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Enhancing Sustainable Development of Diverse Agriculture in Indonesia

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ESCAP

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

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General Terms

ADB	:	Asian Development Bank
AGRIDIV	:	Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Selected Asian Countries
AusAID	:	Australian Agency for International Development
CAPSA	:	Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific
CGPRT	:	Coarse Grains, Pulses, Roots and Tubers.
DRC	:	Domestic Cost Ratio.
EPC	:	Effective Protection Coefficients;
ESCAP	:	Economic and Social Commission for Asia and the Pacific
GATT	:	General Agreement on Trade and Tariffs
GDP	:	Gross Domestic Product
HYV	:	High-yielding Varieties
ICFORD	:	Indonesian Center for Food Crops Research and Development (formerly CRIFC - Central Research Institute for Food crops)
IMF	:	International Monetary Fund
O&M	:	Operation and Maintenance
PCR	:	Private Cost Ratio
R/C	:	Returns-to-Costs Ratio
SID	:	Simpson Index of Diversification
SQ	:	Specialization Quotient
SSN	:	Social Safety Net
UPP	:	Urban Poverty Alleviation Programme

Local Terms

BIMAS	:	Mass Guidance Programme for Production Intensification
BKKBN	:	National Family Planning Agency
BPS	:	Central Bureau of Statistics
BULOG	:	Food Logistics Agency
DPG	:	Food and Nutritional Diversification Programme

GBHN	:	General Guidelines of Government Policy
HTI	:	Forest Land for Industrial Crops
IDT	:	Development Programme for Underdeveloped Villages
INMAS	:	Production Intensification Programme
INPRES	:	Presidential Degree
INSUS	:	Special Production Intensification Programme
IP 300	:	Programme of Cropping Index 300
KKP	:	Food Security Credit
KOPTI	:	Co-operatives of Tofu and *Tempe* Producers
KUD	:	Village Co-operative Unit
OPK	:	Special Market Operations
P2AT	:	Ground Water Project
P3A	:	Water User Associations
P4K	:	Projects to Increase Small Farm Incomes
PBB	:	Taxes for Land and Buildings
PELITA	:	Five-Year Development Plans
SD	:	Primary Schools
SLTA	:	High Schools
SLTP	:	Junior High Schools
SPG	:	Scholarships and School Grants Programme
STA	:	Sub-terminal Agribusiness
SUPRA INSUS	:	Supra Special Production Intensification Programme
SUSENAS	:	National Socio-economic Surveys

Foreword

Most Asian countries succeeded in multiplying major cereal production through the '*Green Revolution*'. This was made possible by the introduction of high yielding varieties and policy support which promoted the construction of irrigation facilities and the use of modern inputs such as chemical fertilizers and pesticides. Recently however, the growth in productivity of major cereals has reached a plateau. Agricultural diversification has a number of positive effects, among others, food security, risk mitigation, labour absorption and conservation of biodiversity. It is crucial to be aware of the driving forces and constraints to agricultural diversification to formulate policy options which realize the coexistence of sustainable agricultural development and poverty reduction in rural areas.

Responding to this vital need, UNESCAP-CAPSA conducted a three-year research project, "Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Selected Asian Countries (AGRIDIV)", from April 2003, in collaboration with eight participating countries, namely Bangladesh, India, Indonesia, Lao People's Democratic Republic, Myanmar, Sri Lanka, Thailand and Viet Nam.

It is my pleasure to publish "**Enhancing Sustainable Development of Diverse Agriculture in Indonesia**" as a result of the first phase of the Indonesian country study of the project. This volume presents a descriptive and quantitative analysis of current secondary crop agriculture and development constraints and options. This study focuses on policy recommendations, as well as areas for further study.

I thank Mr. Masdjidin Siregar and the members of the study team for their efforts. Continuous support from the Indonesian Centre for Agricultural Social-Economic and Policy Studies (ICASEPS), is highly appreciated. Prof. Hitoshi Yonekura, Graduate School of Agricultural Science, Tohoku University, Mr. Tomohide Sugino and Dr. Parulian Hutagaol provided useful guidance at every stage of the study as Regional Advisor, Project Leader and Associate Project Leader respectively. I extend thanks to Mr. Matthew Burrows for his English editing.

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Taco Bottema
Director
UNESCAP-CAPSA

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Executive Summary

This report is the outcome of the first phase of the AGRIDIV project sponsored by UNESCAP-CAPSA with funding from the Government of Japan. The study was carried out in 2003-2004. The major objectives of this study are as follows:

1. Review historical development and current status of CGPRT crops;
2. Overview and analyse policies related to agricultural diversification;
3. Evaluate the impact of global trade orientation on CGPRT crops;
4. Examine the benefits of agricultural diversification, specifically towards poverty alleviation;
5. Identify the constraints and potentials of diverse agriculture; and
6. Suggest policy recommendations for the development of sustainable diverse agriculture towards poverty alleviation.

Based on the availability of secondary data, five major CGPRT crops grown in Indonesia are studied in detail to examine the sustainable development of diverse agriculture. The crops include maize (*Zea mays L.)*, soybean (*Glycine max*), groundnut (*Arachis hypogaea L*.), cassava (*Manihot esculenta cranz*) and potato (*Solanum tuberosum*). Depending on the availability of data and information from previous studies, sweet potato (*Ipmea botatas L*.) is also included. In addition, rice, as the major staple food in Indonesia, is included and rice-related policies affect resource allocation and therefore affect the development of CGPRT crops.

Agriculture is an important sector in the Indonesian economy because, in 2002 for example, it contributed 16 per cent to GDP and provided employment to about 45 per cent of the labour force. Development of agriculture in general, and food crops (rice and CGPRT crops) in particular, seems to play an important role in employment creation, income generation and poverty alleviation. In 2002, unemployment was 9 per cent and the proportion of the population below the poverty line was 18 per cent, of whom about 65 per cent live in rural areas.

In the food crop sub-sector, rice occupies 65.6 per cent of the total harvested area of food crops, while maize accounts for 19 per cent, soybean 3 per cent, groundnut 4 per cent, cassava 7 per cent, sweet potato 1 per cent, and 0.4 per cent for potato. Although the government accorded high priority to rice production, production growth of CGPRT crops,

except soybean, remains positive. The negative growth rate of soybean production is caused by the weak competitiveness of this crop. Among the food crops, maize has the highest production growth rates due to the expanding use of hybrid varieties. The only CGPRT crop with a declining yield is potato because it can be difficult for farmers to source quality seeds. However, since the export demand for this commodity is relatively high, production growth is also relatively buoyant.

Unlike rice, most CGPRT crops are cultivated by relatively poor farmers on poor soils in harsh environments. Since these crops generally require less care and few inputs, they are suitable for poor producers. Although these crops tend to be cultivated on marginal lands, the returns are still attractive because production costs are relatively low. Thus, expanding the production of these crops will increase farmers' income and reduce rural poverty. Higher growth of CGPRT crops will also promote the growth of the non-farm sector through a boost in processing activities.

In general, Indonesia has competitive and comparative advantage in CGPRT crops, except soybean. Since soybean production in Indonesia has weak competitive and comparative advantage, production of soybean has declined and, consequently, imports have risen significantly. Although maize production has increased, average maize imports also increased significantly. This is attributable to high domestic demand for maize, particularly from the feed industry. The production of groundnut only satisfies 85 per cent of domestic demand. Consequently, net imports of groundnut totalled 120 tons per year in 1996-2002. In the case of potato and cassava (tapioca and dried cassava), Indonesia is a net exporter.

The marketing efficiency of each CGPRT crop varies from one place to another. In general, the marketing systems of maize, soybean and potato are relatively more efficient than the systems of both fresh cassava and dried cassava due to the existence of an oligarchical tapioca industry and less-developed infrastructure. The only way to raise marketing efficiency is to improve infrastructure such as roads and marketing facilities, enhance market information, encourage co-operation between processing firms and farmers, and expand access to credit for traders and those willing to enter marketing and processing activities.

Hitherto, public policies relating to production, marketing and international trade in food crops have been biased towards raising rice production. Consequently, diversification in food crops has diminished and rice has become the only specialized crop in almost all provinces. Moreover, and food security in Indonesia is dependent on rice. These policies are

becoming difficult to maintain as the cost of irrigation infrastructure is rising and competition for scarce water resources is becoming fierce.

Since CGPRT crops in general, have competitive advantage and comparative advantage, it is reasonable to produce the crops at home rather than relying on imports. This requires that future policies concerning CGPRT crops be redirected. Some policy options recommended for the development of diverse agriculture based on CGPRT crop production are summarized as follows:

1. Removal of import tariffs, import bans, and price support for rice:

   All government policies related to crop production, such as irrigation development, floor prices, farm credits, and technological development have long favoured rice production. Trade policies, such as tariffs and price support also favoured rice production. This has increased rice production at the expense of crop diversification. Furthermore, food security is highly dependent on rice.

   In order to diversify food crops, alternative crops must receive support and trade policies that favour of rice production be gradually removed.

2. Imposition of import tariffs for wheat and wheat products:

   In the past, the government subsidized wheat imports, wheat flour processing and the noodle industry through soft loans, and consequently, noodle consumption increased significantly. Although this is positive from the viewpoint of food diversification, it is not healthy for the economy and for food security in Indonesia as wheat is totally imported. To reduce this dependence, tariffs should be imposed on wheat and wheat products.

3. Imposition of import tariffs for net-imported CGPRT commodities:

   The implementation of recommendation 1 would see a decrease in the price of rice and, in turn, an increase in consumption. Implementation of recommendation 2 would increase the price of wheat and reduce its consumption, thereby increasing rice consumption.

   In order to diversify food crops, the prices of CGPRT commodities must be sufficiently high that farmers are encouraged to grow them. In order to raise the prices of CGPRT crops, the government should impose import tariffs on net-imported CGPRT commodities such as maize and soybean.

4. Develop partnerships to raise the prices of net-exported and non-traded CGPRT commodities

Policy measures to lift the prices of net-exported CGPRT commodities (such as cassava and potato) and non-traded CGPRT commodities (such as sweet potato) are not easy to formulate due to the perishable nature of these commodities. It is not possible to implement floor prices backed by procurement and storage when the prices are low. The only way to secure the prices of these commodities is to encourage partnerships between farmer organizations and processing companies/exporters. This is not an easy task and may face several constraints:

- Processing companies/exporters might not consider such partnerships necessary because, hitherto, their businesses have been profitable without such arrangements.
- Agreement between farmers and processing companies/exporters on prices is difficult to secure.
- It may be difficult to develop trust between the two parties. In the case of cassava, for example, farmers are suspicious of the way tapioca processing companies measure the moisture and starch content of cassava, which determines the price paid to the farmer. Local (provincial or district) governments can play a significant role in facilitating the partnerships. As facilitator and mediator, the government might not have to bear the high costs of developing a 'Memorandum of Understanding' between the two parties because such tasks entail only minor costs.

5. According high research priority to CGPRT crops:

Based on the Policy Analysis Matrix Framework, the results of the economic analysis indicate that Indonesia has comparative advantage in all CGPRT crops, except soybean. A sensitivity analysis also concluded that the comparative advantages of maize and groundnut, for example, are relatively robust in the face of changes in import parity prices or changes in yields, whereas the comparative advantage of soybean is not. In the era of free trade, however, continuous research on increasing the production efficiency of CGPRT crops is important so farmers are motivated in spite of price fluctuations. To increase the demand for CGPRT commodities, the government should also prioritize research and development on industrial uses of CGPRT crops. For example, the Agency for Technology

Assessment and Application (BPPT) is developing the use of sweet sorghum for bio-fuel.

6. Improving marketing efficiency:

The marketing systems for soybean and potato are relatively efficient; but those for maize, fresh cassava and dried cassava are inefficient due to the oligarchical power of processing industries (feed mills and tapioca) and less-developed infrastructure. Marketing efficiency can be improved by bolstering infrastructure, enhancing market information, expanding access to credit for traders and those willing to enter marketing and processing, and developing vertical co-ordination between farmers and processing units.

7. Advancing institutions supporting agricultural diversifications:

Factors that may discourage farmers to diversify crops on irrigated land include: (i) the status of rice as the major staple food; (ii) lack of technological competence; (iii) access to capital; (iv) farmers' risk aversion; and (v) marketing constraints of non-rice crops. Therefore, crop diversification, which integrates various alternative crops to mitigate risks and stabilize farm income, requires several supporting programmes, such as (a) the improvement of agricultural extension programmes concerning both farm and off-farm activities (post harvest, processing and marketing) of CGPRT crops; (b) increasing the availability and access to credit, especially for CGPRT crop production; (c) improving the market structures of CGPRT commodities; and (d) strengthening farmer institutions and encouraging partnerships between farmer and private companies to overcome the marketing constraints of CGPRT commodities.

1. General Introduction

1.1 Background and justification

Agriculture is an important sector in the Indonesian economy. In 2002 for example, it contributed 16 per cent to GDP and provided employment to about 45 per cent of the labour force. In 2002, the agricultural population of Indonesia was 106 million. About 80 per cent of the population lived in rural areas and a sizeable proportion of the rural population was dependent upon agriculture for their livelihood. In 2002, the proportion of population under the poverty line was 18 per cent, about 65 per cent of whom lived in rural areas. Self-sufficiency in rice production, achieved only in 1984, has been the major agricultural policy for the last four decades to ensure food security, income generation and employment creation in rural areas (Statistical Yearbook of Indonesia, 2002).

Subsequent to rice self-sufficiency in 1984, the government turned to diversifying food crops using their successful experience with rice over the two previous decades. In PELITA V (1989-1994) (Perencancaan Lima Tahun or Five Year Plan), as stated in the General Guidelines of Government Policy (GBHN), agricultural diversification was given the first priority. Although agricultural diversification has been frequently discussed in Indonesia, there are different interpretations of the concept and therefore there have never been any clear guidelines for its implementation (Karama *et al*., 1992).

Agricultural diversification can be examined in terms of horizontal and vertical diversification. Horizontal (and regional) diversification describes how a farm unit (a region) allocates its land to produce various crops in a particular year. Agriculture in a region may be diversified even if each individual farm unit is not diversified. Vertical diversification describes to what extent a farm unit generates income through processing and marketing.

Horizontal diversification can be carried out by a rotation of different crops or by incorporating two or more crops together in the same field at the same time. There are several major advantages of horizontal diversification. These advantages include (i) stability of yields, (ii) reduction of pest and disease invasions, therefore reducing the need for chemicals; (iii) reduction of risks (bio-physical and price); (iv) potential for greater economic benefits; (v) increased food security through reduced dependence on a particular crop such as rice; and (vi) encouraging the industrial use of secondary food crops (CGPRT crops) not only for food and feed but also for other industrial uses such as for bio-fuel products.

Despite ostensibly promoting agricultural diversification, in the last four decades, the government has prioritized rice production. Both production-related policies (such as irrigation development, technological development through research and development, and farm credits) and trade-related policies have promoted the cultivation of rice.

Before 1989, rice production received generous protection in Indonesia, especially through the use of non-tariff barriers. Despite this, rice imports climbed substantially because domestic production could not meet the increasing demand for rice and Indonesia is once again one of the largest rice importers in the world. When the Indonesian economy was hit by the crisis in 1997, the government rapidly deregulated the domestic rice market, including the removal of import tariffs and the BULOG (Food Logistics Agency) monopoly on rice imports. To encourage farmers to grow rice and sugar cane, the government again imposed import tariffs for rice (34 per cent) and sugar (25 per cent) in May 2002. In 1974, the government also imposed a 30 per cent import tariff for soybean, and in 1990 imposed a 15 per cent import tariff on maize. Both of these tariffs have gradually decreased over time and consequently, imports of soybean and maize have increased (Erwidodo and Hadi, 1999).

Since both production and trade related policies were, in reality, in favour of rice, the development of secondary food crops, Coarse Grains, Pulses, Roots and Tubers, or CGPRT crops, received low priority. Consequently, diversification of food crops has diminished and rice has become a specialized crop in almost all provinces. At the same time, food security in Indonesia has decreased due to the reliance on the cultivation and importation of rice. The Statistical Yearbook of Indonesia indicates that rice occupied 65.6 per cent of the total harvested areas for food crops in 2002; in contrast, maize occupied 19 per cent, cassava 7 per cent, groundnut 4 per cent, soybean 3 per cent, sweet potato 1 per cent and potato 0.4 per cent. According to the 2003 agricultural census, 71 per cent of agricultural households grew food crops (rice and CGPRT crops such as maize, soybean, cassava, sweet potato, etc.) and about 39 per cent of these food-crop farm-households grew CGPRT crops.

Most CGPRT crops are grown on unfavourable lands where infrastructure and markets are less developed than in irrigated areas, it is likely that many of the poorest people in Indonesia depend on these crops. Thus, for the purposes of poverty alleviation, CGPRT crops should be focus of government attention.

1.2 Study objectives

The specific objectives of this study are as follows:

1. Review of the historical development and current status of CGPRT crops;
2. Summarize and analyse policies related to agricultural diversification;
3. Evaluate the impact of global trade orientation on CGPRT crops;
4. Examine the benefits of agricultural diversification, specifically towards poverty alleviation;
5. Identify the constraints and potentials of agricultural diversification; and
6. Suggest policy recommendations for the development of sustainable agricultural diversification for the purpose of poverty alleviation.

1.3 Scope of the study

Based on the availability of secondary data, five major CGPRT crops grown in Indonesia were studied in detail to examine the sustainable development of diverse agriculture. The CGPRT crops are maize (*Zea mays L.)*, soybean (*Glycine max*), groundnut (*Arachis hypogaea L*.), cassava (*Manihot esculenta cranz*), and potato (*Solanum tuberosum*). Depending on the availability of data and information from previous studies, sweet potato (*Ipmea botatas L*.) was also included. In addition, rice is also included because rice is the major staple food in Indonesia and rice-related policies affect resource allocation and, therefore, the development of CGPRT crops.

Maize is the staple food in some parts of Indonesia. It is usually mixed with rice for human consumption. Maize is also an important feed component since the demand for maize from the feed industry is rising as a result of rapid development in the poultry industry over the last two decades.

Soybean is an important source of protein in the Indonesian diet. The rapidly increasing demand for soybean is caused by the rapid expansion of food and feed industries in Indonesia. A target (not achieved) of the *Gema Palagung* programme was soybean self-sufficiency by 2002.

Cassava is also an important crop in Indonesia, not only as a staple food, but also as a raw material for the feed and food industries, and it is a source of foreign exchange earnings. Since the poor consume it as a staple, it is often associated with poverty and considered an inferior good.

Potato is not considered a staple because it is usually consumed as a vegetable or horticultural crop. It is mostly grown in high elevation areas where farmers grow cabbage.

Recently, however, the production growth rate of potato is relatively high to meet increasing demand from fast food restaurants. Potato is also a source of foreign exchange earnings since it is exported, particularly from North Sumatra to Singapore and Malaysia.

This report is organized into eleven chapters. The first chapter presents the background and justification of the study including a brief overview of policies, the objectives and the scope of the study. The third chapter describes demographic and economic profiles and extent of agricultural diversification, unemployment and poverty, and environmental problems. Trends in production and marketing of CGPRT crops are described in the fourth chapter. Overview of agricultural diversification-related policies including policies on production, food diversification, processing and marketing are analysed in the fifth chapter.

The sixth chapter describes Indonesia's trade policies and trade balances of CGPRT crops, and analyses the effects of trade liberalization on CGPRT crop production, marketing and demand. The seventh chapter presents an overview of public policies on poverty alleviation in Indonesia and their limitations, and then assesses potential benefits of agricultural diversification including their basic requirements for poverty alleviation. The demand for CGPRT crops as staple foods and their industrial importance in Indonesia are discussed in the eighth chapter. The ninth chapter identifies the driving and constraining forces for agricultural diversification. The last chapter presents conclusions and policy recommendations.

2. General Conceptual Framework and Research Methods

2.1 General conceptual framework

As explained in the introduction, agricultural diversification can be classified into horizontal (regional) and vertical diversification. Horizontal diversification in particular can have social, economic and environmental benefits.

Factors promoting horizontal diversification of food crops may be both demand-side and supply-side. The typical demand side factors are changes in income and taste, which only change gradually. On the supply side, factors contributing to diversification are the relative profitability of each crop, factor endowment and technological change. In general, the observed horizontal diversification is largely demand-driven (Pingali and Rosegrant, 1995; and Joshi *et al*., 2003). Development of agro-industries using secondary food crops as raw materials to produce food, feed and other products seems to be a realistic policy measure to improve food crop diversification in Indonesia.

Although horizontal diversification is largely affected by demand-side factors, there are possibilities for improving horizontal diversification of food crops from supply-side through production, marketing and international trade policies. Thus far, these policies have been biased towards rice production (Simatupang, 1989; and Kasryno *et al*., 2004) and consequently, diversification of food crops in Indonesia has diminished.

Because of the policy bias towards rice production, CGPRT crops tend to be cultivated in less favourable cropping seasons and more on marginal land. This has resulted in a decline in productivity and degradation of soil in some areas. Crop diversification would help improve soil fertility, increase productivity, ensure food security, mitigate risk and protect the environment. In addition, promoting diversification of food crops based on CGPRT crops may also alleviate poverty. These crops require less care and smaller amounts of inputs and are thus suitable for poor producers without access to capital. Expanding the production of these crops may increase farmers' income and reduce the incidence of poverty in rural areas.

2.2 Research methods

The first phase of this study uses secondary data and existing research. Data on demographic profiles, economic profiles, poverty, unemployment, trends in production and consumption of different crops were obtained from the Central Statistics Agency (BPS), while information on diversification–related policies and their effects are reviewed from the results of previous studies. The results of the review are used to explain changes and trends of CGPRT crop production, consumption and diversification.

