possible renewal for another 30 years if necessary. This regulation allows an investor to make a longer production and investment plan. The company

also implemented modern management and high technology in cultivation, processing and marketing.

The success is also related to well integrated planning, organizing, operating and controlling from production, processing and marketing of the products. Planning on planting, for example, can be designed to meet the schedule of processing and marketing. Furthermore, raw material production, processing and marketing is one unit of the business with the same objective so different interests between production, processing and marketing subsystem a do not exist. Lastly, under the integrated system, the implementation of technology and standardization is easier and fully controlled by the company.

The large increase in canned pineapple export (sliced and juice) beginning in 1985 is due to the rapid development of integrated pineapple processing industries, especially Great Giant Pineapple (Table 7.7)

Table 7.7 Export of processed pineapple, 1984-1992.

Year	Volume (tons)	Value ($ '000)
1984	614	344.6
1985	9,312	5,314.7
1986	18,977	8,532.6
1987	26,952	13,757.2
1988	27,495	14,231.8
1989	48,292	22,471.0
1990	na	na
1991	63,932	45,468.0
1992	71,485	47,004.0
1993	99,397	49,702.0

Source: Directorate General of Food Crops and Horticulture 1995.

Successful vertical coordination models are to be found in the tobacco marketing arrangement between farmers and BAT (British American Tobacco) in Lombok, and in contract systems for mushroom and potato with PT. Mantrust in Dieng Platean, Wonosobo, Central Java (IPB 1993).

7.4 Passion fruit

7.4.1 Production and market prospects

Passion fruit is an exotic tropical fruit with an increasing consumption both in domestic and international markets. In Indonesia the more popular *markisa* juice has been widely known although a significant amount of fresh fruit is now available in the market. The total area of passion fruit in Indonesia is estimated at around 1,000 ha of purple passion fruit and about the same area of golden passion fruit. South Sulawesi and Sumatra are the main passion fruit producing areas. There are only two passion fruit processing factories in the country, both of them currently operating far below installed capacity due to lack of passion fruit supply. If the two plants fully operated, Indonesia would be one of the largest passion fruit juice producers in the world. On average, the factories in Malino, South Sumatra and in Brastagi, North Sumatra operate at 20-30% of their installed capacity.

There are actually two different views of the passion fruit problem. While farmers have no technical constraint in producing more fruit as long as the price is right, the processing company considers the price is too high for them to be sufficiently profitable.

The international market prospect of passion fruit is currently small but steadily increasing. In Europe and USA the juice is mostly blended with other juices. However pure juice is increasingly preferred. In Indonesia passion fruit juice or *markisa juice* is a special product, priced higher than orange, apple or other fruit juices. The domestic demand for passion fruit juice is high in Indonesia, however the supply is quite limited.

Passion fruit has been grown for many years in Indonesia for its aromatic juice and pulp. In Indonesia passion fruit is consumed as juice as well as fresh fruit. The fresh fruit is readily found at the market or among fruit vendors along the street. However, good pure passion fruit juice is not easily found. The one product available in the market is usually already sweetened, and of low quality by international standards.

7.4.2 Marketing

There is no marketing regulation on fruit, including passion fruit. Increasing attention to Indonesian tropical fruits instead of subtropical fruit, such as apple and grape, has changed some research and development priorities on fruit. Passion fruit is one fruit with good potential for development due to its suitability with the agroecosystem and its market potential. Current yield of Indonesian passionfruit is low compared to the potential yield. Current yield of passionfruit in an intensive farm is around 13-18 ton/ha/year which is about 30% of the average yield in Australia, or about 15% of the reported maximum yield of 50-60 ton/ha/year in Africa and Malaysia. At the farm level the average yield is around 4-5 ton/ha/year. Income to farmers is usually lower than that from competing commodities such as vegetables.

Market outlets for passion fruit are traditional fruit markets (usually along the street) and processing factories. Post harvest handling is usually poor. Brown spots on the fruit's skin make the fruit less attractive. Without proper post harvest handling, the lifetime of the fruit is usually very short, and the percentage of decayed fruit is high. The market volume of fresh fruit is small and limited to local markets around the producing areas and large cities.

Large demand for passion fruit is expected from the processing factories. Local government and the Ministry of Cooperatives initiated the establishment of a processing factory at the passion fruit production center in Malino, South Sulawesi. The processing factory also has a 220 ha passion fruit plantation as a nucleus estate. Plasma farmers grow passion fruit and sell the fruit to the factory at a guaranteed price. This arrangement should be able to increase demand for farmers as well as to encourage farmers in the surrounding area to grow passion fruit. Another processing plant was built in Brastagi, North Sumatra at a passion fruit production center. Both plants in Malino and Brastagi have large installed capacity of 80-100 ton/day.

Both processing plants have failed to continually produce high quality product for export. Low quality and quantity of raw materials have caused severe problems for these plants. Plant capacity has not been met although farmers are willing to supply the factory at a reasonable price. The shortage of raw material seems to be related to the following factors:

- Low yield of passion fruit generates low profit. At the current average yield of 5 ton/ha/year and the price of fruit of Rp 250/kg, revenue is Rp 1.25 million/ha/year. Farmers get no profit, because the average cost of establishment is about Rp 1.8 million. A fully intensive cultivation yield of 8 ton/ha generating profit of Rp 2.2 million/ha/year. Compared to the profit from other commodities such as vegetables, this profit is much lower.
- Middlemen dominate the passion fruit market in these areas. The strong role of middlemen constrains farmers from selling directly to the factory, although the factory has already set the guaranteed price. This situation ensures that the price received by farmers is very low

(Rp 125-150/kg) which eliminates the incentive for farmers to produce a large quantity of high quality fruit. Initially, the factory set a guaranteed price of Rp 15/average size fruit. However, this price setting did not work since the middlemen with more access to farmers can buy at a lower price with advance payment. Farmers sell the fruit to them at Rp 5-7/fruit.

- The processing plant has a 220 ha nucleus estate but the conditions are poor. The hilly sloping land and poor transportation increase the cost of moving fruit from the field to the factory. The yield of the nucleus estate is only 8 ton/ha/year, which barely covers the labor cost during production.
- The installed factory capacity is too large. To operate year-round at full capacity, the company has to be supported by 4,000-5,000 semi-intensive farms. This cannot be realized due to large competition with other crops, especially vegetables. Cabbage, which was introduced by a farmer from West Java and was immediately adopted by local farmers, is currently the largest competitor to passion fruit..
- The juice quality is low by international market standards. The rejection rate in the first export was high and this caused a temporaly collapse of the processing factory. The factory was also designed for single commodity processing, hence during the passion fruit slack season the factory is idle for almost 5 months.

There are also several small processing industries in South Sulawesi and North Sumatra. They obtain raw material from their own plantations as well as from supplier farmers and from the large processing companies. The second grade of concentrate is sold to smaller processing companies for further processing into *markisa* juice. Small industries seem to survive well because of the small overhead cost and less competition in the domestic market.

7.4.3 Farm and processing profitability

With a farm gate price of Rp 150/kg of fruit and with present yields, the farmer will not make any profit. The farmer gets some profit at Rp 300/kg if the average yield is about 7 tons/year. The annual profit is considered to be low (accumulated profit in year 4 is Rp 1.3 million) compared to the profits from other commodities. Vegetables, for example, generate profits of Rp 500-Rp 2 million yearly.

The processing factory will be able to operate profitably and to export if the price of fruit is Rp 250-300/kg, provided that the extraction rate is 30%. With this condition the company earns a profit Rp 275/kg of juice. In Australia the sale price is Rp 1,900/kg which is about the same as in the domestic market. The strong domestic market has forced juice producers to concentrate on satisfying the domestic market.

The company made good progress during its first 3 years of operation, exporting 10 tons, 19 tons, and 180 tons, respectively during the period of 1990-1992. Since the company has experienced cash flow difficulties and shortage of raw material, it lost a great deal of farmers' confidence and reduced farmers' willingness to commit themselves to their agreements (Kilmer 1993).