Crop diversification was calculated using Simpson's Diversity Index based on the following equation (Equation 1):

$$SID = 1 - \Sigma (A_i / \Sigma A_i)^2 \quad (1)$$

Where:

SID = Simpson index of diversification

A_i = Harvested area of the i^{th} crop

The minimum value of SID is 0 (the least diversified), whereas the maximum value is 1 (the most diversified). In computing the SID of food crops, all the major crops are included. Besides the crop diversification index, the crop specialization quotient (SQ) is also computed (Equation 2):

$$SQ_{ij} = (A_{ij} / \Sigma A_{ij}) / (A_i / \Sigma A_i) \quad (2)$$

Where:

SQ_{ij} = Specialization index of commodity i in region j

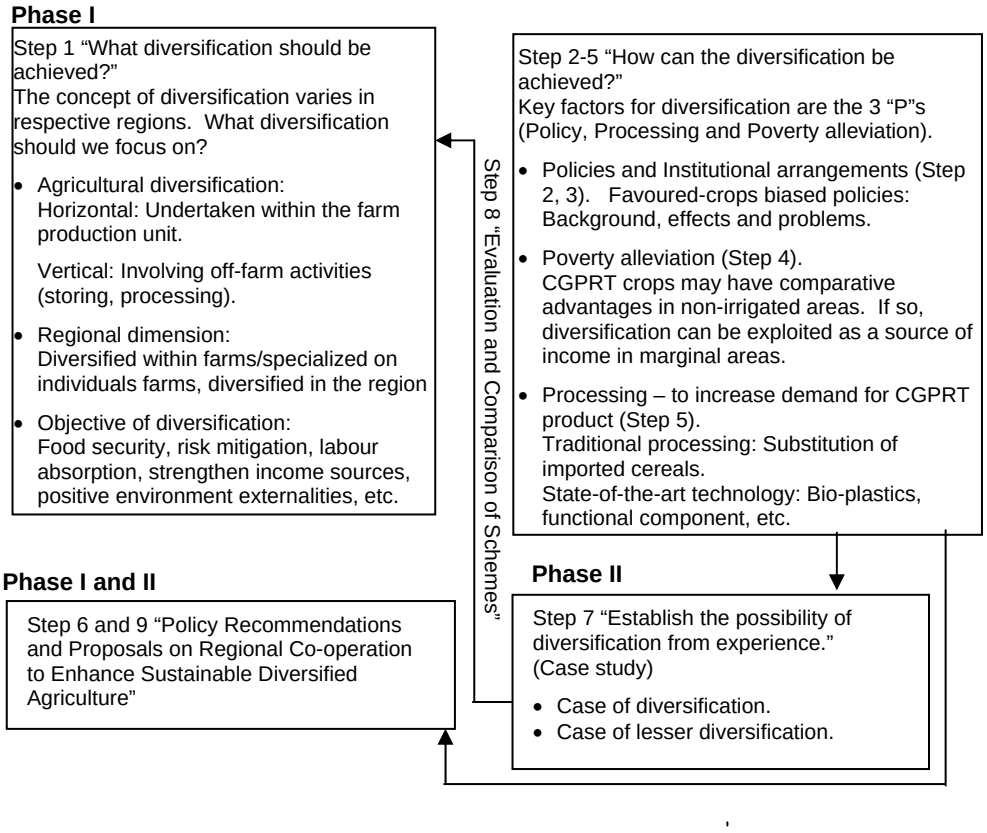
A_{ij} = Harvested area of commodity i in region j

A_i = Harvested area of commodity i in the country

If SQ_{ij} is greater than 1 it means that region j specializes in commodity i.

The study was carried out in two phases. This report presents the results of Phase I carried out from August 2003 to August 2004. It covers descriptive and quantitative analyses of the current status of CGPRT crops and identifies driving and constraining factors for CGPRT crops-based diversification and its potential benefits for poverty alleviation. Phase II of the study was conducted from September 2004 to May 2005 and covered descriptive and quantitative assessment of CGPRT farming system performance and their vertical integration, including institutional arrangements with the private sector in marketing and processing. The steps of this study are presented in the Roadmap to AGRIDIV (Figure 2.1).

Figure 2.1 Roadmap to AGRIDIV



3. The Demography, Economy, Agriculture and Environment of Indonesia

3.1 Demographic profile

The population of Indonesia is the fourth largest in the world after that of China, India and USA. It increased from 194.7 million in 1995 to 205.8 million in 2000 with a growth rate of 1.21 per cent per year (Table 3.1).

Table 3.1 Indonesian population by age structure and sex, 1995 and 2000 (thousand)

Age category	1995				2000			
	Male	Female	Total	M/F	Male	Female	Total	M/F
0 ~ 9	21 604	20 636	42 240	1.05	21 204	20 067	41 729	1.06
	(22.3)	(21.1)	(21.7)		(20.5)	(19.6)	(20.3)	
10 ~ 19	22 311	21 677	43 988	1.03	21 593	20 962	42 554	1.03
	(23.0)	(22.2)	(22.6)		(20.9)	(20.4)	(20.7)	
20 ~ 29	15 835	17 624	33 459	0.90	18 788	19 978	38 766	0.94
	(16.3)	(18.0)	(17.2)		(18.2)	(19.5)	(18.8)	
30 ~ 39	14 315	14 786	29 101	0.97	15 995	16 025	32 020	1.00
	(14.8)	(15.1)	(14.9)		(15.5)	(15.6)	(15.6)	
40 ~ 49	9 992	9 362	19 353	1.07	11 784	10 846	22 630	1.09
	(10.3)	(9.6)	(9.9)		(11.4)	(10.6)	(11.0)	
50 ~ 59	6 713	6 602	13 315	1.02	6 827	6 535	13 362	1.04
	(6.9)	(6.7)	(6.8)		(6.6)	(6.4)	(6.5)	
60 ~ 69	3 999	4 739	8 738	0.84	4 361	4 728	9 089	0.92
	(4.1)	(4.8)	(4.5)		(4.2)	(4.6)	(4.4)	
70 +	2 161	2 400	4 560	0.90	2 692	3 001	5 693	0.90
	(2.2)	(2.5)	(2.3)		(2.6)	(2.9)	(2.8)	
Total	96 930	97 825	194 755	0.99	103 243	102 600	205 843	1.01
	(100)	(100)	(100)		(100)	(100)	(100)	

Source: Population Censuses 1995 and 2000, BPS.
Notes: M/F = Male to female ratio; Figures in parentheses are the percentages in the total of each column.

For five-year intervals of age, Table 3.1 shows that the age structure of the Indonesian population is almost perfectly pyramidal in that the higher the age-category the lower the proportion of population and the highest proportion of population is in the age ranges of 0-9 and 10-19 years. The male to female ratio in the range of 0-19 years was

higher than one. It was also true for the range of 40-59 years in 1995 but it moved to the range of 30-59 years in 2000. For the whole population, the male to female ratio changed from 0.99 in 1995 to 1.01 in 2000.

The labour force as a proportion of the total population increased from 43.4 per cent in 1992 to 48.4 per cent in 2002 with an average growth rate of 1.14 per cent per year (Table 3.2). The labour force also grew in absolute terms, at a rate of 2.49 per cent per year. The high growth rate of the total labour force stems from the relatively high growth rate of population and the pyramidal age-structure of population. In the same period, the unemployment rate increased significantly from 2.71 per cent in 1992 to 9.06 per cent in 2002 with a growth rate of 23.43 per cent per year. Labour force growth presents many challenges and opportunities for Indonesia.

Table 3.2 Indonesian population and proportion of labour force by status

Year	Population (thousands)	Labour force		Proportion of labour force by status (%)				Dependency ratio [b]
		Total (thousands)	%[a]	Partly employed	Fully employed	Total employed	Un-employed	
1992	185 828	80 704	43.43	39.41	57.88	97.29	2.71	4.4
1993	188 875	81 446	43.12	38.56	58.69	97.24	2.76	4.5
1994	191 860	85 776	44.71	37.55	58.10	95.64	4.36	4.2
1995	194 757	86 361	44.34	35.72	57.04	92.76	7.24	4.5
1996	197 483	90 110	45.63	39.44	55.66	95.11	4.89	4.0
1997	199 991	91 325	45.66	37.60	57.72	95.32	4.68	4.0
1998	202 251	92 735	45.85	36.99	57.55	94.54	5.46	4.0
1999	204 233	94 847	46.44	35.36	58.28	93.64	6.36	4.0
2000	205 867	95 651	46.46	33.23	60.69	93.92	6.08	3.9
2001	207 205	98 812	47.69	30.57	61.32	91.90	8.10	3.8
2002	208 241	100 779	48.40	31.17	59.77	90.94	9.06	3.7
Growth (% / year)	1.21	2.49	1.14	-2.09	0.33	-0.65	23.43	-1.59

Source: Indonesian Manpower, BPS.

Note: [a] Proportion in total population. Before 1988, labour force is defined as the number of people older than 10 years, but it has been changed to 15 years since 1998; Partly employed are those who work less than 35 hours a week; n.a. = not applicable.

[b] Dependency ratio here is defined as the ratio of not working population to total employed labour force.

The average education level of the Indonesian labour force is relatively low. For example, the illiteracy rate within the labour force was 10.6 per cent in 1998 and 9.3 per cent in 2002 (Table 3.3). The proportion of the labour force that has not had any schooling was 9.4 per cent in 1998 and 7.7 per cent in 2002. Around 35 per cent of the labour force has been schooled up to primary level, 20.4 per cent up to middle school and 28.1 per cent

up to high school. The proportion of the population with a university qualification was 0.9 per cent in 1994 and around 2 per cent in 2002.

Table 3.3 Number and proportion of labour force by educational level

Educational level	1994		1998		2002	
	(thousands)	%	(thousands)	%	(thousands)	%
Illiterate	11 666	13.6	9 811	10.6	9 372	9.3
Did not attend/has not attended school.	9 178	10.7	8 717	9.4	7 760	7.7
Drop-out/has not yet finished Primary School	23 674	27.6	15 394	16.6	14 613	14.5
Completed Primary School	29 850	34.8	32 735	35.3	35 777	35.5
Completed Middle School	11 065	12.9	16 600	17.9	20 559	20.4
Completed High School:						
a. General High School	6 433	7.5	10 757	11.6	12 194	12.1
b. Specialized High School	3 860	4.5	5 471	5.9	6 047	6.0
One to three years in College	944	1.1	1 484	1.6	1 814	1.8
Undergraduates/graduates	772	0.9	1 576	1.7	2 016	2.0
Total	85 776	100	92 735	100	100 779	100

Source: Indonesian Manpower, BPS (various years); Before 1988, labour force is defined as the number of people older than 10 years, but it has been changed to 15 years since 1998.

Lanjouw *et al*. (2001) stated that education is an important factor for poverty reduction through raising individuals' earning capacity. Byron and Takahashi (1989, cited in ADB (2004)) estimated that the rate of return to private investment in schooling for urban Java was 17 per cent in 1981. McMahon and Boediono (1992) added that the social rate of return to education in Indonesia was 14 per cent for junior secondary school and 11 per cent for senior secondary school. Although the rate is moderate, an increase in the education budget may be a cost-effective poverty alleviation tool.

3.2 Economic profile

3.2.1 GDP growth rates and sectoral shares

Economic transformation in Indonesia had been relatively slow even before the country was hit by the monetary crisis in 1997. Prior to the crisis, the contribution of agriculture to GDP decreased from 17.9 per cent in 1993 to 14.9 per cent in 1997, but it increased during the crisis to 17.1 per cent in 1999. In line with the economic recovery process, the contribution of agriculture to GDP declined to 15.9 per cent in 2002. On the other hand, the contribution of the manufacturing sector has been increasing gradually; from 22.3 per cent in 1993 to 26.6 per cent in 2002 (Table 3.4).

Table 3.4 Proportion of GDP by sector at 1993 constant price

Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002 [a]
Agriculture, livestock, forestry and fishing	17.9	16.7	16.1	15.4	14.9	16.9	17.1	16.6	16.2	15.9
Mining and quarrying	9.6	9.4	9.3	9.1	8.9	10.0	9.7	9.8	9.4	9.3
Manufacture	22.3	23.3	23.9	24.7	24.8	25.3	26.1	26.4	26.5	26.6
Electricity, gas and water supply	1.0	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.7	1.8
Construction	6.8	7.3	7.6	8.0	8.2	6.0	5.8	5.8	5.9	5.9
Wholesale/retail	16.8	16.8	16.7	16.8	17.0	16.0	15.8	16.0	16.2	16.2
Transport and communication	7.0	7.1	7.1	7.2	7.3	7.2	7.1	7.3	7.6	7.9
Financial, ownership, and business services	8.5	8.7	8.9	8.8	8.9	7.5	6.9	6.9	6.9	7.0
Other services	10.1	9.7	9.2	8.8	8.8	9.7	9.8	9.6	9.4	9.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
GDP (trillion of rupiah)	329.8	354.4	383.8	413.8	433.2	376.4	379.4	396.0	411.7	426.8

Source: Statistical Yearbook of Indonesia, BPS (various years).
Note: [a] Temporary data.

The growth rate of the agricultural sector has fluctuated around an average growth rate of 2.4 per cent per year before the crisis (1993-1996) and 1.4 per cent per year post crisis (2000-2002). The growth rate of the manufacturing sector before the crisis also fluctuated but it was much higher than that of the agricultural sector (Table 3.5). The growth rate of the manufacturing sector, which has declined since the crisis, indicates that Indonesia's economic recovery is relatively slow. This is also indicated by the average growth rate of GDP, 7.6 per cent per year before the crisis, and 2.6 per cent per year post crisis. Consequently, the growth rate of GDP per capita in local currency decreased from 5.9 per cent per year before the crisis to 3.3 per cent per year after the crisis. GDP per capita, in US$ terms, fell dramatically from US$ 862 per capita on average in 1993-1996 to an average of US$ 211 per capita in 2000-2002.

3.2.2 Sectoral employment

Although both the contribution of the agricultural sector to GDP and the growth rate of the agricultural sector are lower than that of the manufacturing sector, agriculture is a larger employer than manufacturing. Nevertheless, the proportion of the labour force employed in the agricultural sector declined from 53.7 per cent in 1993 to 41.2 per cent in 1997, although it increased to about 44 per cent in 2001. On the other hand, the proportion of the labour force in the manufacturing sector increased from 10.5 per cent per year in 1992 to 13.3 per cent per year in 2002.

Table 3.5 Growth rate of GDP by sector and GDP per capita before and after the crisis

	Before the crisis					During the crisis			Recovery			
Sector	1993	1994	1995	1996	Ave-rage	1997	1998	1999	2000	2001	2002	Ave-rage
Agriculture, livestock, forestry and fishing	1.4	0.6	4.4	3.1	2.4	1.0	-1.3	2.2	1.9	1.0	1.7	1.4
Mining and quarrying	2.2	5.6	6.7	6.3	5.2	2.1	-2.8	-1.6	5.5	0.0	2.2	1.2
Manufacture	9.3	12.4	10.9	11.6	11.0	5.3	-11.4	3.9	6.0	4.1	4.0	3.6
Electricity, gas and water supply	4.1	12.5	15.9	13.6	11.5	12.4	3.0	8.3	7.6	7.7	6.2	5.9
Construction	12.1	14.9	12.9	12.8	13.2	7.4	-36.4	-1.9	5.6	4.2	4.1	2.4
Wholesale/retail	8.8	7.6	7.9	8.2	8.1	5.8	-18.2	-0.1	5.7	5.3	3.6	2.9
Transport and communication	9.9	8.3	8.5	8.7	8.9	7.0	-15.1	-0.8	8.6	7.3	7.8	4.6
Financial, ownership, and business services	10.3	10.2	11.0	6.0	9.4	5.9	-26.6	-7.2	4.6	3.4	5.5	1.3
Other services	4.3	2.8	3.3	3.4	3.4	3.6	-3.8	1.9	2.3	2.0	2.0	1.7
GDP (trillion of rupiah)	329.8	354.4	383.8	413.8	370.5	433.2	376.4	379.4	396.0	411.7	426.8	412.2
Growth rate (%/year)	(6.8)	(7.5)	(8.2)	(7.8)	(7.6)	(4.7	(-13.1)	(0.8)	(4.9)	(3.4)	(3.7)	(2.6)
GDP/cap (thousand of rupiah)	1 746	1 847	1 971	2 095	1 915	2 166	1 861	1 857	1 924	1 987	2 049	1 987
Growth rate (%/year)	(4.8)	(5.8)	(6.7)	(6.3)	(5.9)	(3.4)	(-14.1)	(-0.2)	(3.6)	(3.3)	(3.1)	(3.3)
GDP/Cap ($)	833	850	872	893	862	709	171	223	225	190	218	211
Growth rate (%/year)	(1.9)	(2.0)	(2.6)	(2.4)	(2.2)	(-20.7)	(-75.9)	(30.7)	(0.8)	(-15.3)	(14.7)	(0.1)

Source: Statistical Yearbook of Indonesia, BPS (various years); Figures in parentheses are the growth rates (per cent per year).

Table 3.6 Proportion and growth rates of employment by sector, 1991-2001

(percentage)

Sector	Proportion of employment (%)			Growth rate of employment (%/year)		
	Before the crisis (1991-96)	During the crisis (1997-99)	Reco-very (2000-01)	Before the crisis (1991-96)	During the crisis (1997-99)	Reco-very (2000-01)
Agriculture, forestry, hunting and fishing	48.9	43.1	44.5	-1.8	0.8	1.8
Manufacturing	11.8	12.4	13.1	6.1	2.9	2.5
Construction	3.5	4.2	4.1	20.0	-2.8	6.1
Trade, hotel and restaurant	16.5	19.6	19.9	6.6	2.9	0.0
Transport and communication	3.9	4.7	5.0	9.4	2.2	3.0
Finance, insurance, property and other services	0.8	0.7	1.1	6.4	-2.7	33.5
Social services	13.5	14.1	11.4	4.5	1.5	-3.4
Others	1.1	1.1	0.9	4.0	1.1	33.0
Total	100 (80.0)	100 (87.8)	100 (90.3)	2.1 (80.0)	1.2 (87.8)	1.1 (90.3)

Source: Statistical Yearbook of Indonesia, BPS (various years).

Notes: Mining and quarrying, electricity, gas and water supply are included in others; Figures in parentheses are the total employment (in millions).

3.2.3 Income distribution

Since expenditure data is more reliable than income data, expenditure data is frequently applied as a proxy of income in analysing income distribution in Indonesia. It should be noted, however, that expenditure tends to be higher than income for low-income households, and vice-versa. Consequently, per capita expenditure tends to be more equally distributed than per capita income.

Table 3.7 shows that the per capita expenditure distribution in Indonesia is fairly equal. The bottom 40 per cent of the population accounts for around 20 per cent of total expenditure. Per capita expenditure distribution in 1999 (third year of the crisis) was more equal than in 1966 (before the crisis) as can be seen from the Gini index, which was 0.36 in 1996 and 0.31 in 1999. However, the Gini index in 2002 was 0.33, indicating that expenditure distribution in Indonesia is diverging during the recovery period. The trend is not only true for urban areas but also for rural areas. Expenditure distribution in rural areas is more equal than in urban areas.

Table 3.7 Distribution of per capita expenditure by expenditure bracket and Gini Index

Area	Year	Distribution of per capita expenditure by brackets (%)				Gini Index
		Lowest 40%	Middle 40%	Highest 20%	Total	
Urban	1993	20.47	37.29	42.24	100	0.33
	1996	19.03	36.93	44.04	100	0.36
	1999	21.52	37.85	40.63	100	0.32
	2002	20.33	38.31	41.36	100	0.33
Rural	1993	25.13	38.42	36.45	100	0.26
	1996	23.24	39.09	37.67	100	0.27
	1999	25.02	40.00	34.97	100	0.24
	2002	25.82	37.99	36.18	100	0.25
Urban+Rural	1993	20.34	36.90	44.76	100	0.34
	1996	20.27	35.09	44.64	100	0.36
	1999	21.66	37.77	40.57	100	0.31
	2002	20.92	36.89	42.19	100	0.33

Source: National Socio-economic Surveys (SUSENAS), 1996, 1999 and 2002.

3.2.4 Significance of the informal sector

The informal sector is defined as a segment of the economy where economic activity is not officially registered, and hence does not contribute to government tax revenues. Although most agricultural landowners pay taxes for land and building (*Pajak Bumi dan Bangunan*), no tax is levied on farm production. The proportion of informal employment in agriculture is the highest (91.9 per cent) of all economic sectors.

Table 3.8 Proportion and growth rates of informal and formal employment by economic sector, 1992, 1997 and 2002

Economic sector	Informal employment [a]				Formal employment [b]				Informal
	1992	1997	2002	GR[d]	1992	1997	2002	GR[d]	%[c]
Agriculture, forestry, hunting and fisheries	67.63	55.56	58.53	-1.35	21.39	16.42	11.79	-4.49	91.9
Mining and quarrying	0.48	0.81	0.56	1.67	1.10	1.41	0.99	-1.00	56.2
Manufacturing Industries	5.96	7.83	6.84	1.48	21.05	21.59	27.82	3.22	36.0
Electricity, gas and water supply	0.04	0.03	0.03	-2.50	0.59	0.67	0.58	-0.17	9.6
Construction	0.97	1.19	3.62	27.32	8.36	11.09	7.05	-1.57	54.1
Wholesale and retail trading, restaurant and hotel	18.49	25.66	21.77	1.77	6.78	9.65	14.02	10.68	78.1
Transportation, storage, communication	2.74	4.30	4.82	7.59	4.51	5.53	5.74	2.73	65.8
Financing, insurance, real estate and business services	0.08	0.07	0.09	1.25	2.24	1.93	3.35	4.96	6.1
Community, social and personal services	3.43	4.54	3.74	0.90	33.90	31.71	28.65	-1.55	23.0
Others	0.16	0.00	0.00	-10.00	0.06	0.00	0.00	-10.00	0.0
Total (%)	100	100	100	-	100	100	100	-	-
Total (millions of workers)	54.8	55.1	63.8	1.64	23,7	32,0	27,8	1.73	69.6

Source: Statistical Yearbook of Indonesia, BPS (various years).

Notes: [a] Informal sectors include activities of those who (1) work alone; (2) work and assisted by household members/non-permanent worker(s); and (3) work for family.

[b] Formal Sectors include activities of those who (1) have own business with permanent worker(s), and (2) work as formal labourers or employees.

[c] Percentages of informal sector in each economic sector, 2002.

[d] GR=Growth rates (per cent per year).

The agricultural sector also absorbs the highest proportion of total informal employment: 67.6 per cent in 1992 or 58.5 per cent in 2002. Conversely, formal employment in the agricultural sector decreased from 21.4 per cent in 1992 to 11.8 per cent in 2002. The highest growth rate of informal employment is the construction sector and the transportation sector.

3.3 Unemployment and poverty

3.3.1 Unemployment

The data presented in Table 3.9 shows that the labour force in Indonesia has increased 2.48 per cent per annum, while unemployment surged at 23.70 per cent per annum. Due to rural-to-urban migration, the growth rate of labour force in urban areas (8.63 per cent per annum) was much higher than that in rural areas (0.09 per cent per annum). However, the proportion of labour force in rural areas remained higher than that in urban areas.

Table 3.9 Proportions and growth rates of rural and urban labour force by employment status in Indonesia, 1992-2002 (percentage)

Category	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	GR
						Rural						
Partly employed	46.9	46	45.2	44.5	45.8	43.3	45.5	44.2	43	39.3	44	-0.62
Fully employed	51.6	52.3	52.2	50.2	51.1	53.8	51.2	52	53	54.6	49	-0.50
Unemployment	1.5	1.6	2.6	5.3	3.2	2.8	3.3	3.8	4.1	6.1	7	36.67
Rural labour force (million)	58.1	57.8	59.3	57.2	59.9	59.2	59.3	58.7	58.1	58.3	58.6	0.09
	(72)	(71)	(69)	(66)	(66)	(65)	(64)	(62)	(61)	(59)	(58)	-
						Urban						
Partly employed	20.2	20.2	20.5	18.5	22.8	41.2	21.9	21	18.2	18.1	18.6	-0.79
Fully employed	74.1	74.2	71.3	70.4	68.9	50.7	68.8	68.5	72.6	71	69.4	-0.63
Unemployment	5.8	5.5	8.2	11.1	8.3	8.1	9.3	10.5	9.2	11	12	10.69
Urban labour force (million)	22.6	23.6	26.5	29.2	30.2	32.2	33.4	36.1	37.6	40.6	42.1	8.63
	(28)	(29)	(31)	(34)	(34)	(35)	(36)	(38)	(39)	(41)	(42)	-
						Rural + Urban						
Partly employed	39.4	38.6	37.5	35.7	39.4	37.6	37	35.4	33.2	30.6	31.2	-2.08
Fully employed	57.9	58.7	58.1	57	55.7	57.7	57.6	58.3	60.7	61.3	59.8	0.33
Unemployment	2.7	2.8	4.4	7.2	4.9	4.7	5.5	6.4	6.1	8.1	9.1	23.70
Total labour force (million)	80.7	81.4	85.8	86.4	90.1	91.3	92.7	94.8	95.7	98.8	100.7	2.48
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	-

Source: Indonesian Manpower (various years), BPS.
Note: Figures in parentheses are the percentages of total labour force.

In rural areas, unemployment rose from 1.5 per cent in 1992 to 7 per cent in 2002, while in urban areas it increased from 5.8 per cent in 1992 to 12 per cent in 2002. Note that the growth rate of rural unemployment (36.67 per cent per year) is slightly higher than that of urban unemployment (10.69 per cent per year). Also unemployment data is very likely an underestimate of what is commonly considered to constitute 'unemployment', and does not

include underemployment. A fully employed person is defined as someone who works at least 35 hours a week, while a partly employed person is defined as someone who work less than 35 hours but more than 8 hours a week.

3.3.2 Poverty

The poverty line is defined as the minimum amount of income that can meet the basic human nutritional needs; (2,100 calories per day), housing, clothing, education, transportation and other necessities. Before the crisis, the number of people under the poverty line in Indonesia declined from 25.9 million in 1993 to 22.5 million in 1996, but it increased during the crisis to 37.5 million in 1999, and worsened still during the recovery period to 38.4 million in 2002. In rural areas, the number declined from 17.2 million in 1993 to 15.3 million in 1996; but increased during the crisis to 25.1 million in 1999, and 28.6 million in 2001. In urban areas, it dropped from 8.7 million in 1993 to 7.2 million in 1996, but increased again during the crisis to 12.4 million in 1999, and still increased during the recovery period to 13.3 millions in 2002 (Table 3.10). The proportion of people under the poverty line in rural areas increased.

Table 3.10 Number and proportion of population below the poverty line

Year	Poverty line (Rp/cap/month)		Number of population below poverty line (millions)			Proportion of population below poverty line (%)		
	Urban	Rural	Urban	Rural	Total	Urban	Rural	Total
1993	27 905	18 244	8.7	17.2	25.9	13.4	13.8	13.7
			(33.6)	(66.4)	(100)			
1996	38 246	27 413	7.2	15.3	22.5	9.7	12.3	12.2
			(32.0)	(68.0)	(100)			
1999	89 845	69 420	12.4	25.1	37.5	15.1	20.2	18.2
			(33.1)	(66.9)	(100)			
2000	91 632	73 648	12.3	26.4	38.7	14.6	22.4	19.1
			(31.8)	(68.2)	(100)			
2001	100 011	80 382	8.5	28.6	37.1	9.8	25.0	18.3
			(22.9)	(77.1)	(100)			
2002	130 499	96 512	13.3	25.1	38.4	14.46	21.10	18.4
			(34.6)	(65.4)	(100)			

Sources: Socio-economic survey (December 1988, February 1999, August 1995, Estimation in 2001, and February 2002), BPS.
Note: Figures in parentheses are the percentages of the total.

In the 1990's, ICASERD conducted a study on various aspects of poverty reduction including geographic aspects, causal factors and alleviation efforts (Hermanto *et al*., 1995). The study indicated that most dry land, coastal and tidal swamp agro-ecosystems could be classified as less favoured areas (LFA).

Natural resources, technology, human resources, physical infrastructure, capital and institutional aspects were found to be important factors causing poverty. The major natural resource factor causing poverty is infertile farmland, which is exacerbated in many cases by erosion. The low level of technology, particularly farm technology, stems from the lack of agricultural extension, technology transfer and the inadequate supply of material inputs. The limitations relating to human resources in poor localities are low levels of education, low health standards, and a lack of economic motivation resulting from the lack of infrastructure and market information. In relation to physical infrastructure, almost 80 per cent of the sample sub-districts are relatively isolated. Low wage rates, low access to formal credit, and unfair shared-cropping arrangements are examples of institutional factors affecting the incidence of poverty (Taryoto, 1995).

Table 3.10 indicates that almost two-thirds of poor people in Indonesia reside in rural areas. Many of the poor are dependent directly or indirectly on the agricultural sector for their incomes. Therefore, raising agricultural productivity and returns to farm labour is particularly important in alleviating poverty. Rosegrant and Hazel (2000) stated that, when the Indonesia's agricultural value added per rural dweller increased by 2.6 per cent per year between 1970 and 1987, poverty declined by 41 per cent. Sumarto and Suryahadi (2004, cited in ADB, 2004) found that 1 per cent growth in the agricultural sector reduces rural poverty by 2.9 per cent, urban poverty by 1.1 per cent and total poverty by 1.9 per cent, while neither manufacturing sector growth nor services sector growth significantly alleviated poverty. In both urban and rural areas, the elasticity of poverty reduction with respect to manufacturing and services sector growth is around 0.06 and 0.03 respectively.

Balisacan, Pernia, and Asra (2003) found that the growth elasticity of poverty is about 0.7. suggesting that the welfare of the poor in Indonesia responds quite strongly to overall income growth. For comparison's sake, the growth elasticity of poverty in the Philippines is about 0.5.

3.4 Agricultural landholding and wage rates

Most landowners usually cultivate their own land but they may also lease out a part or all of their land to another farmer. For the purposes of the following discussion, the size of cultivated land can be defined as the area of owned land minus leased out land plus rented in land.

The tenancy status of rented land may be under a lease arrangement or shared-cropping arrangement. In a lease arrangement, a tenant pays the landowner in cash or in

kind, depending on the agreement between the two parties. In a shared-cropping arrangement, a tenant may obtain one-half of production. Landowners are responsible for material inputs, while tenants are responsible for labour. The shares of costs and outputs vary depending on the agreement between the two parties.

Land ownership in Indonesia is fairly unequal, in that around 48 per cent of farm households own only approximately 12 per cent of the total privately-owned land area. Table 3.11 shows that cultivated land is more equally distributed since 38.6 per cent of households own around 15 per cent of the total cultivated land area. The Gini indices of cultivated land are smaller than that of owned land for both lowland and upland, as demonstrated in Table 3.12.

Although cultivated land is more equally distributed than overall land ownership, the opportunity for landless farmers to rent land from landowners is small. As shown in Table 3.8, the number of households who owned land was 19.0 million in 1993, while the number of households cultivating land was 19.7 million. This implies that the majority of farmers own the land they cultivate. It is likely this is because most landowners have only a small area of land (see Table 3.8) and also farm labour is easy to obtain and is cheap (although real agricultural wages are growing at 5-8 per cent per annum).

Table 3.11 Distribution of households and average land size by land size category and status in Indonesia, 1993

Land Status	Land size categories (ha)						Total [b]
	< 0.10	0.10-0.24	0.25-0.49	0.50-0.99	1.00-1.99	> 1.99	
Owned land [a]							
% of households	7.79	17.91	22.30	22.23	17.03	12.74	100 (19.0)
% of area	0.58	3.29	8.19	15.91	24.72	47.31	100 (15.6)
Average size (ha)	0.06	0.15	0.30	0.59	1.19	3.05	0.82
Cultivated land [a]							
% of households	8.09	18.11	22.41	22.19	16.80	12.41	100 (19.7)
% of area	0.56	4.09	10.47	2.00	29.28	53.59	100 (14.5)
Average size (ha)	0.05	0.17	0.34	0.66	1.28	3.18	0.86

Source: Agricultural Census, 1993.
Note: [a] The size of cultivated land is defined as the area of owned land minus rented-out land area plus rented-in land area.
[b] Figures in parentheses are the total number of households (in millions) or total land area (in thousand of hectares).

Table 3.12 Gini ratios of cultivated and owned land by land type, 1993

Land type	Cultivated land [a]	Owned land
Lowland	0.4470	0.4608
Upland	0.5167	0.5248
Total	0.4995	0.5097

Source: Agricultural Census, 1993.
Note: [a] The size of cultivated land can be defined as the area of owned land minus rented-out land area plus rented-in land area.

Table 3.13 indicates that, based on the Agricultural Censuses 1983 and 1993, there was no significant change in the average size of cultivated land. However, it is interesting to compare the lowest two strata and the highest two strata. In the lowest two strata, the number of households increased by 32 per cent for the stratum of less than 0.1 hectares and by 16 per cent for the stratum of 0.10-0.19 hectares. On the other hand, the number of farm households in the highest two strata decreased by 66.2 per cent for the stratum of 10.00-14.99 and by 67.2 per cent for more than 15 hectares, while the average cultivated land size for the strata of more than 10 hectares increased slightly. Consequently, the average size of overall cultivated land changed from 1.05 hectares in 1983 to 0.86 hectares in 1993. Around 8 per cent of farmers cultivate on less than 0.1 hectares, 20 per cent of farmers cultivate on less than 0.2 hectares, 49 per cent of farmers cultivate on less than 0.5 hectares, 64 per cent cultivate less than 0.75 hectares, and 71 per cent of farmers cultivate on less than 1 hectare. Only about 29 per cent of farmers cultivate 1 hectare or larger.

Table 3.13 Farm households and cultivated land for food crops by strata, 1983 and 1993

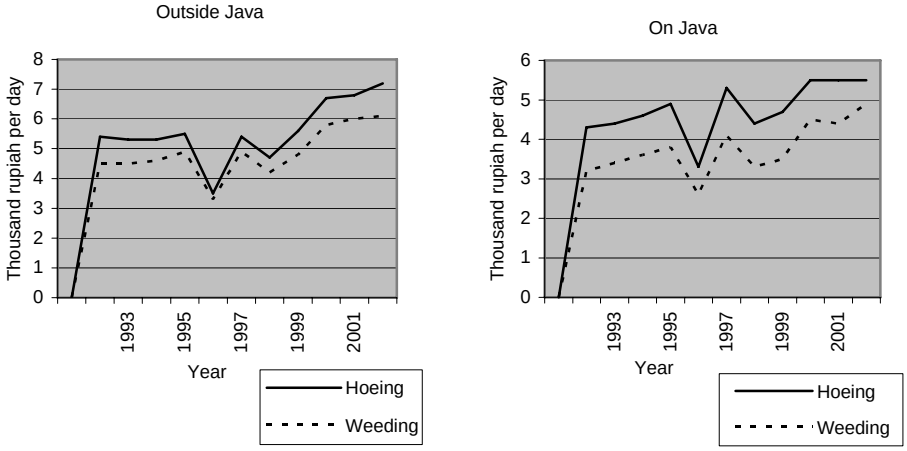
Cultivated land strata (hectares)	Agricultural Census 1983			Agricultural Census 1993			Changes in the number of households (%)
	Farm households (%)	Cultivated land area (%)	Average cultivated land (hectares)	Farm households (%)	Cultivated land area (%)	Average cultivated land (hectares)	
< 0.10	1.1	0.1	0.08	6.0	0.5	0.06	32.1
0.10 - 0.19	11.0	1.5	0.14	12.8	2.5	0.14	16.1
0.20 - 0.49	28.7	8.7	0.32	29.8	12.7	0.32	3.9
0.50 - 0.74	16.4	9.1	0.58	15.4	12.0	0.58	-6.2
0.75 - 0.99	8.6	6.8	0.83	7.6	8.4	0.83	-12.0
1.00 - 1.99	19.9	24.4	1.29	16.6	28.7	1.29	-16.3
2.00 - 2.99	7.6	16.1	2.24	7.2	21.4	2.22	-4.7
3.00 - 3.99	2.9	9.1	3.23	2.4	10.2	3.24	-19.7
4.00 - 4.99	1.4	5.7	4.22	1.0	5.8	4.23	-27.9
5.00 - 7.49	1.5	8.3	5.74	0.9	6.9	5.73	-40.5
7.50 - 9.99	0.4	3.0	8.39	0.2	2.3	8.37	-46.0
10.00 - 14.99	0.3	3.5	11.29	0.1	1.7	11.47	-66.2
15 +	0.2	3.8	20.70	0.1	1.9	22.17	-67.2
Total	100	100	1.05	100	100	0.86	145.4

Source: Agricultural Census, 1983 and 1993. The size of cultivated land can be defined as the area of owned land minus rented-out land area plus rented-in land area.

Figure 3.1 presents the trends of real wage rates in agriculture, particularly for hoeing and weeding. Three points can be drawn from the figure. Firstly, the low real wage rates indicate that Indonesia is a labour-abundant economy. Secondly, since the availability of labour outside Java is scarcer than within Java, the real wage rates outside Java are

approximately 30 per cent higher than the real wage rates on Java. Thirdly, the real wage rates have been gradually increasing from time to time.

Figure 3.1 Trends in real wage rates in agriculture 1992-2002 (Deflated by consumer price index based on 1995 constant prices)



Source: Wage Statistics, BPS (various years).

3.5 Agricultural diversification

3.5.1 Horizontal and regional diversification of CGPRT crops

Table 3.14 shows that the diversification indices of food crops and fruit crops were decreasing, while the diversification indices of vegetable crops and estate crops (rubber, oil palm, coffee, cocoa) were increasing in the last ten years. The diversification index for all agriculture in Indonesia decreased from 0.640 to 0.538.

Table 3.14 Changes in Simpson diversification indices by crop sub-sector, 1991-2001

Year	Food crops	Vegetable crops	Fruit crops	Estate crops	All crops
1991	0.580	0.880	0.784	0.833	0.640
1992	0.597	0.879	0.785	0.837	0.605
1993	0.571	0.878	0.771	0.844	0.531
1994	0.577	0.884	0.739	0.843	0.500
1995	0.584	0.877	0.763	0.847	0.439
1996	0.577	0.877	0.781	0.851	0.525
1997	0.559	0.882	0.764	0.870	0.580
1998	0.559	0.885	0.759	0.825	0.565
1999	0.550	0.875	0.755	0.853	0.571
2000	0.542	0.875	0.750	0.860	0.492
2001	0.534	0.883	0.746	0.850	0.538
Growth rates (%/year)	-0.802	0.036	-0.475	0.226	-1.168

Source: Statistik Tanaman Pangan (Food crops), Statistik Hortikultura (Fruits and vegetables), and Statistik Perkebunan (Estate crops), various years.

As shown in Table 3.15, food crop diversification indices in most provinces decreased except in three provinces: Central Kalimantan, Southeast Sulawesi, and East Nusa Tenggara. Regardless of the trends, five provinces can be classified as having high diversification indices, 13 provinces have medium diversification indices, and five provinces have low diversification indices.

In all provinces where the diversification indices of food crops were decreasing, rice was the only specialized crop (as determined by a specialization quotient less than one). Seventeen provinces specialized in rice, while six provinces had no specialized crop in 2002. No province specialized in crops other than rice.

Table 3.15 Changes in diversification and specialization of CGPRT crops and rice

Province [a]	Simpson Diversification Index				Specialized Crop [a]		Crops by trend in Specialization Index [a]	
	1996	2002	Ch [b]	DC [c]	1996	2002	Decreasing	Increasing
NAD	0.431	0.332	D	M	R	R	S,G,P,Sw	R,M,C
North Sumatra	0.449	0.428	D	M	R	R	R,S,G,C,P,Sw	M
West Sumatra	0.222	0.204	D	L	R	R	R,M,S,G,P	C,Sw
Riau	0.362	0.334	D	M	R	R	R,S,P,Sw	M,G,C
Jambi	0.328	0.263	D	M	R	R	R,S,G,C	M,P,Sw
South Sumatra	0.337	0.240	D	L	R	R	M,S,G,C,Sw	R,P
Bengkulu	0.563	0.499	D	M	R	R	M,S,G,C,P,Sw	R
Lampung	0.697	0.665	D	H	-	-	R,M,S,G,P,Sw	C
West Java	0.333	0.309	D	M	R	R	R,M,S,G,C,Sw	P
Central Java	0.614	0.561	D	M	-	-	M,S,C,P,Sw	R,G
D.I. Yogyakarta	0.767	0.760	D	H	-	-	R,S,Sw	M,G,C,P
East Java	0.680	0.650	D	H	-	-	M,S,C,P,Sw	R,G
Bali	0.590	0.534	D	M	-	R	M,S,C,Sw	R,G,P
West Nusa Tenggara	0.576	0.451	D	M	-	R	M,S,C,Sw	R,G,P
East Nusa Tenggara	0.656	0.664	I	H	-	-	M,S,G,C	R,P,Sw
West Kalimantan	0.262	0.205	D	L	R	R	R,M,S,G,C,Sw	P
Central Kalimantan	0.200	0.225	I	L	R	R	R,M,S	G,C,P,Sw
South Kalimantan	0.258	0.218	D	L	R	R	R,M,S,G,C	P,Sw
East Kalimantan	0.267	0.253	D	M	R	R	R,S,G,C,Sw	M,P
North Sulawesi	0.660	0.574	D	M	-	-	R,S,G,C,Sw	M,P
Central Sulawesi	0.342	0.342	C	M	R	R	R,S,G,C,Sw	M,P
South Sulawesi	0.536	0.446	D	M	R	R	M,S,G,C,P,Sw	R
Southeast Sulawesi	0.594	0.645	I	H	-	-	R,M,S,P	G,C,Sw
Average or total	0.466	0.426	I = 3 C = 1 D=19	H = 5 M=13 L = 5	R=14 (61%)	R=16 (70%)		

Source: Statistik Tanaman Pangan, 1996 and 2002.
Total number of provinces = 23.
Note: [a] A specialized crop is defined as a crop having specialization quotient greater than one;
R = Rice; M = Maize; S = Soybean; G = Groundnut; C = Cassava; P = Potato; Sw = Sweet potato.
[b] Ch = Changes in diversification index: I = increased; D = decreased; C = constant.
[c] DC = Diversification index categories in 2002: H = High; M = Medium; L = Low;
H > (Means+SD); L < (Means-SD); and (Means-SD) < M < (Means+SD).

Due to decreasing food crop diversification, Bali and West Nusa Tenggara did not specialize in any one crop in 1996, but were specializing in rice by 2002. Five provinces (Lampung, Central Java, DI Yogyakarta, East Java, and North Sulawesi) had no specialized crop in 1996 and 2002, despite decreasing food crop diversifiction. East Nusa Tenggara and Southeast Sulawesi had increasing food crop diversification and also had no specialized crop in 1996 or 2002.

For rice, 12.7 per cent of provinces showed a decreasing specialization quotient, while 17.6 per cent of provinces had an increasing specialization quotient. Similarly, 13.6 per cent of provinces had decreasing but 15.7 per cent had an increasing specialization quotient in maize. In the case of soybean, none of the provinces had an increasing specialization quotient but 20.9 per cent had a decreasing specialization quotient.

In the cases of cassava and groundnut, the proportions of provinces with decreasing and increasing specialization quotients in each crop are almost the same. In the case of potato, the proportion of provinces having increasing specialization quotient is high (27.5 per cent) compared to those with decreasing specialization quotient. In the case of sweet potato, more provinces have a decreasing than increasing specialization quotient (Table 3.16).

Based on this data, the trend seems to be towards specialization in potato, rice and maize, with 27.5 per cent, 17.6 per cent, and 15.7 per cent of regions have increasing specialization quotients in potatoes, rice and maize respectively.

Although most diversification indices at the provincial level were decreasing, the diversification of CGPRT crops nationwide is not due to regional specialization on the basis of competitive advantage. Regional specialization is avoided to some extent due to the high inter-provincial and inter-island transport costs. This factor, and the inelastic nature of demand for CGPRT crops means that slight increases in supply can dramatically reduce prices and, as a result, farm income. Conversely, slight shortages of supply can dramatically increase prices and hence make the consumers worse-off (Hedley, 1987).

Hedley (1987) pointed out several important features about the early diversification efforts in Indonesia. Firstly, co-ordination among several government agencies involved in the provision of inputs, credit, extension, marketing, pricing and seed development and multiplication was not as clearly defined as in the case of rice several years earlier. The Ministry of Agriculture did not have the full range of policy instruments or mandate that had worked so successfully with the rice intensification programme.