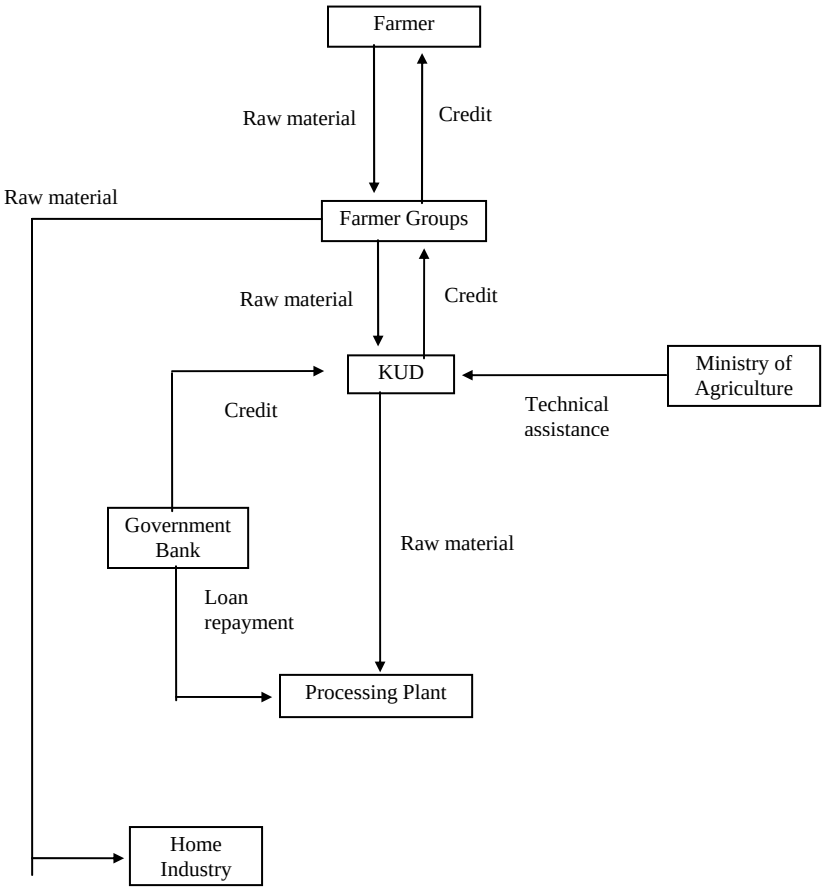
7.4.4 Lack of small farmer-processor linkage

There are different institutional linkages in the passion fruit industry. The processing plant was under the supervision of the Ministry of Industry, and the passion fruit cultivation was under the supervision of Ministry of Agriculture. Lack of coordination between farmers, the processing industry and the government ruined the field operations. Kilmer (1993) observed the farmer-processor linkage and the company's performance and concluded that the role of the public sector is very dominant in development of programs to increase passion fruit production in the area (Figure 7.2). However, the farmer assistance program was not sufficient to convince farmers of the commitment of the company to the program or to enable them to establish and maintain successful plantings of passion fruit.

A formal farmer-processor linkage such as contract farming is probably not necessary to develop good marketing of passion fruit. The failure of this program is mainly due to the lack of cooperation between farmers and the processor. Furthermore, poor technical information and inadequate supply of high quality seeds and other inputs contributed to the unsuccessful passion fruit development program. The KUDs which are designed to bridge farmers and processors have not been functioning well. While it might still be possible to involve the KUDs in the program as a supplier of agricultural inputs and perhaps coordinators of harvesting and collection activities, the company should be much more active in working with individual farmers and small farmer groups to develop their confidence and insure that targeted activities are being carried out (Kilmer 1993).

The channels of credit and the flow of raw material (passion fruit) were too complicated creating possible inefficiency. Large overhead in every channel, inefficient credit distribution and raw material supply, and lack of close and direct cooperation between processor and farmers have been the main factors contributing to the failure of the passion fruit market development program.

Figure 7.2 Flow of raw material and credit in passion fruit production and processing in Malino.



Failure in passion fruit market development was caused by the following conditions:

- Large scale installed capacity was built without support of raw material supply. The surviving successful processing plants are usually small scale with simple processing technology which process juice for the domestic market.
- The excessive role of middlemen ruined the marketing arrangement between farmers and the processing company.
- A good relationship between farmers and the processing industry was not maintained, and a reward and penalty system was not consistently implemented.
- Passion fruit varieties of low productivity and poor cultivation techniques are other factors which make passion fruit farming not profitable to farmers.

7.5 Pepper

7.5.1 The unutilized potential

Historically, Indonesia has been a pepper producing and exporting country. In the past Indonesia's richness of spices brought this country into a prolonged and difficult period of colonization. Currently, Indonesia is the second largest in terms of area under pepper cultivation, and the first in production and export (Table 7.8). Other pepper producing countries are Brazil, Malaysia, Madagascar, Thailand, Sri Lanka, and Vietnam. Indonesian pepper is world famous; Lampung black pepper and Muntok white pepper are regarded as standards that all other pepper in the world is compared with.