Table 3.16 Proportion of provinces with decreasing or increasing specialization quotients in particular crops from the year of 1996 to 2003 (percentage)

Proportion of provinces having:	Rice	Maize	Soybean	Ground-nut	Cassava	Potato	Sweet potato	Total
Decreasing specialization quotients	12.7	13.6	20.9	13.6	14.5	9.1	15.5	100
Increasing specialization quotients	17.6	15.7	0	13.7	13.7	27.5	11.8	100

Source: Statistik Tanaman Pangan 1996 and 2002;
Note: The total number of provinces is 23.

Secondly, the price of rice is the most important factor determining farm income level in many areas of Indonesia, but more than half of rice producing households are also net rice consumers. This implies that diversification of food crops must begin with the stability of prices of food crops. Otherwise, it is unlikely that diversification can make long-term progress.

Thirdly, since rice is the staple food, there is a large body of knowledge regarding the harvest, storage, milling and distribution of rice. Moreover, many CGPRT crops are more perishable and more difficult to transport than rice. Therefore, CGPRT crops require careful marketing if their production is to be expanded. Marketing arrangements used for rice may not be appropriate for the other food crops.

Fourthly, rice marketing in Indonesia has operated through BULOG for many years. BULOG can cover the operating costs because the domestic rice prices are relatively high in comparison with global rice prices. It is not clear whether BULOG is an appropriate marketing system for other food crops.

3.5.2 Vertical diversification

Vertical diversification of food crops may be defined as the expansion of post-harvest activities including sorting, grading, processing, packing, storage and transport (Hedley, 1987). The expansion of processing and transformation industries seems to be the most important factor in generating income and employment in rural areas.

Indonesia has a wide range of indigenous knowledge in processing food but it is still dominated by traditional technologies. On the other hand, changes in consumer demand and rapid growth of supermarkets require improved technologies that meet high, quality and hygiene standards. Contract farming between supermarkets and farmers of CGPRT crops is not as developed as in fresh fruits and vegetables.

It may be appropriate for the government to provide incentives in the form of risk sharing and tax relief so that the private sector is willing to invest in processing and post-harvest activities. The government also needs to initiate public-private partnerships in well-

defined research areas and provide rural infrastructure where private provisions are unlikely (ADB, 2004).

3.6 Environmental problems

3.6.1 Environmental impacts of agricultural policy

In order to intensify the production of food crops, particularly rice, the government of Indonesia has been implementing the Mass Guidance Programme (BIMAS) since the mid 1960s. This programme has introduced high-yielding varieties, highly dependent on inorganic fertilizers, the use of which has increased rapidly, while the use of organic fertilizers has declined. The declining use of organic fertilizers has resulted in low organic content of the soil leading to low water retention capacity and soil erosion.

Extensive use of nitrogen fertilizers leads to nitrate leaching because the supply of nitrogen from fertilizers exceeds the nitrogen uptake by plants. Nitrate leaching can contaminate drinking water as well as cause excessive algal growth, oxygen depletion and fish mortality in waterways (FAO, 2004).

The intensification of production has also increased the use of pesticides that lower the resistance of high-yielding varieties to pests and diseases. High pesticide application also kills pest predators and is harmful for the health of both growers and consumers.

3.6.2 Deforestation[1]

Indonesia is endowed with one of the largest stocks of tropical rainforest of any country in the world. The major types of forest in Indonesia range from lowland dipterocarp forests in Sumatra and Kalimantan to seasonal monsoon forests and savanna grasslands in Nusa Tenggara. In the last 20 years, forest cover in Indonesia has declined considerably. It is estimated that in 1985 there were 110 million hectares of forest, covering 60 per cent of Indonesia's land area, of which around 50 million hectares were designated as parks, reserves and protected areas, and 60 million productive forest. This area declined to 92 million hectares in 1997 and 86 million hectares in 2000 (ADB, 2004). The main factors accelerating deforestation are (i) large-scale conversion of forest land to estate crops and timber plantations; (ii) excess wood processing industries and widespread illegal logging driven by the timber industry; (iii) forest fires; and (iv) smallholder conversion and settlement (ADB, 2004).

[1] This part is heavily drawn from ADB, 2004.

Industrial timber (Hutan tanaman industri) and estate crop plantations have been promoted to boost export revenues. About 8 million hectares, mostly natural forest, have been allocated for industrial timber plantations, particularly fast growing Acacia mangium, to produce pulpwood. Around 7 million hectares of forest have been approved for estate crop plantations, particularly oil-palm plantations. While the conversion of forest to timber and estate crop plantations has already exceeded the approved conversion area, only around one-quarter to one-third of the deforested land is actually used for those purposes. This implies that around 10 million hectares of the cleared land is currently idle (Kartodihardjo and Agus, 2000).

Table 3.17 Forest area and deforestation in Indonesia, 1985-1977 (thousands of hectares)

Island	1985			1977			Deforestation 1985-1977 (thousand ha. /year)
	Forest area	Forest cover	Percentage of forest	Forest area	Forest cover	Percentage of forest	
Sumatra	47 531	23 324	49	47059	16 632	35	557.6
Java and Bali	13 820	1 346	10	n.d.	n.d.	n.d.	n.d.
Nusa Tenggara	8 074	2 469	31	n.d.	n.d.	n.d.	n.d.
Kalimantan	53 583	39 986	75	53 004	31 512	59	706.1
Sulawesi	18 615	11 269	61	18 462	9 000	49	189.1
Maluku	7 802	6 348	81	n.d.	5 544	n.d.	67.0
Papua	41 480	34 958	84	40 871	33 160	81	149.8
Total	190 905	119 700	63	189 702	100 000	53	1 641.7

Source: Adopted from ADB, 2003.
Note: Figures in italics are estimates by Forest Watch Indonesia/Global Forest Watch.

Wood-processing industries (plywood, pulp and paper) have expanded regardless of the availability of timber supplies and the capacity has exceeded sustainable forest yields. Consequently, the shortfall of timber for processing has been met by illegal logging. In 1997, around 41 million cubic metres of logs were supplied by illegal logging, and in 1998 the amount increased to 57 million cubic metres (World Bank, 2001). FWI/GFW (2002, cited in ADB (2004)) estimates that additional shortfall of 35-40 million cubic metres annually was met from illegal logging, which has expanded into protected forest and national parks. The Ministry of Forestry reported that about 30 per cent of almost 47 million hectares of forest land operated by 432 existing and expired concessions was degraded, reduced to scrub or converted to agriculture. Only 40 per cent was left in good condition as primary forest and 30 per cent as good-to-moderate logged forest land (FWI/GFW, 2002, cited in ADB, 2004).

In the past, shifting cultivation practices were always blamed for forest fires. Satellite imagery has shown that forest fires in 1997 and 1998 were indeed primarily caused by land clearing activities. Large-scale forest conversion was responsible for 34 per cent of the fires, shifting cultivation for 25 per cent, estate plantation for 17 per cent, social conflict for 14 per

cent, and transmigration projects for 8 per cent. Only 1 per cent of the fires were not started by human activity. Due to the drought brought about by El Nino, the large forest fires in 1997/98 spread extensively in eight provinces (World Bank, 2001, cited in FAO, 2004).

Forest Watch Indonesia/Global Forest Watch (2002) estimated that smallholders had caused 4 million hectares (20 per cent) of forest loss in the period of 1985-1997. The transmigration of people from Java to the outer islands has caused about 2 million hectares of forest clearance between 1960s and 1999 (ADB, 2004).

3.7 Concluding summary

The growth rate of the Indonesian population is 1.15 per cent per year. The labour force totals about 48 per cent of the population with a growth rate of 2.3 per cent per year. Unemployment is high and growing. The educational level of the labour force is comparatively low, as evidenced by the literacy rate, the low proportion of the labour force who have completed high school and the literacy rate.

Although the contribution of the agricultural sector to total GDP has been relatively low (around 17 per cent), its contribution to employment remained high (45 per cent) in 2002. Income per capita increased from US$ 753 in 1994 to US$ 901 in 1997. Due to the crisis, it dropped to US$ 779 in 1998 and then increased to US$ 820 in 2002. The total number of people below the poverty line rose from 26 million (13.7 per cent) in 1993 to 38 million (18.4 per cent) in 2002, and around 65 per cent of them reside in rural areas.

The Simpson Diversification Index for food crops fell in all provinces of Indonesia, rice representing the only specialized crop.

Intensification of food production over the last 30 years has resulted in several environmental problems: (i) Declining use of organic fertilizers, and thus declining organic content of the soil leading to low water retainment in the soil and high erosion; (ii) extensive use of nitrogen fertilizers leading to environmental damage and problems for human health; and (iii) greater use of pesticides, lowering the resistance of high-yielding varieties to pests and diseases, killing pest predators and damaging human health.

Deforestation is another serious environmental problem in Indonesia. It is caused by forest land conversion for estate crops, wood-processing industries (including illegal logging), forest fires and smallholder resettlement.

4. Historical and Current Status of CGPRT Crops

4.1 Trends in CGPRT crops production and consumption

4.1.1 Cropping patterns and cropping indices

A cropping pattern describes not only the frequency of cropping in one year but also the crops grown in each season or period. Cropping patterns vary across agro-ecological zones. To measure the cropping intensity in a given area, a cropping index is used, defined as the total planted area of all crops for one year divided by cultivated area. Table 4.1 indicates that the cropping index of irrigated land is higher than that of non-irrigated land (rainfed lowland and dry land).

Table 4.1 also shows that CGPRT crops are not the major crops grown on irrigated land and rainfed lowland since the two types of land are dominated by rice. In contrast, most CGPRT crops are grown in marginal, dry land areas characterized by low soil fertility, lack of marketing infrastructure, and widespread land degradation. Most farmers who grow CGPRT crops in dry land areas are poor. A government initiated programme for CGPRT crop development in marginal land may directly reduce the incidence of poverty.

On irrigated land, rice may be grown once, twice or three times a year depending on (i) the availability of water; (ii) population pressures; and (iii) the price level. It is noteworthy that before 1990 rice farmers were not accustomed to grow rice three times a year even on very well irrigated land. In the late 1990's, especially after the Programme of Cropping Index 300 (IP300) was implemented, more farmers in well-irrigated areas grew rice three times a year. Although the programme did not recommend such a cropping pattern, it was not explicitly prohibited. Irawan *et al*. (2003) found that the number of farmers who grew rice three times a year on irrigated land of East Java increased from 8.9 per cent to 40 per cent as a result. Intensive cropping should be avoided, as it is detrimental to soil fertility and pest control.

Table 4.1 Cropping pattern by type of land in nine sample districts

District	Irrigated land	Rainfed lowland	Dry land
Deli Serdang (North Sumatra)	R R - R	R R - R	G - G - G Rr - B S - Mb
Simalungun (North Sumatra)	R – R R – C R - M	ni	P - M (P+T) - (P + T) - (P + T)
Muba (South Sumatra)	ni	ni	R R - R (R + M+ C) - (C + M)
Oku (South Sumatra)	R Mb – R	R S - R	S+C+M
Central Lampung (Lampung)	R – R M – M	R - R R - R - S	(C+S) M (S + M) - (S + M)
North Lampung (Lampung)	R – R R - R - (Mb+M+C)	R R - R	R + C + M M - M
Garut (West Java)	R – R R – Rp R - R – Rp	(S + M) - (S + M) (S + M) - S	
Subang (West Java)	R – R R - R - (M+Mb+G+Gb)	R - R (R + S) - (Sb+Gb) (C +B +S +Sb + Gb)	R - (M +G) (R + C)
Lamongan (East Java)	R – R S – G R - S – R R - S – G	R - S R - S - M	(C + M+G+Rp) - (M + G) (C+M+G+Rp) - M (M+Rp) - (M + G)
Nganjuk (East Java)	R – R (C+S+M)- (S +M) (R - S - Sh)	ni	(S + C + M)
Bone (South Sulawesi)	R – R R - S – R S – R	R	S
Bulu Kumba (South Sulawesi)	R - Mb – R R – R R - R – R	R - R R	M - M - M Mb - M
Average multiple cropping index (%)	224	182	205

Source: Anonymous, 1990.

Note: R = Rice; P = Potato; Sh = Shallot; M= Maize; G = Groundnut; T = Tomato; S = Soybean; Sb = String bean; Mb = Mung bean; C = Cassava; Rp = Red pepper; Gb = *Gajih* bean; ni = no information (+) = intercropping; (-) = between cropping seasons.

4.1.2 Cultivated area, yields and production of CGPRT crops[1]

Table 4.2 shows the total production of rice and CGPRT crops from 1993 to 2003. Total production of all CGPRT crops has been increasing since 1993, except for sweet potato and soybean.

[1] Although rice is not a CGPRT crop, rice is frequently included in the discussion because any rice policy, to some extent, can affect the development of CGPRT crops

Table 4.2 Total production of rice and CGPRT crops, 1993-2003 (thousands of tons)

Year	Rice	Maize	Soybean	Groundnut	Cassava	Potato	Sweet potato
1993	48 181	6 460	1 709	608	17 215	809	2 069
1994	46 642	6 869	1 565	627	15 654	877	1 827
1995	49 744	8 246	1 680	756	15 365	1 035	2 153
1996	51 102	9 307	1 517	734	16 948	1 110	2 002
1997	49 377	8 771	1 357	685	15 092	813	1 832
1998	49 237	10 169	1 306	688	14 663	928	1 923
1999	50 866	9 204	1 383	660	16 457	924	1 665
2000	51 179	9 677	1 010	736	16 087	977	1 828
2001	50 461	9 347	827	709	17 055	831	1 749
2002	51 490	9 654	673	718	16 913	894	1 772
2003[a]	52 079	10 910	672	785	18 474	984	1 998
Trend (% / year)	0.8	6.9	-6.1	2.9	0.7	2.2	-0.3

Source: Statistical Yearbook of Indonesia (various years).
Note: [a] Estimate.

Changes in total production may be broken down into changes in cultivated area and changes in yields (Tables 4.3 and 4.4). Factors that affect changes in yields are: (i) the adoption of HYV (high-yielding varieties); (ii) production management; and (iii) soil fertility. Factors that may expand harvested area are: (i) changes in cropping patterns; (ii) land conversion to non-agricultural uses; (iii) climate; (iv) irrigation developments; and (v) demand.

It can be seen from Tables 4.3 and 4.4 that the decline in total production for soybean and sweet potato was due to a decline in the total area cultivated of these crops. In addition, soybean is not well suited to cultivation in the tropics and only minor improvements have been made to yields for tropical varieties. The decline in cultivated area was due to declining profits from the production of these crops.

Table 4.3 Area cultivated of rice and CGPRT crops, 1993-2003 (thousands of hectares)

Year	Rice	Maize	Soybean	Groundnut	Cassava	Potato	Sweet potato
1993	11 013	2 940	1 470	621	1 389	51.0	220
1994	10 734	3 109	1 407	638	1 337	56.1	192
1995	11 439	3 652	1 477	735	1 305	62.4	224
1996	11 570	3 744	1 279	686	1 401	69.9	208
1997	11 141	3 355	1 114	619	1 233	50.2	192
1998	11 730	3 848	1 095	646	1 197	65.0	199
1999	11 963	3 456	1 151	625	1 350	62.8	172
2000	11 793	3 500	824	684	1 284	73.1	194
2001	11 494	3 286	679	655	1 318	56.0	181
2002	11 521	3 127	546	647	1 277	57.3	177
2003[a]	11 477	3 380	530	670	1 200	63.8	171
Trend (% / year)	0.4	1.5	-6.4	0.8	-1.4	2.5	-2.2

Source: Statistical Yearbook of Indonesia (various years).
Note: [a] Estimate.

Table 4.4 Yields of CGPRT crops, 1993-2003 (tons per hectare)

Year	Rice	Maize	Soybean	Groundnut	Cassava	Potato	Sweet potato
1993	4.38	2.20	1.16	0.98	12.40	15.87	9.40
1994	4.35	2.21	1.11	0.98	11.70	15.64	9.52
1995	4.35	2.26	1.14	1.03	11.77	16.59	9.61
1996	4.42	2.49	1.19	1.07	12.09	15.88	9.64
1997	4.43	2.61	1.22	1.11	12.24	16.20	9.57
1998	4.20	2.64	1.19	1.06	12.25	14.28	9.66
1999	4.25	2.66	1.20	1.06	12.19	14.71	9.67
2000	4.34	2.76	1.22	1.08	12.53	13.37	9.41
2001	4.39	2.84	1.22	1.08	12.94	14.84	9.66
2002	4.47	3.09	1.23	1.11	13.25	15.60	9.99
2003 [a]	4.54	3.23	1.27	1.17	15.39	15.41	11.69
Trend (% / year)	0.37	4.68	0.95	1.94	2.41	-0.29	2.44

Source: Statistical Yearbook of Indonesia (various years).
Note: [a] Estimate.

Table 4.4 shows that, except for potato, yields for rice and all CGPRT crops grew over the ten years from 1993. The decline in potato yield was due to a decline in the availability of quality seed. However, demand for potatoes, both locally and for export, grew over the period and consequently, cultivated area and production increased. Yield growth rates for all CGPRT crops, except potato, were higher than that for rice. It appears that rice yields have levelled off after rapid growth during the green revolution.

The expanding use of hybrid maize seeds has caused rapid growth in maize yields. In addition, increasing demand for maize (largely from the poultry industry) has resulted in an increase in its cultivation. Hence, the production growth rate of maize was the highest among CGPRT crops. Similarly, the growth in total production of groundnut was high as both the growth in yield and cultivated area was positive.

4.1.3 Domestic use of rice, wheat and CGPRT crops

Consumption of rice and CGPRT crops from 1993 to 2001 is shown in Table 4.5. The consumption of all crops has increased, except for sweet potato and soybean. Rice remains the most commonly consumed staple food, and rice prices are the most important determinant of food security and poverty. The effect of rice prices on household income depends on whether the household is a net seller or net buyer of rice. The urban poor and the majority of the rural poor are net buyers of rice. For them, lower rice prices mean higher real incomes and less poverty at least in the short run. Policies should be geared towards reducing the price of rice to help alleviate poverty.

Table 4.5 Total consumption of rice, wheat and selected CGPRT crops, 1993-2001

Commodity	Total consumption (thousands of tons)					Growth rate (%/yr)
	1993	1995	1997	1999	2001	
Rice (milled)	28 180	28 894	29 878	32 236	31 945	1.7
Wheat	2 553	4 193	3 564	3 112	2 945	1.9
Maize	5 947	6 866	7 110	7 098	8 402	5.2
Potatoes	6 22	829	734	810	864	4.9
Cassava	10 359	10 924	11 782	11 638	11 883	1.8
Sweet potatoes	1 830	1 907	1 616	1 425	1 517	-2.1
Soybeans	1 992	2 050	1 828	1 602	1 840	-1.0
Groundnuts (shelled)	744	734	858	770	824	1.3

Source: SUSENAS (Socio-economic Survey), BPS.

4.1.4 Current status of irrigation

Lowland in Indonesia is classified into irrigated and tidal swamps, while irrigated land itself can be broken down into technical, semi-technical, simple irrigated and rainfed lowland. For technical irrigation systems, the government builds and maintains the systems up to primary and secondary canals such that the supply and distribution of water can be easily controlled. In semi-technical irrigation systems, the government only builds main water gates. In simple irrigation, government involvement is minor. In rainfed lowland areas, water is dependent on rainfall.

Irrigation development in Indonesia was initiated during the colonial era, but many irrigation systems were damaged and not properly maintained during the war for independence. In the first five-year development plan (*PELITA* I), the government implemented four irrigation development strategies: (i) development of new irrigation system; (ii) rehabilitation of old irrigation systems; (iii) river and flood controls; and (iv) development of wetland and tidal swamp areas. Public investment in irrigation increased from Rp 20.7 billion in 1969/70 to Rp 1,556.4 billion in 1993/94 (Rosegrant and Pasandaran, 1995). In *PELITA* I and II (1969-1979), priority was put on the rehabilitation of damaged irrigation systems. Since then, priority has been put on the development of new irrigation systems.

Table 4.6 Area growth rate by type of lowland and frequency of rice cropping per year

Type of lowland	Frequency of rice crop per year	1991		1996		2001		Growth rates
		Hectare (thousands)	%	Hectare (thousands)	%	Hectare (thousands)	%	(%/yr)
Technical irrigated	Once	362	4.4	406	4.8	352	4.5	-0.28
	Twice or more	1 473	17.9	1 730	20.3	1 892	24.3	2.84
Semi-technical irrigated	Once	247	3.0	227	2.7	237	3.0	-0.40
	Twice or more	703	8.6	708	8.3	745	9.6	
Simple irrigated	Once	664	8.1	628	7.4	604	7.8	0.60
	Twice or more	983	12.0	1 062	12.5	1 037	13.3	-0.90
Rainfed lowland	Once	1 854	22.6	1 670	19.6	1 455	18.7	0.55
	Twice or more	311	3.8	419	4.9	509	6.5	-2.15
Tidal swamp	Once	432	5.3	478	5.6	514	6.6	6.37
	Twice or more	70	0.8	100	1.2	87	1.1	1.90
Others	Once	1 044	12.7	1 039	12.2	311	4.0	2.43
	Twice or more	72	0.9	54	0.6	37	0.5	-7.02
Total (once rice/year)		4 603	56.0	4 447	52.2	3 473	44.6	-2.45
Total (twice or more rice/year)		3 612	44.0	4 072	47.8	4 307	55.4	1.92
Grand total		8 215	100	8 519	100	7 780	100	-0.53

Source: Land Area by Utilization in Indonesia, BPS (various year).

The total area of lowland that can be used to grow rice twice a year increased by 9.26 per cent per year, whereas the total area that can be used to grow rice once a year decreased by 12.65 per cent per year, demonstrating that part of the rationale for irrigation improvement must be to raise harvest frequency of rice. The supply and the use of irrigation water is threatened by four factors: (i) land conversion to non-agricultural uses; (ii) increasing competition for water, (iii) increasing costs of irrigation investment, and (iv) global climate change. Land conversion means not only that agricultural land is lost, but also that irrigation infrastructure is dismantled, which is costly to replace. Irawan (2001) found that, due to the low productivity of the available land, for every hectare of irrigated land lost 3.5-7.0 hectares of land must be employed, with pump-irrigation, to maintain the prevailing food supply and employment in agriculture.

In agriculture, water scarcity is negatively correlated to the investment in irrigation development and rehabilitation. Since the cost of irrigation investment tends to increase faster than the government's irrigation budget, the general condition of irrigation systems has deteriorated. Consequently, the efficiency of irrigation water use is low. The situation has been exacerbated by the recent droughts caused by El Nino.

In line with the general decentralization of government, the operation and maintenance (O&M) costs of irrigation facilities are the responsibility of regional governments. However, regional governments are not able to implement O&M properly due to institutional, staffing and budget constraints, while Water User Associations (P3A) do not

have the necessary resources to carry out proper irrigation management. This gives rise to dysfunctional irrigation facilities, distribution difficulties at tertiary blocks, and increasing costs of irrigation rehabilitation (FAO, 2003).

As a result of economic development and population growth, irrigation competes for water with households, electricity, industry and fishponds. All the while, water quality has worsened due to the degradation of catchment areas. This is a significant barrier to rice production which depends heavily on water availability. From a financial point of view, it is also impossible for the government to provide sufficient funds to maintain and expand irrigation systems in order to serve the increasing demand for irrigation water. In addition, economic returns to irrigation investment have declined as the cost of irrigation investment in new areas has steadily risen and world rice prices have fallen. Given these looming problems, it seems sensible to promote crops that are more water efficient.

4.2 CGPRT crops and markets

4.2.1 Market structure

There are two primary functions of the market: (i) price setting based on consumer demand and producer costs; and (ii) processing and transportation of raw commodities. For the two to function efficiently, a skilful combination of public and private investment is required.

Market structure in general, is dependent on the number of sellers and buyers. For example, the market structure of CGPRT crops at the village level may be competitive during the peak harvest period because many buyers come from outside the villages. Outside these times, however, the market may become oligopsonistic where farmers sell their produce to a very limited number of buyers (see for example: Hadi *et al*., 1993 and Saptana *et al*., 2001).

Hadi *et al*., (1993) found that in the case of maize where the final users are feed mills, the feed mills have oligarchical power to determine the price of maize along the length of the market chain. The feed industry is the price maker while middlemen and farmers are price takers. Such a market structure is also true in the case of cassava (see Pakpahan and Nasution, 1992). The limited number of large tapioca, pellet and dried cassava (*gaplek*) factories indicates the existence of oligarchical market structure.

4.2.2 Market chains, margins and efficiency

In the market chain for maize in East Java, for example, there are three levels of traders between farmers and wholesalers: village traders, sub-district traders and district

traders (Appendix 1). Farmers may sell maize to village traders or directly to sub-district traders, while village traders may sell maize to sub-district traders or directly to district traders. Wholesalers in Surabaya buy maize from district traders and then sell it to feed mills or to wholesalers in other provinces. The flow of maize to other provinces takes place at peak harvest time when production exceeds the capacity of the local market and feed mills. Conversely, during off-peak times, maize flows from other provinces to wholesalers in Surabaya. Before 1993, BULOG was responsible for importing maize to meet the feed mill needs. Since 1993, imports have been the responsibility of private importers or feed mills themselves.

Table 4.7 shows that market efficiency of maize in East Java is higher than that in West Java due to differences in transportation costs (see also Appendix 2). As the maize producing area in East Java is more concentrated than that in West Java, transportation costs in East Java are lower.

Table 4.7 Marketing margin of maize [a]

Region/ Market chain	Buying prices		Marketing costs		Profit		Selling prices	
	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]
West Java (Wanaraja):								
Local assembler	200	78.4	10	3.9	20	7.8	230	90.2
(Sub) district traders	230	90.2	15	5.9	10	3.9	255 [c]	100
East Java (Kediri):								
Local assembler	205	84.7	5	2.1	13	5.4	223	92.2
(Sub) district traders	223	92.2	8	3.3	11	4.5	242 [c]	100

Source: Hadi *et al*., 1993.
Note: [a] Market chain: farmers - local assemblers – (sub) district middlemen - feed mills.
[b] Percentages towards selling price to feed mills.
[c] Selling price to feed mills as final users.

The market chain for soybean in East Java is presented in Appendix 3. Although there are various chains from farmers to final users, the main market chain is from farmers to village assemblers, large assemblers, district traders and finally to tofu/*tempe* producers. Appendix 4 indicates that the farm gate price of soybean is about 77 per cent of the selling price at wholesale level. It implies that the market efficiency of soybean in East Java is lower than that of maize, perhaps because soybean producing areas are more dispersed than maize producing areas.

In West Java and Lampung, the farm gate price of soybean is more than 90 per cent of the buying price paid by tofu/*tempe* producers. This implies that soybean market efficiency in the two provinces is higher than that in East Java because the market chains in the two provinces are shorter than in East Java (see Appendix 4). As implicitly described in

Table 4.8, soybean flows through a short chain from farmers to sub-district traders and finally to tofu/*tempe* producers.

Although cassava farmers produce two kinds of cassava products, most farmers prefer producing fresh cassava to produce dried-sliced manioc (*gaplek*), especially when the price of cassava declines. The market chain of fresh cassava is simpler than that of dried-sliced cassava (see Appendices 5 and 6). Farmers usually sell unharvested crops to traders or to co-operatives after both parties agree upon the estimated total value of the crops (called the *tebasan* system). While a trader acts as an agent of the tapioca producer, a co-operative acts as the supplier of fresh cassava to tapioca producers. At peak harvest time, a serious problem often arises because both traders and co-operatives have to wait in a long queue at the gates of tapioca processing units. The long waiting time may reduce the quality of cassava and consequently reduce the selling price to tapioca producers.

Table 4.8 Marketing margin of soybean [a]

Region/ Market chain	Buying prices		Transport costs		Profit		Selling prices	
	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]
West Java (Garut):								
Local assembler	720	93.5	11	1.4	9.0	1.2	740	96.1
(Sub) district traders	740	96.1	11	1.4	19	2.5	770 [c]	100
East Java (Kediri):								
Local assembler	615	92.5	8	1.2	7.0	1.0	630	94.7
(Sub) district traders	630	94.7	18	2.7	17	2.6	665 [c]	100

Source: Hayami *et al*., 1987 and Hayami *et al*., 1989.
Note: [a] Market chain: farmers - local assemblers – (sub) district middlemen – *tempe*/tofu industry.
[b] Percentage towards selling price to *tempe*/tofu industry.
[c] Selling price to *tempe*/tofu industry.

Compared with market chains for maize and soybean, the market chain of fresh cassava is less efficient in a sense that farm gate prices are less than 70 per cent of prices at the tapioca producers, except in Kediri (Table 4.9). Unlike in Malang and Lampung where the *tebasan* system is commonly practised, most farmers in Kediri do not sell standing crops but sell after they harvest the crops themselves (see Djauhari *et al*., 1992 and Nasution *et al*., 1992).

Table 4.9 Marketing margin of fresh cassava (percentage)

Cost component	Lampung		East Java	
	Central Lampung	North Lampung	Malang	Kediri
Farm gate price	48.7	48.1	64.9	74.5
Market margin:				
Harvesting and truck loading	17.9	19.2	6.1	6.2
Transport	19.7	22.6	7.1	6.2
Traders' profit	13.6	10.1	21.9	13.3
Total	51.3	51.9	35.1	25.7
Buying price by tapioca producers	100.0	100.0	100.0	100.0

Source: Computed from Djauhari *et al*., 1992 and Nasution *et al*., 1992.

In the case of dried cassava, there are also two market chains (Appendix 6). In the first market chain, a farmer sells dried cassava to a Village Co-operative Unit (KUD), which then reprocesses it to achieve the desired quality. The KUD sells the dried cassava to a KUD Center that sells it to exporters. In the second market chain, farmers sell dried cassava to village assemblers who then sell the product to large traders. The large traders re-dry the product to satisfy the requirement for a 17 per cent-moisture content. The large traders sell the product to wholesalers who then sell it to exporters. Similar to the case of fresh cassava in general, the farm gate prices of dried cassava are less than 70 per cent of the wholesale price, indicating that market for dried cassava is less efficient than that of maize and soybean (see Table 4.10 and Appendix 7).

Adiyoga *et al*. (1996), cited by Erwidodo and Hadi (1999), describes that although there are several market chains for potato in Pangalengen (West Java), the market chains are relatively simple and short. The market chains consist of (i) field assembly traders; (ii) contract traders; (iii) rural assembly traders; (iv) regional and inter-regional traders; (v) wholesalers; and (vi) retailers (see Appendix 8). Field assemblers are small-scale traders who visit farms daily to buy potatoes and then sell them to rural traders. They operate with their own funds or act as commission agents of rural assembly traders. The potato market systems in Pangalengan, Karo and Wonosobo districts are relatively efficient since the farm gate price is more that 70 per cent of the prices paid by consumers or exporters (see Table 4.11 and Appendix 9).

Table 4.10 Marketing margin of dried cassava (percentage)

Cost component	Central Lampung (*Gaplek*)	Kediri (Chips)
Farm gate price	68.8	58.3
Market margin:	30.2	41.7
Processing/packing	6.3	6.3
Losses	3.4	7.7
Transport	12.1	11.7
Traders' profit	9.4	16.0
Traders' selling price to exporters	100.0	100.0

Source: Computed from Djauhari *et al*., 1992 and Nasution *et al*., 1992.

From the above discussion, it may be concluded that the market systems of maize, soybean and potato are relatively efficient during peak harvest periods but the systems are less efficient during periods of lean harvests. The market systems of both fresh cassava and dried cassava are inefficient due to the existence of oligarchical power and less-developed infrastructure. Hayami *et al*. (1987) and Hayami *et al*. (1989) found that the soybean market in Garut and Lampung was efficient since the margins at each level of the chain can only be explained by handling and transportation costs, plus the middleman's 'opportunity costs'. In other words, no trader can enjoy 'economic rent' or excessive profit. Similar findings were also found by Rusastra *et al*.(1992), Zulham *et al*.(1993), Purwoto *et al.*(1993) and Purwoto and Sayaka (1992), though profits for sub-district middlemen were slightly above 'normal profits'.

Table 4.11 Marketing margin of potato [a]

Districts/ Market chains	Buying price		Transport costs		Profit		Selling price	
	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]	Rp/kg	% [b]
Karo (North Sumatra):								
Local assemblers	1 650	73.8	84	3.8	41	1.8	1 775	79.4
Sub-district traders	1 775	79.4	118	5.3	42	1.9	1 935	86.6
District traders	1 935	86.6	141	6.3	44	2.0	2 120	94.9
Provincial traders/Exporters	2 120	94.9	86	3.8	29	1.3	2 235[c]	100
Wonosobo (Central Java):								
Local assemblers	2 220	74.9	177	6.0	3	0.1	2 400	80.9
Sub-district middlemen	2 400	80.9	94	3.2	56	1.9	2 550	86.0
District middlemen	2 550	86.0	225	7.6	45	1.5	2 820	95.1
Provincial traders	2 820	95.1	101	3.4	44	1.5	2 965[c]	100

Source: Saptana *et al*., 2001.

Note: [a] Market chain: farmers - local assemblers – (sub) district middlemen – district middlemen – provincial traders/exporters.

[b] Percentage towards selling price to provincial traders/exporters.

[c] Selling price provincial traders/exporters.

In the case when a margin can only be explained by handling and transportation costs, Hayami *et al*. (1987) suggest that the government should not intervene in the market

because any intervention would reduce market efficiency. The only way to increase market efficiency is to improve infrastructure, enhance market information and expand access to credit for middlemen and those who are willing to enter the market (see also Pakpahan and Nasution, 1992).

4.3 Concluding summary

Total production of rice and all CGPRT crops has increased, except for soybean due to a decrease in its harvested area. Except for potato, the yields for all CGPRT crops have increased faster than that for rice.

Government policy in irrigation development has resulted in a high growth rate of irrigated area that can be cultivated for rice at least twice a year. This area grew by 9.3 per cent per year for the 1991-2001 period. Consequently, the proportion of farmers who grew rice three times a year on irrigated-land also rose considerably, regardless of its adverse effects on soil fertility and pest populations.

Rice remains the most commonly consumed staple. Rice prices are the most important determinant of food security and poverty.

The efficiency of markets for CGPRT crops varies from one location to another. In general, market systems of maize, soybean and potato are relatively efficient; but market systems of both fresh cassava and dried cassava are relatively inefficient due to the existence of oligarchical power and less-developed infrastructure. When market margins can only be explained by handling and transportation costs and normal profits, the government should not intervene in the market because intervention would reduce market efficiency. The best ways to increase market efficiency are to improve infrastructure, enhance market information and expand access to credit for middlemen and those willing to enter the market.

5. Overview of Agricultural Diversification-Related Policies

5.1 Public policies relating to CGPRT crop production

CGPRT crop production policies in Indonesia were preceded by rice production policies. Before the first five-year development plan (*PELITA* I) was initiated in 1968/69, rice as a major staple food in Indonesia was in short supply and rice imports were rising. Although rice production could be augmented through area expansion programmes, such programmes were costly to carry out, and the potential to boost rice production through area expansion was small. Fortunately, the green revolution provided technology to increase domestic rice production through the BIMAS rice intensification programme. Through extension services, the programme promoted the use of new production technology consisting of HYVs (high-yielding varieties), inorganic fertilizers and pesticides.

To support these programmes, the government implemented other programmes such as the rehabilitation of irrigation systems, transfer of technology, establishment of low interest credit for rice farmers, rice marketing through BULOG, a floor price, input subsidies, research to develop rice suitable to local conditions, provision of inputs (seeds, fertilizers and pesticides), multiplication and distribution of seeds, and area expansion targets. As a result, Indonesia was self-sufficient in rice in 1984.

After 1984, the BIMAS intensification programme and its subsequent improvements such as INMAS, INSUS, SUPRA INSUS, and Self-Reliance programmes were also implemented for CGPRT crops, especially for maize and soybean, but intensification programmes for rice production always received the highest priority until now. Through INMAS, farmers could buy modern inputs at subsidized prices but without subsidized credit. The INSUS programme provided farmers with extension services while the farmers had to acquire all inputs by themselves. In the SUPRA INSUS programme, the government provided a subsidized credit package contingent on co-operation between groups of farmers.

In these programmes, the government provided cheap credit not only for the production of rice but also for the production of maize, soybean and horticultural crops. The Farm Credit Programme (KUT) was launched in 1985 but most of the credit was used for rice production. Besides, the provision of credit only ever reached 10 per cent of the

national rice area, except in 1999 when it reached 20 per cent but the default rate was also the highest (Erwidodo and Hadi, 1999). Since 2000, the KUT programme has been replaced by the Food Security Credit (KKP) programme in which the executing banks bear all the credit funds and risks.

An important policy supporting the intensification programmes was input subsidies aimed at encouraging farmers to meet the high input requirements of high-yielding varieties. Fertilizer subsidies, however, applied to all crops. These subsidies were removed in 1998 as a part of reform proposed by IMF in dealing with the economic crisis. The removal of fertilizer subsidies increased the prices of Urea, ZA, SP-36 and KCL by 147, 53, 146 and 94 per cent respectively. To compensate the increases in fertilizer prices, the floor price of unhusked rice was raised by 50 per cent and the interest rate in rice intensification programmes was reduced from 14 to 10.5 per cent per annum (Erwidodo and Hadi, 1999). To provide incentives for rice production, the government again provided incentives in the form of fertilizer and seed subsidies up to one billion rupiah (Suryana and Hermanto, 2004). It is apparent that these compensation policies are particularly aimed at supporting rice production rather than supporting the production of other crops.

Soybean received special attention because it is an important source of protein, particularly for low-income households. To reduce the dependency on soybean imports, the country implemented a series of soybean production programmes, which were similar to those adopted to encourage rice production. In addition, the government also implemented the UPSUS programme (*upaya khusus*) known as a special programme for soybean. The programme sets targets for area expansion, distributes improved seeds and facilitates credit. As a result of the programme, as well as subsidized liming, price support and trade policies, the harvested area of soybean has increased from 896,000 hectares in 1985 to 1.47 million hectares in 1993. Since then, as shown previously, the area under soybean cultivation has declined due to low profits from soybean production compared with rice and other CGPRT crops such as maize and groundnut.

Maize varieties suited to Indonesian growing conditions were not developed until the late 1970s, when the State Company of PT Sang Hyang Sri produced new maize varieties, *Arjuna* and *Harapan-6* maize varieties*,* which are responsive to the use of fertilizers and partially resistant to downy mildew. In 1983, PT Cargil produced C-1 hybrid seed. The more recent high-yielding varieties are CPI-1and CPI-2 produced by PT Charoen Pokphan, Arjuna Bisi produced by PT Bright Indonesia Seed Industry, and Pioneer produced by PT Pioneer (Erwidodo and Hadi, 1999). Consequently, the use of these varieties increased the

use of fertilizers and maize yields. For this reason, the government also increased the maize area under the intensification programme (BIMAS).

In relation to potato, government policies have been limited because potato is not considered a staple food. Since 1995, the government has implemented a production credit scheme for potato. Credit is distributed by a bank (BRI) through Village Co-operative Units (KUD) to farmer groups. Although membership of a farmer group is required, evidence indicates that generally only large-scale and well-educated farmers accessed the credit scheme.

The largest cost in potato production is the seed. To obtain quality potato seeds, the Government of West Java, supported by the Japanese International Co-operation Agency, carried out a potato seed project involving a number of related agencies. The Vegetable Research Institute in Lembang is responsible for producing and sending potato plantlets G-0 (pathogen-free material) to the Seed Farm Centre at Pangalengan which multiplies them to produce G-1 and G-2. The G-2 is then sent to PD. Mamin, which is responsible for producing G-3. Through the Centre of Rural Co-operative Units, G-3 is sold to certified seed growers who produce G-4. Finally, G-4 is bought by the Centre of Rural Co-operative Units and then distributed to farmers (Erwidodo and Hadi, 1999).

Similar to the case of potato, the government has never launched significant programmes for CGPRT crops such as cassava, sweet potato, groundnut or mung bean, except programmes for varietal and agronomic improvements carried out by ICFORD (formerly Central Research Institute for Food Crops (CRIFC)). To prevent soil erosion, the government recommends that steeply sloped land not be cultivated, particularly for cassava, however, this recommendation has not been enforced.

To reiterate, government policies have favoured rice production and to a lesser extent, soybean and maize production. At the national and provincial levels, no specific production policy has been developed for potato, cassava, sweet potato or mung bean production.

Simatupang (1989) also stated that rice production policies, such as irrigation development, technological development through research and development, and farm credits through intensification programmes (Bimas and Supra Insus) have reduced crop diversification. The impact of each policy on crop diversification is set out below.

Policies for irrigation development and supporting institutions, such as the Water User Association (P3A) were initially designed to support rice production. This is demonstrated by the existence of Irrigation Committees the at district level that determine

the cropping patterns in each district. Although the committee recommends that rice be grown twice a year (during the wet season and the dry season), it also recommends that secondary food crops (CGPRT crops) and vegetables be grown in the dry season only. This policy has reduced farmers' flexibility to choose alternative crops (Sumaryanto *et al*., 2001).

Technology development policies have also favoured rice production. For example, 16 new rice varieties were released from 1993 to 1998, while in the same period only seven soybean varieties, three groundnut varieties, and one mung bean variety were released. This policy has brought about high and stable productivity of rice and in turn increased profitability and decreased the risks involved with rice production. Although private companies have expanded the use of new maize varieties, the varieties are only grown in the main maize production centres. In addition, agricultural extension services are predominantly for rice production, thus, farmers are most knowledgeable about rice production.

Farm credit policies, in intensification programmes such as Bimas and Supra Insus and food security programmes have also favoured rice production. Although the farm credit programme (KUT) in the period of 1997-2000 was oriented towards secondary food crops and horticulture, it was limited in scale and sporadic in nature. Credit for rice production is offered at a concessionary rate (10.5 per cent per year) lowering rice production costs.

5.2 Marketing and price support policies

The effectiveness of price support as a production incentive depends to a large extent on government marketing operations. The main purpose of marketing policies is to procure commodities from domestic production or from abroad. The major objectives of price support and marketing policies in the past were (i) to maintain farm gate prices of the commodities above a certain level set by the government; and (ii) to meet the demand for the commodities by intervening in domestic marketing and importation. In the past, these policies were implemented for rice, soybean and maize.

To ensure domestic price stability and food security, the government assigns the Logistic Agency (BULOG) to maintain a minimum stock of rice by importing and purchasing domestic production. To facilitate BULOG's market operations, the government provides BULOG with soft credit from the central bank (Bank Indonesia). BULOG has built 433 rice storage facilities throughout the country with a total capacity of 2.5 million tons. Note that

the government procurement of rice accounted for only 6-7 per cent of domestic rice production.

After the country reached rice self-sufficiency in 1984, rice imports were banned. BULOG was only allowed to purchase rice from domestic production for its stabilization activities. This import restriction policy, however, was costly for two reasons: (i) the international rice price tended to decline, and domestic prices were higher than those in the world market; and (ii) the price stabilization policy became costly due to the high costs of domestic procurement and storage to maintain buffer stocks. Since BULOG's operational costs were subsidized through soft credit provision, the price stabilization policy proved too costly for the government. Regardless of the costs, the price stabilization policy was successful in stimulating domestic rice production.

The price support policy for CGPRT crops was first initiated for maize in 1978, while price support policies for soybean began in 1980. No price policy has been established for cassava, potato, sweet potato or groundnut. Similar to rice, the floor prices for maize and soybean were also set on the basis of production costs and returns (including expected net returns to farmers) and the previous market prices. The floor prices were adjusted annually. In fact, the floor price of maize was raised by 10.9 per cent per year, which was higher than that of rice (10.4 per cent) and soybean (6.4 per cent).

To make the price support policies effective, the government implemented market intervention policies particularly for rice, maize and soybean. In the case of soybean, BULOG intervention in the domestic market was relatively small and indirect. As the only importer, BULOG and its trading companies had a monopoly on the importation and distribution of soybean to private traders and KOPTI (the co-operatives of tofu and *tempe* producers), while KOPTI was assigned to procure soybean from farmers. Since the actual farm gate price of soybean was about 60 per cent above the floor price, the floor price had little effect and domestic soybean procurement by KOPTI did not operate effectively. Instead, private traders could carry out the procurement efficiently because domestic supply was far below demand and peak harvest production could be absorbed without lowering the farm gate price of soybean. During the off-season, the soybean price was still relatively low because the amount of imported soybean was high.