Table 7.8 Area, production and export of pepper of main producing countries, 1987 and 1991.

Country	Area (ha)		Production (tons)		Export (tons)	
	1987	1991	1987	1991	1987	1991
Brazil	190,000	30,000	27,000	47,500	25,500	47,689
India	136,620	60,000	45,000	55,000	32,252	18,735
Indonesia	80,000	18,000	36,000	61,000	29,995	49,665
Malaysia	7,669	11,200	14,000	9,000	13,859	25,390
Madagascar	6,200	6,500	3,000	3,380	1,825	1,222
Sri Lanka	7,250	8,600	2,514	2,850	2,015	2,058
Thailand	3,167	5,500	3,485	10,443	1,477	3,877
Vietnam	5,848	8,900	4,780	8,900	4,275	16,252
China	na	na	4,000	5,000	428	635
Mexico	na	na	2,600	2,800	2,125	2,031

Source: IPC Pepper Statistical Yearbook 1991.

This large export, however, is limited to unprocessed or semi-processed pepper. High quality ground pepper available at the market is usually imported from Malaysia, India, USA or Europe. Indonesia, as one of the largest producers, actually has a good chance to improve the whole marketing function including quality improvement, processing and packaging. However, the practice of growing and processing pepper has not changed over the centuries. Black pepper is produced by drying the immature berry. The quality is evaluated on the basis of appearance, aroma, flavor, and cleanliness. It is clear that a proper drying process is important to produce high quality black pepper. White pepper is prepared from the fully ripe berries by removing the berries from their spikes and pericarp/mesocarp by a fermentation process. Farmers usually put the pepper in woven plastic bags and submerge the bag in a slow moving stream for 1 or 2 weeks until the core of the fruit is separated from the pericarp and mesocarp.

The quality of pepper is mainly determined during the processing (washing and drying). Currently the technology used by farmers is suitable only for small scale processing. However, large processors/farmers, especially those who are far from streams have difficulties in the processing. Large scale processors are constrained especially by water availability. With decreasing quality of

water available for processing, the quality of pepper is deteriorating. At the same time, demand for quality, health awareness, and food safety standards are increasing. The slow anticipation of pepper product development has made pepper marketing fragile to market changes. Fluctuations of price and a disastrous price fall has ruined the pepper industry in the country since it completely depends on the export of raw and unprocessed products.

Although traditional pepper cultivation is one aspect that is currently being resolved, quality and processing are the major failures in the development of pepper in Indonesia. In the domestic market, processed pepper is low in quality compared to that imported from other countries, and after years of experience in producing and exporting, there is almost no improvement in the processing technique. Pepper has a large variety of related products such as black pepper, white pepper, green pepper, pepper oleoresin, black paper oil, white pepper oil, and pepper paint. These products have not been developed, although there is increasing demand for better quality pepper products.

7.5.2 The fragile international market

Most of the pepper plantings are small scale (0.5-2.0 ha), traditional, and scattered in 21 of the 27 provinces in Indonesia. No less than 200,000 households are involved in pepper production. Although production is increasing, increase in production has caused a large decrease in price since pepper is a highly price inelastic commodity. The international market price fluctuates greatly. In 1970-1980 the price range was US $ 1.005-2.778/kg. In the period of 1981-1990 the price range was between US $ 1.142 and US $ 0.494/kg. The high price in 1986 and 1987 was the peak; since then the price declined to US $ 1.324/kg in 1991.

The export earning declined steadily from US $ 148.187 million in 1987 to US $ 61.385 in 1992 (Table 7.9) In general the undeveloped pepper processing industry is a disadvantage for the pepper economy in Indonesia in terms of:

- loss of value added from processing activities;
- no alternative market for a bumper domestic pepper crop, which has a serious impact on pepper cultivation. During the price drop in 1991/92, the farm gate price of white pepper in Lampung was Rp 900/kg or around US $ 0.40/kg. At this price pepper cultivation is no longer profitable. A large number of pepper farmers shifted to cassava or other cash crops; and
- a significant amount of processed pepper (high quality packed white pepper beans, ground pepper, and bottled ground black pepper) is imported from Malaysia, Europe and USA.