Government involvement in maize marketing and price support policies for maize have been limited. BULOG procured maize from farmers through village co-operatives (KUD) for the period of 1978-1988. Initially, the procurement was sizeable because inter-island and inter-provincial marketing of maize was entirely controlled by BULOG to balance

supply and demand, but procurement subsequently drastically declined. Since 1988, however, BULOG no longer intervened in maize marketing because such intervention resulted in (i) substantial financial burdens to the government budget; (ii) higher farm gate prices resulting from competition with private traders; and (iii) excess domestic demand particularly from the feed industry. Since maize marketing has been left to private companies and traders, maize can be purchased at market prices.

Simatupang (1989) argued that the floor price policy for rice has resulted in relatively high and stable prices making its production more profitable and less risky than the production of secondary food crops (CGPRT crops). The effectiveness of this policy, however, has been declining since it is no longer supported by soft loans, the Food Logistic Agency (BULOG) has been reformed and input subsidies have been phased-out. However, the effects of the policies on rice price level and stability at the farm gate still continue to some extent.

Since 1997 and the monetary crisis, government capacity to implement the price stabilization policy for rice has declined. In addition, the agenda sponsored by the IMF has forced Indonesia to implement drastic and broad reforms, including for rice. The IMF insisted that BULOG's operations and monopoly be limited to rice and that all subsidies for food commodities be sharply reduced. In December 1998 dramatic reforms in agriculture were implemented including (i) the liberalization of the rice market such that all importers, including BULOG, are allowed to import and distribute rice; (ii) the floor price of rice is implemented regionally, not nationally to avoid price drops during the peak harvest period; (iii) during periods of scarcity, special market operations with a low rice price are implemented for the needy; and (iv) elimination of subsidized fertilizers (urea, SP-36, and KCL) and pesticides. However, contrary to the dictates of the IMF, the floor price of rice is still implemented nationally, and since 2002 the government has again provided farmers with input subsidies for fertilizers and seeds.

5.3 Public policies regarding food diversification and processing

As a response to the food crisis in the 1960s, the government launched a campaign of 'rice-maize', promoting a mix of rice and maize in every meal and the substitution of maize for rice at particular meals. At the end of the first five-year development plan (*PELITA* I), the government announced Presidential Decree (INPRES) no. 14, 1974 regarding 'food quality improvement' (*Upaya Perbaikan Mutu Makanan Rakyat*) which was superseded by INPRES no. 20, 1979. In fact, the emphasis on food quality improvement was for staple

food diversification rather than overall food diversification, and how this policy should be implemented was also unclear. Since 1991/92, the Ministry of Agriculture has advocated a Diversified Food and Nutrition Programme (*Diversifikasi Pangan dan Gizi*) with two objectives: (i) to strengthen food security at the household level; and (ii) to improve the awareness of rural people to consume diversified foods. Since 1998/99, the programme has included the development of local food alternatives. None of these programmes, however, have significantly reduced per capita consumption of rice.

Once it became clear that self-sufficiency in rice could not be maintained after 1984, the government shifted the orientation of food policy: (i) from rice sufficiency to food sufficiency; (ii) from food quantity to food quality; (iii) from management of food shortages to management of food surplus through market operations; (iv) from production-focused to market demand-focused; and (v) from a single favoured commodity to diversified food commodities (Hasan, 1994). Nevertheless, the implementation of these food diversification policies remains unclear.

In relation to wheat, government subsidies for wheat imports and distribution, as well as the establishment of wheat flour processing have significantly increased the consumption of wheat products. In the second half of the 1960s, when the country was facing foreign currency shortages, the government intensively introduced wheat flour to avoid being dependent on rice imports. During that period, rice was characterized by unstable international prices and a thin international market. To stabilize food prices in particular and the economy in general, it was seen to be preferable to import wheat because the international price of wheat was relatively stable, the international wheat market was relatively large, and the substitutability of wheat for rice was predicted to be high.

As reported by Magiera (1981), the role of USA in supporting this policy was significant. At the end of the 1960s, USA facilitated a concessionary loan to purchase USA-grown wheat. In the period of 1968-1973, imports totalled 3.3 million metric tons of wheat (grain equivalent); 61 per cent of which was imported from USA and 89 per cent of the import budget was the concession loan. After the construction of three wheat flourmill plants in the early 1970s, wheat imports drastically increased up to 4.6 million tons in the period of 1973-1978, but the proportion of the concession loan declined to 24 per cent.

Indonesia has become the sixth largest wheat importer in the world after Brazil, Egypt, Iran, Japan and Algeria. Imports of wheat grain increased from 3.7 million tons in 1997/98 to 4.1 million tons in 2000/01 (Sawit, 2003). The government subsidy for wheat imports and distribution may in part account for this development. The real subsidy

increased from Rp 3 billion in 1976/77 to Rp 17 billion in 1978/79. The instant noodle industry was even more highly subsidized. Based on 1994 data, the industry received subsidies of Rp 760 billion per year. In line with the increase in rice production, wheat imports were reduced in the 1980s, but have increased rapidly after the government liberalized the market for wheat and wheat flour in 1998. Noodle consumption, therefore, increased from 1.1 kilogram per capita per year in 1993 to about 2.3 kilograms per capita per year in 2002 (Martianto and Ariani, 2004).

Indonesia has become the second largest consumer of instant noodles in the world, after China. It appears that the income elasticity of demand for wheat products is relative high because the consumption level of wheat products by high-income individuals is 40 to 60 times that of low-income individuals. The share of large companies in producing instant noodles is enormous, the share of the Indofood Company alone is 85-90 per cent. In 2000, domestic production of instant noodles totalled 8.2 billion packs. The rapid shift of consumption to wheat products by low and middle-income classes has significantly reduced the consumption of domestically produced food crops such as cassava, sweet potato, sago and maize (Sawit, 2003).

The relatively low price of wheat flour and protection of the wheat flour industry, which has resulted in rapid expansion, has resulted in negative impacts for growers of other staple crops. Eliminating the protection of the wheat flour industry would benefit both farmers and food security in Indonesia.

It seems that the increase in per capita noodle consumption has reduced rice consumption per capita from 116 kilograms per capita per year in 1993 to 100.3 kilograms per capita per year in 2002 (see Table 8.1). An increase in the import tariff for rice, if effective, would raise the domestic price of rice. Since rice and wheat are substitutable goods, any increase in the import tariff of rice would increase wheat and wheat flour imports significantly. Therefore, Sawit (2003) suggests that a tariff should be levied on wheat that is at least 50 per cent as much as the import tariff on rice. Such a policy would diversify consumption and subsequently diversify the production of food crops.

The food situation in Indonesia is unique in that not only is Indonesia an archipelago but the country also has a wide range of soil fertility, different potentials of local food crops, and many different cultural groups (Hasan, 1994).

5.4 Concluding summary

The government's production-related policies such as the irrigation development policy, floor price policy, farm credit policy, and technological development policy are all biased towards boosting rice production.

To encourage domestic rice production, the government imposes import tariffs and price support for rice. Wheat imports, wheat flour processing and the noodle industry were initially subsidized through soft loans. Consequently, noodle consumption increased from 1.1 kilogram per capita per year in 1993 to about 2.3 kilograms per capita per year in 2002. Price support for maize and soybean, which were implemented before 1992, were not effective because the floor prices were far below the actual market prices at the farm gate level, or the ratios of the floor prices of maize or soybean to the floor prices of rice declined. These policies do not encourage domestic food diversification and, therefore, do not encourage crop diversification. From this point of view, it would be more reasonable for the government to impose import tariffs for wheat than to impose import tariffs on rice.

6. Trade and CGPRT Crops

6.1 Trade in CGPRT crops

Soybean imports increased from 0.75 million tons in 1996 to 1.36 million tons in 2002. This is because domestic production fell, and concomitantly demand from the rapidly growing tofu, *tempe*, poultry and feed industries grew. Imports of soybean meal also increased from 0.9 million tons in 1996 to 1.3 million tons in 2002. It appears that reductions in the import tariff did not have a large effect on soybean imports as even the domestic price increased by 14 per cent per year from 1993 to 2003.

Indonesia is both an exporter and importer of maize, however, the trade balance of maize has been negative except in 1998, as depicted in Table 6.1. In 1998, domestic demand for maize dropped sharply due to the collapse of the poultry industry, the largest user of maize for feed. Japan is the major destination of maize exports from Indonesia. In recent years, growth in domestic consumption has outstripped growth in domestic production, and imports have ranged from 0.6 to 1.26 million tons. The main sources of maize imports were Argentina, USA, South Africa and Viet Nam.

In the case of groundnut, the growth rate of domestic production was higher than that of domestic consumption. However, since production was still lower than consumption, the trade balance of groundnut was negative but the deficit was not as large as that for soybean or maize.

The main cassava export product is dried-sliced manioc, other products being tapioca and pellet exports. From 1996 onwards, the quantity of dried cassava exports declined due to shrinking domestic production and growing domestic use.

Indonesia is a net exporter of potato. Exports of potato have increased rapidly without substantial government assistance, from 365 tons in 1980 to 36,758 tons in 1997 (Erwidodo and Hadi, 1999). The major destination countries of potato exports are Malaysia and Singapore.

Potato imports, in the form of potato seeds, fresh/chilled potato and frozen potato also increased rapidly from 18.9 tons in 1988 to 2,035 tons in 1997. The major countries of origin are Australia, USA and the Netherlands for potato seeds, Australia and the Netherlands for fresh/chilled potato, and USA for frozen potato (Erwidodo and Hadi, 1999).

Table 6.1 Exports (X), imports (M) and trade balances (TB) of food crops, 1996-2002

Commodity	Trades & balances[a]	1996	1997	1998	1999	2000	2001	2002	GR[b]
Wheat	X	0	0	0	0	0	0	0	0.0
	M	4 116	3 612	3 444	2 713	3 589	2 172	4 250	0.5
	TB	-1 050	-777	-630	-404	-502	-400	-614	-6.9
Rice	X	0.2	0.1	2	2.7	1.2	4	4	316.7
	M	2 150	350	2 895	4 751	1 356	645	1805	-2.7
	TB	-766	-109	-860	-1326	-319	-134	-341	-9.2
Maize	X	26.8	19	624.9	90.6	28.1	90.5	16.3	-6.5
	M	617	1 098	313	618	1 265	1 036	1 154	14.5
	TB	-128	-161	18	-69	-153	-115	-135	0.9
Soybean	X	0	0	0	0	0	0	0	0.0
	M	746	616	343	1 302	1 278	1 136	1 365	13.8
	TB	-252	-207	-99	-302	-275	-239	-299	3.1
Soy meal	X	0	0	0	0	0	0	0	0.0
	M	942	869	668	905	1 262	1 570	1 326	6.8
	TB	-266	-282	-158	-161	-269	-361	-278	0.8
Groundnut	X	3	3	5	3	3	2	4	5.6
	M	163	171	42	112	132	119	119	-4.5
	TB	-7	-109	-20	-36	-41	-35	-37	71.4
Tapioca	X	9.8	18.9	31.6	48.3	5.4	8.9	0	-16.7
	M	0	0	0	0	0	0	0	0.0
	TB	3	3	8	8	1	2	0	-16.7
Dried cassava	X	389	247	221	340	151	177	70	-13.7
	M	0	0	0	0	0	0	0	0.0
	TB	48	23	20	23	11	14	6	-14.6
Potato	X	17 968	36 788	26 026	32 268	30 229	27 664	27 363	8.7
	M	894	2 035	682	3 176	4 569	2 679	2 336	26.9
	TB	1 553	2 954	1 427	444	363	396	446	-11.9
Other cereals	X	0	0.3	0.2	0.1	0	0.2	0.2	0.0
	M	35	7	6	7	17	9	11	-11.4
	TB	-8	-4	-2	-2	-3	-2	-2	-12.5
Total TB		-2 302	-1 576	-1 605	-2 036	-1 428	-1 146	-1 537	-5.5

Source: Exports and Imports, BPS (various years).

Notes: [a] Trade: X = export (thousands of tons), M = Import (thousands of tons). TB (trade balance) = export value - import value (US$ million); the italic figures are the average trade balances.

[b] GR = growth rates (per cent per year).

After 1984, rice imports steadily increased. In 1996, the country imported 2.1 million tons of rice due to a domestic supply shortage resulting from drought. In 1998-1999, the economic crisis and severe drought also increased the quantity of rice imports. Despite the fact that rice was highly protected over the period, average annual rice imports from 1996 to 2002 were around 2 million tons (around US$ 520 million) per annum.

6.2 Indonesia's trade policies regarding rice and CGPRT crops

Before 1989, the rice market in Indonesia was heavily protected, especially with non-tariff barriers. In spite of the heavy import restrictions, rice imports increased substantially because domestic production could not meet increasing demand for rice and Indonesia is once again one of the largest rice importers in the world. Since the government declared its policy of 'self-sufficiency on trend' in the 1990s, import restrictions have not been rigidly implemented. Rice imports are adjusted to the level of domestic rice production; but the goal of increasing self-sufficiency remains (Suryana, 2004).

Previously, the government also imposed tariffs and controls on soybean imports as well as marketing policies to increase soybean self-sufficiency and reduce imports. A 30 per cent import tariff was introduced in 1974. It was reduced to 20 per cent in 1986, 10 per cent in 1989, 7.5 per cent in 1994, 5 per cent in 1995, 2.5 per cent in 1996, and phased out in 1997. An import tariff of 5 per cent for soybean oil was still in effect up to 2001 (Hadi, 2002). To protect the soybean meal industry, which has had an average capacity of 350,000 tons per year since 1988, the government imposed a tariff of 35 per cent for imported soybean cake before 1989. The tariff level was reduced to 10 per cent in 1988, 5 per cent in 1993, and was phased out in 1995 (Erwidodo and Hadi, 1999).

Prior to 1997, BULOG and its trading companies had a monopoly on the importation and distribution of soybean. As the result, the domestic price was always above the import parity price. In 1995, for example, the domestic price of soybean was 94 per cent higher than its import parity price (Erwidodo and Hadi, 1999). This situation provided substantial incentives for BULOG, and its trading companies, but it increased the costs to poultry and the other livestock raisers, and taxed small-scale tofu and *tempe* producers, as well as consumers in general.

Although government policies resulted in higher domestic soybean prices compared to the import parity price, it did not positively affect domestic production because of the low profit generated from soybean production compared with other crops. As shown in Tables 6.3 to 6.8, the return-to-cost ratio of soybean, in general, was lower than that of rice, maize, groundnut and potato. Moreover, the growth rate of the nominal soybean price (14 per cent per year) was lower than that of unhusked rice (17 per cent per year) and maize (19 per cent per year). As a result, soybean production contracted and the growth rate of soybean imports increased by 13.8 per cent per year (Table 6.1).

Most imported soybean was distributed to food processing and the tofu and *tempe* producers' co-operative (KOPTI), and a small proportion went to market. The main objective

of this policy was to guarantee soybean supply for household producers of tofu and *tempe*, which are a cheap source of protein for low-income earners. To make such an intervention effective in boosting domestic soybean production, the government instructed KOPTI to absorb at least 40 per cent of domestic soybean production. The target, however, was not met since the price of imported soybean was lower than that of domestically produced soybean.

BULOG also imported soybean flour and soybean meal (*bungkil kedelai*) for the poultry industry. Since 1991, when domestic soybean meal industries began operating, soybean imports have mainly been in the form of beans. To protect industry, the government also imposed an import tariff of 35 per cent on soybean meal. In June 1991, the government removed BULOG's monopoly on soybean meal importation, while the import tariff was reduced from 10 to 5 per cent. The government made it mandatory for local feed industries to purchase 40 per cent of their requirement from domestic sources. In 1994, the local content was reduced to 30 per cent and the import tariff was eliminated. The local content was reduced further to 20 per cent, and all trade regulations on soybean meal were totally removed in April 1996 (Bahri, Kustiari and Wittwer, 2002).

In the case of maize, the government introduced an import tariff policy to protect farmers from price fluctuations. The import tariff rate for maize grain has been reduced from 15 per cent in 1990 to 10 per cent in 1995, and 5 per cent since 1996, but the domestic price of maize grain increased by 19 per cent per year in 1991-2001 because the domestic price of maize was not only affected by import tariffs but also by the global maize price. This implies that the tariff policy for maize did not largely affect farm gate prices or farmer incentives.

Import tariffs were also imposed on maize products such as seed, flour, starch, sweet corn, crude maize oil, corn flakes and maize bran. To support research centres and breeding companies to generate new improved varieties, import tariffs have never been imposed on maize seeds. The tariff for maize flours or maize starch has been 5 per cent since 1989. A 20 per cent tariff for crude maize oil was introduced in 1989 but dropped in 1994. Tariffs on sweet corn were 30 per cent in 1989, 25 per cent in 1995, 20 per cent in 1997 and 5 per cent since 1998. Tariffs for corn flakes were cut from 60 per cent in 1989 to 40 per cent in 1990, 35 per cent in 1994, 30 per cent in 1995 and 5 per cent since 1998. Tariffs for maize bran were also reduced, from 19 per cent in 1989 to 5 per cent since 1995. Incidentally, 1995 was regarded as the base year of GATT ratification (Erwidodo and Hadi, 1999).

Indonesia accounts for 8 per cent of the global cassava market and is a net exporter of cassava. In an attempt to take advantage of this market power, to try and prevent prices from falling, an export quota is imposed on exports to Europe. The quota increased from 500,000 tons in 1982 to 700,000 tons in 1983, and finally to 825,000 tons in 1985. From 1988 to 1993, Indonesia's exports of cassava exceeded the quota, but after 1993 exports decreased to 389,000 tons in 1996 and 7,000 tons in 2002 (Table 6.1). Cassava exports declined while domestic production expanded, indicating greater domestic consumption. Although comprehensive data on types of cassava use is not available, the increase in domestic consumption is most likely due to an increase in industrial uses.

Import tariffs were also imposed on various cassava products. The highest tariff (30 per cent) was imposed on such primary products as dried-sliced cassava and pellets, while the lowest tariff (5 per cent) was imposed on manioc starch. All tariffs remained unchanged until 1998, but eventually all tariffs were reduced to 5 per cent (Erwidodo and Hadi, 1999).

A net exporter of potato, Indonesia imposed a 30 per cent tariff for fresh and chilled potato in 1989, dropping to 25 per cent in 1994, 20 per cent in 1996, and 5 per cent since 1998 (Erwidodo and Hadi, 1999). Since the quantities of imported fresh potato were small (Table 6.1) and the imported potato is not a perfect substitute for domestically produced potato, the tariff for fresh potato does not affect domestic production. No import tariff has been imposed on potato seeds, flour or flakes, but a 5 per cent tariff was imposed on potato granules until 1995 when it was removed. Tariff rates for other potato-related products decreased from 30 per cent in 1989 to 15-25 per cent in 1994-1997, and finally to 5 per cent after 1998 (Erwidodo and Hadi, 1999).

When the Indonesian economy was hit by the Asian monetary crisis, the government rapidly deregulated the domestic rice market, including the removal of BULOG's monopoly on rice imports and import tariffs. Recently, however, there has been growing concern about the potentially adverse effects of the deregulation. In the absence of import tariffs, decreasing prices in the world market lead to increasing imports of rice and a reduction of domestic rice production and farm income. To encourage farmers to grow rice and sugar cane, the government imposed tariffs for rice (34 per cent) and sugar (25 per cent) in May 2002, which became a special tariff in July 2002. Such trade policies distort the use of productive resources. Gradual tariff reduction followed by improvements in farm and marketing infrastructure levels and agro-industrial development would correct these distortions and foster farm diversification.

6.3 Effects of trade liberalization on production and demand for CGPRT crops

This section looks at some effects of phasing out tariffs on rice and CGPRT crops. To answer such a question, Erwidodo and Hadi (1999) have accomplished a partial analysis using basic principles of welfare economics. A reduction in the tariff from 30 per cent to 13.5 per cent for rice and the scrapping of the 5 per cent tariff for maize, soybean and potato was analysed. The results are presented in Table 6.2.

Table 6.2 Effects of tariff reduction on rice, maize, soybean and potato

Effect of tariff reductions	Tariff reductions			
	Rice	Maize	Soybean	Potato
	From 30% to 14%	From 5% to 0 %	From 5% to 0 %	From 5% to 0 %
Tariff reduction effects on:				
Farm gate price (%)	-12.6	-3.6	-3.3	-2.5
Yields (%)	-1.4	-0.2	-9.6	-3.3
Farmers' net returns (%)	-21.7	-4.9	-4.6	-7.9
Domestic supply (%)	-2.8	-1.7	-1.9	-2.2
Domestic demand (%)	2.4	3.1	1.6	0.3
Import (thousands of tons)	1,692	462	68	26
Consumer surplus (Rp billion/yr)	4,910	185.5	110.5	33.8
Producer loss (Rp billion/yr)	2,093	136.3	55.8	29.7
Gov. revenue loss (Rp billion/yr)	985	12.9	22.3	2.9
Net welfare gain (Rp billion/yr)	1,832	36.3	32.4	1.2

Source: Erwidodo and Hadi, 1999.

The estimated effect of the tariff cuts is similar for each commodity. A reduction in the tariff would result in a decrease in the producer price, yields, farmer's net returns and domestic supply, while domestic demand and imports would increase. For each commodity, a reduction in the tariff results in a net welfare gain, with a positive change in consumer surplus outweighing the negative change in producer surplus and government revenue loss. The table also shows that the 16.5 per cent reduction in the rice tariff would reap a larger net welfare gain than the 5 per cent tariff cuts for the other commodities.

In the era of trade liberalization, it is essential that the competitive and comparative advantages of commodities be scrutinized. Tables 6.3 to 6.7 present a financial and economic analysis of rice and CGPRT crop production. Obviously, comparative and competitive advantages of CGPRT crops are not only dependent on prices but also on physical factors such as land type, season and availability of irrigation water. Indonesia has comparative advantage (indicated by DRC of less than one) and competitive advantage (indicated by PCR of less than one) in rice, maize, groundnut, and potato, and comparative

advantage in soybean production. The comparative advantage is greater for maize, groundnut and potato than for soybean and rice.

Table 6.3 Costs and returns (thousands of rupiah per hectare), R/C, PCR, EPC and DRC of rice production in selected localities, 2001

Locality, agro-ecosystem and seasons	Financial analysis				Economic analysis			
	Total returns	Total costs	R/C	PCR	Total returns	Total costs	EPC	DRC
Agam:								
Irrigated, WS	4 433	3 407	1.30	0.74	3 441	3 348	1.03	0.97
DS-I	4 341	3 418	1.27	0.76	3 900	3 421	1.14	0.86
Rainfed, WS	4 960	3 571	1.39	0.68	3 660	3 513	1.02	0.95
DS-I	4 305	3 126	1.37	0.69	4 022	3 136	1.28	0.75
Kediri:								
Irrigated, WS	6 364	4 669	1.14	0.69	5 232	4 587	1.14	0.85
DS-I	5 949	5 011	1.23	0.81	6 318	4 980	1.27	0.75
Rainfed, WS	5 642	4 603	1.23	0.77	4 539	4 476	1.01	0.98

Source: Summarized and computed from Tables 7, 8, 9 and 13 in Anonymous, 2003c.
Notes: DS = Dry season; R/C = Returns-to-costs ratio; PCR = Private cost ratio;
EPC = Effective protection coefficients; DRC = Domestic cost ratio.

The weak competitiveness of soybean among food crops should be seen not only as a handicap, but also as a challenge. Soybean did not originate from the tropics and should be a focus for research, as it is a major source of protein, especially for people in low income brackets.

In 1999-2003, the government did not provide incentives for inputs and outputs of CGPRT crops. Even in the absence of direct government intervention, distortions in input and output markets still exist due to the imperfection of market structures. Input prices are higher than their respective economic prices, particularly for fertilizers and pesticides, and receive output prices lower than their respective economic prices. For soybean farmers in Klaten and Ngawi, for example, input prices are 8-13 per cent higher than their economic prices. Although some farmers obtain soybean prices 6-21 per cent higher than the economic price, most soybean farmers in the two localities receive soybean prices 0-8 per cent lower than the economic price. Consequently, the net transfers for most soybean farmers are negative (Table 6.4).

Table 6.4 Costs and returns (thousands of rupiah per hectare), R/C, PCR, EPC and DRC of soybean production in selected localities, 2001

Locality, agro-ecosystem and seasons	Financial analysis				Economic analysis			
	Total returns	Total costs	R/C	PCR	Total returns	Total costs	EPC	DRC
Klaten:								
Irrigated, DS-II	2 200	2 096	1.05	0.94	2 192	2 051	0.99	0.92
Rainfed, DS-II	2 296	2 368	0.97	1.04	2 304	2 287	0.96	0.99
Ngawi:								
Semi-irrigated, DS-II	1 880	1 874	1.0	1.00	2 061	1 846	0.89	0.88
Simple-irrigated., DS-II	2 369	2 394	0.99	1.01	2 078	2 343	1.15	1.15
Rainfed, DS-I	2 356	2 385	0.99	1.01	3 004	2 346	0.75	0.75
Rainfed, DS-II	1 980	2 070	0.96	1.05	2 131	2 021	0.90	0.94

Source: Summarized and computed from Tables 2, 5, 8, and 14 in Anonymous (2003a); see also Siregar (2003 a, b).

Notes: DS = Dry season; R/C = Returns-to-costs ratio; PCR = Private cost ratio; EPC = Effective protection coefficients; DRC = Domestic cost ratio.

Since Indonesia has comparative advantage in soybean, maize and groundnut, one may ask: why is Indonesia a net importer of these commodities? The growth rate of the total cultivated land in Indonesia has been negative or at least stagnant from 1993 to 2003. Expanding the area for a particular crop would reduce the cultivated area of other crops. Given current government policies, it is unlikely that domestic production will meet domestic demand for soybean, maize or groundnut without an expansion of the land under cultivation or a policy change promoting the production of CGPRT crops (such as a gradual reduction of the import tariff on rice).

Assuming a stable exchange rate of US$ 1 = Rp 9,000, Anonymous (2003a, b) carried out a sensitivity analysis by comparing the actual levels with breakeven points (BEP) of either import parity prices or yields of CGPRT crops (see Table 6.8). The purpose of the analysis was to determine the prospects of Indonesia's comparative advantage in CGPRT crops. In the case of rice, maize and groundnut, either the actual import parity prices or the actual yields are considerably higher than their respective BEP counterparts. In the case of soybean, the differences between the actual and the BEP are minor. This implies that Indonesia has a relatively stable comparative advantage in production of maize, groundnut and rice, and a more tenuous advantage in soybean.

Table 6.5 Costs and returns (thousands of rupiah per hectare), R/C, PCR, EPC and DRC of maize production in selected localities, 2001

Locality, agro-ecosystem and season	Financial analysis				Economic analysis			
	Total returns	Total costs	R/C	PCR	Total returns	Total costs	EPC	DRC
Kediri:								
Irrigated, DS-I	5 115	3 729	1.37	0.65	7 831	3 594	0.58	0.37
DS-II	4 924	3 737	1.32	0.69	6 231	3 498	0.71	0.49
Simple-irrig, DS-I	4 350	3 341	1.30	0.69	6 827	3 212	0.57	0.38
DS-II	3 620	3 008	1.20	0.77	5 367	2 753	0.71	0.43
Rained, DS-I	4 890	3 901	1.25	0.70	7 106	3 652	0.57	0.39
DS-II	4 478	3 677	1.22	0.74	5 799	3 349	0.66	0.48
Sidrap:								
Semi-irrigated, DS-II	4 161	3 673	1.13	0.85	5 035	3 533	0.77	0.65
Simple-irrigated, DS-II	3 559	3 004	1.18	0.80	4 595	2 871	0.70	0.56
Rained, DS-II	3 298	2 889	1.14	0.85	4 390	2 770	0.68	0.58

Source: Summarized and computed from Tables 3, 6, 9, and 14 in Anonymous, 2003a.
Notes: DS = Dry season; R/C = Returns-to-costs ratio; PCR = Private cost ratio; EPC = Effective protection coefficients; DRC = Domestic cost ratio.

Table 6.6 Costs and returns (thousands of rupiah per hectare), R/C, PCR, EPC and DRC of groundnut production in selected localities, 2001

Locality, agro-ecosystem and season	Financial analysis				Economic analysis			
	Total returns	Total costs	R/C	PCR	Total returns	Total costs	EPC	DRC
Klaten:								
Irrigated, DS-II	4 568	3 237	1.41	0.61	4 568	3 150	0.98	0.60
Rained, DS-II	4 224	3 046	1.39	0.61	4 224	2 930	0.97	0.59
Sidrap:								
Semi-irrigated, DS-I	3 272	2 048	1.60	0.57	3 727	2 043	1.00	0.57
DS-II	3 601	2 649	1.55	0.65	3 601	2 560	0.97	0.63
Rained, DS-II	3 200	2 301	1.39	0.63	3 200	2 267	0.98	0.62

Source: Summarized and computed from Tables 4, 7, 10 and 14 in Anonymous, 2003a.
Notes: DS = Dry season; R/C = Returns-to-costs ratio; PCR = Private cost ratio; EPC = Effective protection coefficients; DRC = Domestic cost ratio.

Table 6.7 Costs and returns (thousands of rupiah per hectare), R/C, PCR, EPC and DRC of potato production in selected localities, 2001

Locality and season	Financial				Social			
	Returns	Costs	R/C	PCR	Returns	Costs	EPC	DRC
Wonosobo								
WS	38 809	27 278	1.42	0.50	50 762	28 993	1.04	0.51
DS	28 433	17 406	1.63	0.37	41 882	18 179	0.95	0.34
Tanah Karo								
WS	28 711	29 801	0.96	0.71	51 024	21 992	1.28	0.88
DS	26 516	28 754	0.92	0.84	49 978	27 830	0.94	0.77

Source: Saptana *et al*., 2001.
Notes: WS = Wet season; DS = Dry season; R/C = Returns-to-costs ratio; PCR = Private cost ratio; EPC = Effective protection coefficients; DRC = Domestic cost ratio.

Table 6.8 Sensitivity analysis of import parity prices and yields of CGPRT crops, 2001

Crop, locality and agro eco-system	Import parity prices (Rp/kg)			Yields (kg/ha)		
	Actual	BEP	Difference (%)	Actual	BEP	Difference (%)
Rice (Indramayu district):						
Irrigated land, WS	1 000	754	32.63	6 000	4 370	37.30
Rainfed lowland, WS	1 002	729	37.45	5 500	4 000	37.50
Soybean (Klaten district):						
Irrigated land, DS	2 200	2 052	7.21	1 000	933	7.18
Rainfed lowland, DS	2 185	2 185	0.00	1 050	1 047	0.29
Maize (Kediri district):						
Irrigated land, DS	1 025	720	42.36	4 990	3 507	42.29
Rainfed lowland, DS	1 052	747	40.83	4 528	3 382	40.75
Groundnut (Sidrap district)						
Irrigated land, DS	3 500	2 185	60.18	935	484	93.18
Rainfed lowland, DS	4 000	2 834	41.14	800	567	41.09

Source: Adopted and recomputed from Anonymous (2003a, b)
Notes: BEP= breakeven point at DRC=1;
Exchange rate (Rp 9,000/US$) is assumed to be relatively stable rate in the long run;
WS=Wet season; DS=Dry season.

6.4 Concluding summary

This chapter reviewed Indonesia's trade policies and their impacts on welfare, production, demand, trade balance, producer prices, yields and net revenues of CGPRT crops. In addition, the prospects of the competitiveness of CGPRT crop production in Indonesia was also discussed.

Currently, rice is the only food crop that is protected by the government with a 34 per cent import tariff and additional price support. These policies impose a large cost on society in consumer surplus loss.

Based on a Policy Analysis Matrix Framework, the results of economic analyses indicate that Indonesia has comparative advantage in most CGPRT crops, except soybean in certain regions. From a sensitivity analysis it was also concluded that the comparative advantage in maize and groundnut is relatively stable with regard to changes in import parity prices or changes in yields, whereas the comparative advantage of soybean is not. Ongoing research is required, however, to maintain these comparative and competitive advantages.

Despite Indonesia's competitive and comparative advantage in CGPRT crops, Indonesia is a net importer of these crops, particularly maize and soybean, because government policies skew production incentives towards rice.

7. Benefits of Agricultural Diversification on Poverty Alleviation in Indonesia

7.1 Past and present poverty alleviation policies

From 1970 to 1987, the number and proportion of the Indonesian population below the poverty line fell rapidly. However, these gains were not distributed equally across the archipelago. The population below the poverty line in rural Java dropped from 60 per cent to 40 per cent of the total population below the poverty line in Indonesia, while, the population below the poverty line in rural areas of the outer islands surged from 20 per cent to 50 per cent. This was triggered by several factors (Pakpahan, Hermanto and Sawit, 1995):

1. Infrastructure, public facilities and natural resources on the outer islands are worse than those on Java.
2. Irrigation development in conjunction with the green revolution supported by research and extension, particularly on Java (and several provinces of Sumatra and Sulawesi) boosted rural income.
3. The transmigration programme relocated many poor people, including small farmers and farm labourers, from Java to the outer islands.
4. Government spending on non-agricultural development generated more employment and income on Java than the outer islands.

So far, the government has paid less attention to the development of dry-land farming and coastal agro-ecosystems. In general, dry-land farming is more vulnerable to erosion, lower adoption of technology, and has less infrastructure and public facilities than irrigated farming. Coastal agro-ecosystems are identified as being fragile and less agriculturally productive.

Since the 1980s, the government has implemented various agricultural programmes for poverty alleviation, one of which was the Project for Increasing Small Farm Income (P4K). In P4K, the government, assisted by FAO and IFAD, provided subsidized credit to small farm groups or farm labourer groups consisting of 6 to 12 members who had a specific business plan. Judging by the low default rate on these loans, one may conclude that this project has been successful. Nevertheless, some constraints in the implementation of the project have been identified: (i) the business activities are not the major source of income; (ii) the amount of the credit is limited; (iii) the interest rate is still relatively high; and (iv) in

some cases, the project misidentified the target groups and cannot reach small farmers and farm labourers in remote areas.

In the early 1990s, the Ministry of Agriculture (MoA) carried out projects targeting poverty. The projects were aimed at increasing production within certain sub-sectors (food crops, estate crops, livestock, fishery). The MoA also implemented the Food and Nutritional Diversification Programme (DPG). Basically, these programmes provide poor people with technical assistance in the form of technological packages. These programmes were successful in several places but failed in many others due to several reasons: (i) lack of both vertical and horizontal co-ordination among related organizations; (ii) inadequate quantity, quality and timely delivery of seeds, (iii) inaccurate identification of target groups; (iv) inappropriate packages of technology and unsuitable business types for local situations; (v) lack of guidance, training and extension to target groups; and (vi) inadequate time for programme implementation (Pakpahan, Hermanto and Sawit, 1995).

Taryoto (1995) also identified several shortcomings of the programmes. Firstly, there was insufficient co-ordination among directorate generals in the Ministry of Agriculture. Secondly, as the programmes are financed by government budgets on a yearly basis, the programmes cannot be implemented continuously for a longer time period. Thirdly, many programmes are too commodity specific without adequate community participation. It is recommended that, in the future, poverty alleviation programmes emphasize the importance of decentralization, participation and democracy, so that target groups support the programmes, and the benefits are sustained (Castendyk, 1995, cited by Taryoto, 1995).

Daly and Fane (2002) classified poverty reduction programmes in Indonesia into (i) cash transfer schemes; (ii) benefits in kind; and (iii) job creation schemes (including infrastructure and loans). Examples of these programmes are presented below.

In October-December 2000, the government reduced domestic fuel price subsidies and partially compensated the poor by allocating Rp 800 billion from the resulting budgetary savings to three poverty reduction programmes. This was in partial fulfilment of the conditions stipulated in the Letter of Intent to the IMF. One of the resulting programmes was a cash transfer of Rp 30,000 per family per month to 6.7 million families, but the programme proved difficult to implement and, as a result, was discontinued after three months. Cash transfers are uncommon in developing countries where the governments do not have either the bureaucratic apparatus to administer the scheme or the revenue to fund them.

The first benefits-in-kind programmes was in the form of a subsidized rice programme implemented in Special Market Operations (OPK, Operasi Pasar Khusus),

which was introduced in response to both the economic crisis and the drought in 1997-1998. The rice was acquired centrally by the national logistics agency (BULOG) and transported to distribution points throughout the country. Based on National Family Planning Agency (BKKBN) data, 8 million poor households were identified as beneficiaries. Initially, the government intended to provide each of the households with 10 kilograms of medium quality rice per month at Rp 1,000 per kilogram, when the market price was Rp 2,500-Rp 3,000 per kilogram. Later, the amount of rice was doubled to 20 kilograms per month and the number of households was extended to 9.4 millions households. In April 2000, the amount of rice was changed again to 10-20 kilograms per household per month. In practice, coverage and allocation per household were well below these targets (Daly and Fane, 2002).

The second benefits-in-kind programme was a health care and nutrition programme that was introduced as a part of the social safety net in 1998. This includes a mix of direct funding to services such as hospitals, clinics and family planning for poor households in each district. A separate nutrition programme in 1998-2000 provided supplementary food and vitamins for infants and pregnant women (Daly and Fane, 2002).

The third benefits-in-kind programme was the Scholarships and School Grants Programme (SPG). In August 1998, the government, the World Bank, the Asian Development Bank (ADB), and the Australian Agency for International Development (AusAID) assembled the SPG, which was designed to prevent a fall in school enrolments. The programme provided scholarships for 6 per cent of pupils in the senior three grades of primary school, for 17 per cent of pupils in lower secondary school and for 10 per cent of pupils in upper secondary school, but the actual achievement was much lower than these targets. The scholarships were Rp 10,000 per month for primary students, Rp 20,000 per month for lower secondary students and Rp 25,000 per month for upper secondary students. Block grants were also allocated to schools in poor areas for books, materials, minor renovations and waiving formal and informal school fees of poor children. The aim was to provide grants to 60 per cent of primary and 60 per cent of secondary schools. The annual block grants for primary schools (SD), lower secondary schools (SLTP), and upper secondary schools (SLTA) were, respectively, Rp 2 million, Rp 4 million and Rp 10 million per school (Daly and Fane, 2002).

The Programme for Underdeveloped Villages (IDT), the first poverty reduction programme in Indonesia, can be classified as a job creation scheme (Type 3) since it was supposed to help poor people create and expand productive job opportunities through

various development activities. It was based on Presidential Instruction No.5/1993 to develop selected underdeveloped villages from 1994/95 to 1997/98. About one-third of all villages were selected based on criteria such as the quality of village infrastructure, housing and the environment, ownership of livestock and consumer durables, the availability of electricity, schooling enrolment rates, and health and infant mortality indicators (Daly and Fane, 2002).

The programme provided the selected villages with Rp 20 million per village per year, which was then distributed to poor people as loans. Only 60 per cent of the recipients repaid any part of the loan, perhaps due to the lack of firm guidelines regarding the use of funds. If the loans were not repaid, they became grants, as the funds were a mixture of cash grants and loans for any income generating purpose. Regardless of the cost of its implementation, the programme raised household expenditure, employment of rural women and children (10-18 years), and the proportion of self-employed household heads (see Daly and Fane, 2002).

Similar to the IDT programme, the focus of the *Kecamatan* (Sub-district) Development Programme (KDP) was also job creation. Introduced in 1998/99 and financed by a World Bank loan, the KDP programme provided grants for infrastructure development and loans for business activities. Each village could submit up to two proposals, one of which must be from village women. Technical assistance for village infrastructure projects is supported at the sub-district level and there is an explicit requirement for continued maintenance from the village level. The interest rate was provided at capital market rates and the loan had to be repaid within 18 months. The urban equivalent to KDP was the urban poverty programme (UPP) that provided credit for small-scale and medium enterprises and funds for community-based infrastructure development in poor urban areas (Table 7.1).

In response to the crisis, the government implemented a labour-intensive (*padat karya*) programme by employing low-skilled workers constructing and repairing public infrastructure. Another job creation scheme was the grants to finance loans for local communities or to small and medium enterprises to fund labour-intensive projects. In 1998/99, the number of job creation schemes considerably increased because the government ministries had the opportunity to finance schemes that they could control. Separate schemes were created to provide employment in villages, in forestry, for urban services, for women, for roads and for irrigation. In 1999/2000, the number of separate schemes was reduced to two: the Labour Intensive (*Padat Karya*) Programme and Special Initiative for Unemployed Women (Table 7.1).

Table 7.1 shows that before the crisis, Indonesia spent very little on poverty reduction programmes. The proportion of the budget for poverty reduction to total GDP increased from 0.11 per cent in 1994/95 to 0.28 per cent in 1996/97. The proportion suddenly increased to 1.39 per cent in 1998/99 when the Social Security Net (SSN) was introduced in response to the economic crisis, but it subsequently reduced to 1.05 per cent in 2000. The SSN consisted of targeted, rationed provision of subsidized amounts of food, health care and education, as well as job creation schemes. It was designed and financed by the government and external donors such as USAID, AusAID, World Bank and ADB.

Daly and Fane (2002) raise several points about anti-poverty programmes in Indonesia: (i) low levels of expenditure on anti-poverty programmes in Indonesia indicate that these programmes have been of minor importance in alleviating poverty compared with macroeconomic performance; (ii) the bulk of Indonesian anti-poverty programmes provide benefits in kind rather than cash. The authors believed this to be a wise choice as benefits in kind are better targeted towards the needy than are benefits in cash; and (iii) although social safety net (SSN) programmes are targeted towards the poor, many benefits of the programme flow to other villagers. This is also true in the case of the subsidized rice programme.

Table 7.1 Expenditure on poverty reduction programmes as a percentage of total government expenditure, 1994-2000

	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000
Cash transfers							
Benefits in kind:	.	.	0.49	0.69	5.73	5.14	2.96
Subsidized rice	.	.	.	0.34	3.70	3.14	1.22
Health care & nutrition	.	.	0.16	0.35	0.97	1.16	0.99
Education	.	.	0.33	1.27	1.06	0.84	0.75
Job creation:	0.61	1.37	1.22	1.13	3.95	1.88	2.58
IDT	0.59	0.61	0.53	.	.	.	.
KDP	.	.	.	.	0.22	0.33	1.29
UPP	.	.	.	.		0.04	0.28
PDM-DKE	.	.	.	0.61	1.16	0.40	0.24
Village & urban	.	0.33	0.26	.	0.61	0.51	0.43
infrastructure	.	.	.	0.53	1.01	.	0.22
Labour intensive	0.02	0.43	0.43	.	0.46	0.48	0.92
Loan schemes	.	.	.		0.49	0.12	0.20
Other							
Total poverty reduction	0.43	1.07	1.54	1.98	14.24	13.95	10.35
programmes:	0.11	0.23	0.28	0.29	1.39	1.23	1.05
In trillion rupiah							
In % of GDP							

Source: Daly and Fane, 2002.

In relation to poverty reduction programmes in agriculture and rural areas, Nurmanaf *et al*. (2002) pointed out two shortcomings in the implementation of the programmes: (i)

misidentification of target groups; and (ii) the types of assistance provided in the programmes. In general, each poverty reduction programme is designed centrally and uniformly without adjustment to the local situation and local community needs. To be successful, poverty reduction programmes should be based on community participation so they target local community needs.

7.2 Potential benefits of agricultural diversification for poverty alleviation

Interest in agricultural diversification initially stemmed from the search for a way to reduce individual farm income risk and regional food supply risk. Intensive farm practices expose farmers to fluctuations in the price of one or two commodities over which the farmer has no control. Agricultural diversification can also reduce the instability of rural income, foster rural economic growth and eventually alleviate poverty through employment creation and increased value added.

Timmer (1990) identified three reasons for policymakers to pay more attention to agricultural diversification: (i) when output prices are highly unstable, diverse and flexible agriculture provide more stable farm incomes; (ii) better living standards can, in turn, reduce rural-to-urban migration; (iii) in the long run, a diversified cropping pattern is more ecologically sustainable than intensive cultivation of a single crop.