With the absence of pepper processing in Indonesia, the international price fluctuation has caused a larger farm gate price fluctuation which is certainly a disadvantage to farmers. The difference in black and white pepper price has an impact to farmers supply of black and white pepper. Before 1986 export of Indonesian black pepper was larger than white pepper (Table 7.9). In 1980 and 1985 the export quantity of black and white pepper was 18,868 tons and 12,477 tons, and 14,081 tons and 12,120 tons respectively. Beginning in 1986 white pepper exports were larger than black pepper. This trend is consistent with the trends of black and white pepper prices in the world market. In 1992, when the price of pepper was at the lowest level, black pepper export was larger than white pepper export. Likely, low economic incentives to farmers reduced their willingness to produce white pepper which requires greater effort.

Table 7.9 Volume (ton) and value (US $ '000) of Indonesian export of black and white pepper, 1980-1992.

Year	Black Pepper		White Pepper		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1980	16,868	24,705	12,477	25,316	29,345	50,022
1981	18,809	21,505	15,187	25,667	33,996	47,172
1982	20,222	21,169	16,117	24,708	36,339	45,877
1983	29,984	31,392	15,077	20,066	45,061	51,458
1984	25,182	41,445	8,635	22,792	33,817	64,237
1985	14,081	36,976	12,120	41,395	26,202	78,371
1986	13,304	52,964	16,268	83,970	29,572	136,934
1987	10,395	45,323	19,600	102,863	29,995	148,186
1988	19,600	56,299	21,894	88,200	41,494	144,499
1989	17,303	40,042	24,833	68,790	42,136	108,832
1990	13,015	21,998	34,660	57,313	47,676	79,312
1991	19,024	26,898	30,641	38,859	49,665	65,758
1992	31,322	26,396	30,111	34,989	61,433	61,385

8. Conclusions and Recommendations

8.1 Conclusions

- The major prospects for CGPRT crop market development rely on food and feed processing sectors. Direct human consumption is predicted to decrease due to the fact that most CGPRT crops are inferior to non-upland crops. The strong connection of CGPRT crops with processing sectors indicates that the CGPRT crops actually generate more economic activities and added value than rice. Out of the total domestic supply, 75% of cassava, 86% of maize and 99% of soybean is processed. After the achievement of rice self sufficiency, the market development of CGPRT crops should be fully supported, especially in processing techniques and product promotion.
- Although biological and cultivation constraints for CGPRT crop development are important, the main constraint is the market institution. The current marketing system cannot provide mutually beneficial and long term relationships between farmers as raw material producers and processing companies. In general, the highly concentrated nature of the CGPRT crop market has been to the advantage of processing companies to control the market. However, in return, there is no strong and competitive development of either the agricultural commodity or the processing sector.
- The highly concentrated market (such as the cassava market) and the highly distorted market due to government intervention (the soybean market) seem to have similar impacts: an inefficient market that leads to a weak/non-competitive commodity market which affects the economic activities related to these commodities. In any effort to develop the market of these commodities, emphasis should be put on improvement of the market structure. The role of middlemen has also been very high (the case of sweet potato and passion fruit). Direct transactions between farmers and processing industries have to be facilitated.
- Mango, cabbage and potato are among horticultural crops that have market potential due to future domestic as well as world demand. Their yield and export increased in the last decade, but there is a lot of room for further improvement. The main constraints are poor linkages between producers, and processing and marketing companies.
- Successful processing is characterized by strong integrated and large plantation type processing industries (the case of government owned estates, and Great Giant Pineapple). Since Indonesian agriculture is characterized by small scale and scattered farms, strong vertical coordination is required to gain the market potential of CGPRT crops. An institutional approach is probably more effective (the case of NES program).
- The failed marketing experience is characterized by poor production-processing-marketing linkages. Low quality processed products are associated with low economic incentives, especially to farmers.

8.2 Recommendations

- Increasing the yield of most crops is the highest priority. This should include improvement of seed quality and cultivation methods. Government investment is probably the most important in this step because most farms are small and farmers lack capital.

- The quality of processed products is another factor to be resolved. The implementation of a fair marketing system through encouragement of competitive marketing and good contract farming between farmers and processing/marketing firms should be applied.
- The NES model has proved to be effective for commodity market development in a situation where agriculture is dominated by small scale farms. A long marketing channel and domination of particular market participant have to be eliminated to provide economic incentives to all economic regimes.
- The government should provide infrastructure and facilities in most potential production areas to support the development of commodity markets. The government should also create a favorable business environment and encourage the improvement of quality of commodities. A clear penalty and reward system has to be introduced and consistently implemented to encourage quality improvement.

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