Karama *et al*. (1992) identified several potential benefits of horizontal and vertical agricultural diversification:

1. Increasing quantity and quality of foods and raw materials, providing more income for farmers, improved nutrition and reduced imports;
2. Better use of natural resources;
3. Vertical diversification increases local value-added and creates employment;
4. The increasing income and diversified sources of foods will reduce the demand for rice; and
5. Processed products, resulting from vertical diversification will increase exports and increase foreign exchange earnings.

Most CGPRT crops are cultivated by relatively poor farmers on poor soil. Since these crops generally require less care and inputs, these crops are suitable for poor producers. Although these crops tend to be cultivated on marginal lands, the returns of these crops are still attractive because costs of production are relatively low. Thus,

expanding the production of these crops will increase farmers' income, create employment and reduce poverty incidence in rural areas.

Higher growth of CGPRT crops will promote growth of the non-farm sector through an increase in processing activities. This implies that higher growth of CGPRT crops creates employment for both males and females not only in farm production but also in the industrial utilization of these crops. Access to non-farm income is critical for poor people in raising their household income. Thus, CGPRT crops could generate more income through lower costs of farm production and through job opportunities.

Rice is the major staple food in Indonesia and food security, especially for the poorest members of society, is determined primarily by the rice economy. Individual households can be classified as either net buyers or net sellers of rice. High prices of rice obviously would benefit net sellers of rice and, conversely, low rice prices would benefit net buyers, particularly those who do not produce rice at all (Timmer, Falcon and Pearson, 1983).

Almost all urban dwellers are net buyers of rice and about 14 per cent of them are urban poor, while many rural dwellers are also net buyers of rice.

Note that rice-surplus farmers generate only about half of their family income from rice. A decline in rice-based income does not lead to a proportional decline in household welfare. Timmer (2004) estimated that, when urban households are included, less than 20 per cent of households are better off in the short run from higher rice prices, and very few of them are truly poor.

Low rice prices would also allow real wages to rise without any increase in the nominal wages paid by employers in the industrial and service sectors of the economy. The combination of low nominal wages and high real wages would stimulate job creation and economic growth that are necessary for sustainable poverty reduction. It is noteworthly that high rice prices also have some beneficial effects. High rice prices might encourage rice farmers to hire more workers, thus leading to higher nominal and real rural wages after the correction of higher rice prices themselves (Fane and Warr, 2003). But the impact of such mechanisms depends crucially on the short-run increases in rice yields. As rice yields have been levelling-off in the last several years, the impact of high rice prices on employment would be trivial.

7.3 Policies to encourage agricultural diversification

One important conclusion that can be drawn from Section 7.2 is that agricultural diversification may alleviate poverty directly or indirectly, as it may not only increase and stabilize farmers' incomes, but also foster rural economic growth, increase value adding, create employment, improve nutrition, reduce import demand and increase exports.

7.3.1 Price-related policies

That price stabilization has encouraged farmers to grow rice suggests that farmers are responsive to economic incentives when selecting crops.

It may be sensible to expand the price stabilization to maize and soybean, but not other CGPRT crops, because price stabilization works well only when a particular commodity is non-perishable and homogenous, which most CGPRT crops are not (Timmer, 1986). It is also difficult to establish an optimum tariff policy for many food crops that gives appropriate incentives for farmers to diversify.

7.3.2 Non-price policies

Karama *et al*. (1992) identified several non-price policies that may influence agricultural diversification:

- Macroeconomic policies including fiscal, monetary and trade policies. These policies affect agricultural diversification because they affect inter-sectoral and inter-regional movement of resources, growth and composition of agricultural production and trade in agricultural products.
- Investment policies for infrastructure such as roads, transportation, communication and information facilities. The implementation of these policies will reduce marketing costs, boost farm income and therefore encourage agricultural diversification.
- Agro-industry and export promotion policies. These policies will foster the demand for various agricultural products and therefore encourage agricultural diversification.
- Agricultural technology development policy. This policy is important because no agricultural diversification programme can succeed without appropriate agricultural technologies that enhance productivity.

Additional non-price policies to support agricultural diversification include: (i) improvement of the agricultural extension programme both on farm and off farm (post harvest, processing and marketing) for alternative crops other than rice; (ii) strengthening farmer institutions and encouraging partnerships between farmers and private companies to overcome the marketing constraints of alternative crops; (iii) improving the market structures of alternative commodities; (iv) improving the availability of credit and farmers' accessibility to credit, especially for non-rice production; (v) expanding the use of pump irrigation through government programmes, such as the ground water project (P2AT) or through community self-help promoting farm diversification; and (vi) developing marketing infrastructure, such as Sub-Terminals of Agribusiness (STA) in rural areas for alternative commodities.

To increase vertical diversification, it may be appropriate for the government to provide incentives in the form of risk sharing and tax relief so that the private sector is willing to invest in processing and post-harvest activities. The government also needs to initiate public-private partnerships in well-defined research areas and provide rural infrastructure where private provisions are unlikely (ADB, 2004).

7.4 Concluding summary

Most anti-poverty programmes in Indonesia are well targeted towards the needy because they provide benefits in kind rather than in cash. Most of the social safety net (SSN) programmes that are targeted towards the poor are not cost effective ways of alleviating poverty because many of the benefits are divided among all the villagers. This is also true in the case of the subsidized rice programme.

Two shortcomings in the implementation of poverty reduction programmes in agriculture and rural areas are the misidentification of target groups and the types of assistance provided in the programmes. To be successful, poverty reduction programmes should be based on local community participation from the outset, including problem identification, planning, implementation, monitoring and evaluation such that the local community may have sense of belonging and the programmes can meet specific local community needs.

Lower rice prices would make rice production less profitable and, therefore, encourage rice farmers to diversify their cropping patterns and besides, they can buy cheaper rice from the market. Lowering rice prices by removing price support and import tariffs may encourage food crop diversification. Removal of such influences also encourages optimal food crop diversification. Low rice prices also allow real wages to increase without

raising the nominal wages paid by employers in the industrial and service sectors of the economy. In other words, the combination of low nominal wages and high real wages would stimulate job creation and economic growth necessary for sustainable poverty reduction. Conversely, price support and import tariffs on rice would lead to the opposite.

8. Demand for CGPRT Crops

8.1 Domestic uses of CGPRT crops

The major staple food crops in Indonesia are rice, maize, cassava, sweet potato and sago. Rice remains the most important staple food despite a decline in per capita consumption (Table 8.1).

In East Nusa Tenggara (NTT) and in some parts of East Java including Madura, maize is the dominant staple food. As a staple food, maize is usually mixed with rice or legumes. Before being cooked, the maize itself may be pounded, milled or still in the form of grain. It is consumed three times a day in East Java or once to twice a day in NTT. Those who consume maize once a day usually prepare maize for lunch, cassava and sweet potato for breakfast and rice for dinner.

Most domestic cassava use is for human consumption. It is consumed as fresh root, *gaplek* (dried cassava), and snacks or cakes. Low-income groups consume fresh roots and *gaplek* more than high-income groups, while high-income groups tend to shift their cassava consumption from fresh roots to cassava snacks and cassava cakes.

Soybean is an important source of protein in Indonesian diets. It is consumed in the forms of tofu, *tempe* (fermented soybean), *taoge* (bean-sprout), sauces and soymilk. Tofu, *tempe* and *taoge* are traditional foods, while soymilk is a relatively new product.

Table 8.1 shows that the consumption growth rates of potato, soybean and mung bean are positive, while those of the other CGPRT crops are negative

Table 8.1 Total and average consumption of rice and CGPRT crops, 1993-2002

Commodity	Total consumption (thousands of ton/year)					Consumption per capita (kg/year)				
	1993	1996	1999	2002	GR [a]	1993	1996	1999	2002	GR [a]
Rice	21 940	22 053	21 491	21 708	-0.1	116.0	111.2	103.6	100.3	-1.5
Maize	1 381	2 261	2 780	2 705	10.7	7.3	11.4	13.4	12.5	7.9
Cassava	2 416	1 561	2 023	1 839	-2.7	12.8	7.9	9.8	8.5	-3.7
Sweet potato	1 055	589	584	587	-4.9	5.6	3.0	2.8	2.7	-5.8
Potato	375	352	205	384	0.3	2.0	1.8	1.0	1.8	-1.1
Dried cassava	296	124	43	79	-8.1	1.56	0.63	0.21	0.36	-8.5
Groundnut	128	124	65	102	-2.3	0.68	0.63	0.31	0.47	-3.4
Soybean	20	21	11	23	1.7	0.10	0.10	0.05	0.10	0.0
Mungbean	108	145	65	124	1.6	0.57	0.73	0.31	0.57	0.0

Source: SUSENAS, BPS.
Note: [a] GR = growth rates (per cent per year).

The major portion of household food expenditure is spent on rice. In 1999, about 21 per cent of per capita expenditure in rural areas was spent on rice, while only 11 per cent in urban areas. Expenditure on rice by the urban and rural poor is higher at 25 per cent and 30 per cent respectively (Ariani and Pasandaran, 2002). This implies that urban dwellers diversify their foods further than rural people, and high income groups diversify their foods even more.

8.2 Industrial uses of CGPRT crops

It is difficult to perform a detailed analysis of industrial uses of CGPRT crops as the BPS data on industrial uses of CGPRT crops in Indonesia is confined only to medium and large enterprises. For example, most tofu and *tempe* industries are small-scale and home-based industries, which not included in the publication. Another BPS publication, Food Balance Sheets, also does not include the industrial uses of CGPRT crops by small-scale and cottage industries though these industries use a high proportion of all soybean used.

Maize is used as a raw material in feed and food industries. In the feed industry, maize is used to produce cakes, corn oil, drink, forage and sauces. The number of medium and large-scale food and feed enterprises using maize rose from 2,976 units in 1990 to 4,007 units in 1995, and the proportion of the total amount used by the food industry alone increased from 75 per cent in 1990 to 88 per cent in 1995 (Ariani and Pasandaran, 2002). Table 8.2 shows that the amount of maize used by the feed industry increased from 414 thousands tons in 1993 to 618 thousands tons in 2001.

Similar to the case of maize, the demand for industrial uses for cassava is mostly from the livestock and food industries. The primary domestic use of cassava, however, is for direct human consumption. Table 8.2 shows the use of cassava in the feed industry has not increased, while the use of cassava in the food industry has declined. In 2001, the domestic feed industry and the food industry absorbed only 2 per cent and 13 per cent of domestic production, respectively. Based on Table 8.2, the proportion of CGPRT crops used for industry is small, but this data might be underestimated. In 2001, the proportion of maize, sweet potato and cassava used for industrial purposes was only 7 per cent, 1 per cent and 17 per cent respectively.

Table 8.2 Direct consumption and industrial uses of food crops (thousands of tons)

Year	Commodity	Production	Imports	Exports	Direct consumption	Quantity used in industries		
						Feed	Foods	Non-food
1993	Rice	28 750	24	351	28 175	0	0	0
	Maize	6 460	494	61	5 412	414	0	646
	Sweet potato	2 088	0	8	1 830	42	0	0
	Cassava	17 285	0	0	10 735	346	3 957	0
	Groundnut	1 122	0	1	0	0	1 065	0
	Soybean	1 709	724	1	2 206	0	0	41
	Green bean	322	0	0	290	6	0	0
1997	Rice	29 466	345	0	28 398	0	0	1 419
	Maize	8 771	1 098	19	8 669	591	0	0
	Sweet potato	1 847	0	10	1 616	37	0	0
	Cassava	15 134	0	0	12 033	303	831	0
	Groundnut	1 210	0	3	0	0	1 147	0
	Soybean	1 357	616	0	1 795	0	0	0
	Green bean	262	0	0	236	5	0	0
2001	Rice	29 185	637	4	29 016	0	0	0
	Maize	9 347	1 036	90	9 063	618	0	0
	Sweet potato	1 749	0	8	1 532	35	0	0
	Cassava	17 055	0	0	12 319	341	2 178	0
	Groundnut	1 227	20	2	0	0	1 183	0
	Soybean	827	1 136	1	1 829	0	0	0
	Green bean	301	0	0	271	6	0	0

Source: Food balance sheets, BPS.

8.3 Concluding summary

The consumption growth rates of potato, soybean and mung bean are positive, while those of the other CGPRT crops are negative. In general, the proportion of CGPRT crops used in industry is relatively small. The government should accord high priority to research and development in this field, including the potential uses of CGPRT crops for bio-fuel.

The major proportion of household food expenditure is spent on rice, particularly in rural areas.

9. Potential Scope for the Development of Diversified Agriculture

9.1 Constraining factors for crop diversification

As outlined in Chapter 3, crop diversification in Indonesia is declining. On the supply side, the trend is heavily influenced by government policies to increase rice production.

On the demand side, the programme has exacerbated dependency on rice by encouraging the substitution of rice for CGPRT products as staple foods. Rice can be purchased everywhere, whereas cassava, maize, potato and sweet potato cannot. The difficulties that consumers face in finding and buying CGPRT products have favoured rice consumption.

It has been shown in Chapter 4 that upland agriculture is more diverse than irrigated land. Within irrigated land, simple irrigated land is more diverse than technical irrigated or semi-technical irrigated land. This implies that irrigation water is not the only factor affecting crop diversification. In relation to irrigated land where rice is the dominant crop, Anonymous (2003b) classifies the constraints to crop diversification into technical, economic and institutional:

- Technical constraints:
  - Water availability especially in the dry season. Note that many alternative crops are grown during the dry season. In many cases, land is left fallow when water is not available;
  - Lack of seeds or plant materials. In some places, it is not always easy for farmers to find seeds or plant materials of alternative crops;
  - High production risks of alternative crops. Farmers might be reluctant to grow soybean, for example, because this crop is less resistant to pests and disease than rice; and
  - Perishable nature of alternative crops. Farmers have less scope to store these commodities until the prices are high.

- Economic constraints:
  - High volatility of output prices, increasing the risk of growing these crops. Farmers are generally risk averse;

- Access to capital, for example, maize requires higher production costs than rice;
- Increasing input prices. Regardless of the net returns, input prices can be a disincentive to growing a certain crop; and
- Lack of processing facilities in rural areas. Proximity to such facilities is a crucial factor in farmers' decision-making.

- Institutional constraints:
  - Cultivated land size per household is small, worsening the risk of growing crops with uncertain returns;
  - Tenancy status of farmers. In a shared-cropping arrangement, the crop grown is the prerogative of the land owner; and
  - Replanting groups or the *ceblokan* institution discourages farmers from growing crops other than rice, as the labourers receive a certain proportion of the harvest, and thus prefer to grow rice.

The relative importance of each constraint differs from place to place and among individuals. For example, a small cultivatable land size might be a constraint for crop diversification on irrigated land, but it might not be a constraint in upland areas. CGPRT Centre (1990) found that upland farmers cultivating a plot less than 0.3 hectares diversify their crops more than upland farmers with larger plots.

Removing all the constraints mentioned above will require time. In the short run a focussed approach is necessary. Anonymous (2003b) identified the main factors discouraging farmers to diversify crops on irrigated land as (i) the role of rice in household food security; (ii) lack of technological competence; (iii) access to capital; and (iv) risk aversion attitude of farmers (Table 9.1). Note that, due to public policies, the net returns from rice production on irrigated land are higher than those from maize and soybean production, implying that the removal of these policies is a crucial first step towards crop diversification (Anonymous, 1990b). In Table 9.2, marketing problems are cited as the most important reason for not choosing non-rice crops.

Table 9.1 Farmers' reasons for not diversifying crops (percentage)

Reasons for not carrying out crop diversification [a]	Irrigated land	Semi-irrigated land	Simple Irrigated land	Total
Food security	31.2	29.7	21.7	28.9
Technological know-how	29.2	29.7	26.1	28.9
Limited capital	18.8	20.3	26.1	20.7
Reducing risks	20.8	20.3	26.1	21.5
Total [b]	100 (48)	100(64)	100(23)	100(135)

Source: Anonymous, 2003b.
Notes: [a] Samples are taken from four districts on Java: Indramayu, Klaten, Kediri and Ngawi.
[b] Figures in parentheses are the number of farmers sampled.

Table 9.2 Farmers' reasons for not choosing non-rice alternative crops (percentage)

Reasons for not choosing alternative crops [a]	Irrigated land	Semi-irrigated land	Simple irrigated land	Total
Limited capital	20.0	29.8	21.1	24.8
Technological know-how	8.6	10.6	15.8	10.9
Price risk	28.6	14.9	31.6	22.8
Marketing problems	42.9	44.7	31.6	41.6
Total [b]	100(35)	100(47)	100(19)	100(101)

Source: Anonymous, 2003b.
Notes: [a] Samples are taken from four districts on Java: Indramayu, Klaten, Kediri and Ngawi.
[b] Figures in parentheses are the number of sample farmers.

9.2 Driving factors for crop diversification

Anonymous (2003b) identified factors encouraging farmers to diversify crops on irrigated land as (i) stability and level of income; (ii) availability of technology; (iii) availability of human labour and mechanical power (particularly tractors); (iv) access to capital; and (v) optimization of land utilization (Table 9.3).

From the results presented in Tables 9.1, 9.2, and 9.3, one can conclude that, on irrigated land, crop diversification would increase with improved research and development, extension services for alternatives crops, expanding farmers' access to credit, mechanized farm equipment, and improving infrastructure and marketing facilities. In the medium term, research and development on industrial uses of non-rice food crops would also boost food crop diversification.

Table 9.3 Proportion of farmers (per cent) by their reasons for diversification

Reasons for diversification [a]	Types of irrigated land			Total
	Irrigated land	Semi-irrigated land	Simple Irrigated land	
High/stable income	20.0	11.8	20.3	17.4
Technological know-how	21.5	26.5	17.1	21.8
Labour availability	21.0	21.2	21.5	21.2
Access to capital	21.5	20.6	21.5	21.2
Optimal use of land	16.0	20.0	19.6	18.4
Total [b]	100(200)	100(170)	100(158)	100(528)

Source: Anonymous, 2003b.
Notes: [a] Samples are taken from four districts on Java: Indramayu, Klaten, Kediri and Ngawi.
[b] Figures in parentheses are the number of sample farmers.

9.3 Concluding summary

Factors that may discourage farmers from diversifying crops on irrigated land include: (i) the status of rice as the major staple food; (ii) technological competence; (iii) access to capital; (iv) famers' risk aversion; and (v) marketing problems associated with alternative crops. Food crop diversification may develop if the government prioritises research and extension services for CGPRT crops, expanding farmers' access to agricultural credit and farm machinery, improving infrastructure and marketing facilities, and removing rice-biased policies. In the medium term, research and development should be focused on food diversification and additional industrial uses of CGPRT crops, including bio-fuel to increase the demand for CGPRT crops.

10. Conclusions and Policy Recommendations

The contribution of agriculture to total GDP in Indonesia is relatively low (around 17 per cent), but its contribution to employment remains high (45 per cent in 2002). The labour force in Indonesia is around 48 per cent of the population, with an unemployment rate of around 9 per cent. The total number of people under the poverty line has increased from 26 million to 38 million in the last ten years, and around 65 per cent of them reside in rural areas. Agriculture is still a crucial determinant of the well-being of Indonesian people.

Agricultural development policies in Indonesia have been biased toward increasing rice production in order to achieve some degree of rice self-sufficiently. This can be seen from the fact that production-related policies (such as policies for irrigation development, price support, farm credits, technological development and extension services) are all biased towards increasing rice production rather than diversification. Consequently, food crop diversification has decreased, and specialization in rice has increased. The production of rice is threatened by the expense of irrigation and the increasing scarcity of water.

Trade policies are also biased towards rice. Currently, rice is the only food crop that is protected by the government through tariffs, as well as a price support policy. Price support for maize and soybean, implemented before 1992, were not effective because their floor prices were far below the actual market prices at the farm gate level, or declined relative to the floor price for rice. Such tariff measures along with price support for rice result in a huge cost to society in the form of net welfare losses.

Despite such policies, rice self-sufficiency has not been achieved, and rice imports averaged about 2 million tons per year from 1996 to 2002.

In general, CGPRT crops in Indonesia have competitive and comparative advantage, except soybean. Since Indonesia has weak competitive advantages (PCR>1) and weak comparative advantages (DRC>1) in soybean production, production has declined and imports increased. Although maize production increased, Indonesia is a net importer of maize due to growing domestic demand, particularly for feed. Groundnut is also imported. Conversely, Indonesia is net exporter of potato and cassava products (tapioca and dried cassava). Indonesia's comparative and competitive advantages in these crops bodes well for crop diversification.

Policies to encourage crop diversification are as follows:

1. Removal of import tariff, import bans, and price support for rice.

   All government policies related to crop production, such as irrigation development, floor prices, farm credits, and technological development have long favoured rice production. Trade policies, such as tariffs and price support also favour rice production. This has increased rice production at the expense of crop diversification. Furthermore, food security is highly dependent on rice.

   In order to diversify food crops, alternative crops must receive support and trade policies that favour of rice production be gradually removed.

2. Imposition of import tariffs for wheat and wheat products.

   In the past, the government subsidized wheat imports, wheat flour processing and the noodle industry through soft loans, and consequently, noodle consumption increased significantly. Although this is positive from the viewpoint of food diversification, it is not healthy for the economy and for food security in Indonesia as wheat is totally imported. To reduce this dependence, tariffs should be imposed on wheat and wheat products.

3. Imposition of import tariffs for net-imported CGPRT commodities.

   The implementation of recommendation 1 would see a decrease in the price of rice and, in turn, an increase in consumption. Implementation of recommendation 2 would increase the price of wheat and reduce its consumption, thereby increasing rice consumption.

   In order to diversify food crops, the prices of CGPRT commodities must be sufficiently high that farmers are encouraged to grow them. In order to raise the prices of CGPRT crops, the government should impose import tariffs on net-imported CGPRT commodities such as maize and soybean.

4. Develop partnerships to raise the prices of net-exported and non-traded CGPRT commodities.

   Policy measures to lift the prices of net-exported CGPRT commodities (such as cassava and potato) and non-traded CGPRT commodities (such as sweet potato) are not easy to formulate due to the perishable nature of these commodities. It is not possible to implement floor prices backed by procurement and storage when the prices are low. The only way to secure the prices of these commodities is to encourage partnerships between farmer organizations and

processing companies/exporters. This is not an easy task and may face several constraints:

- Processing companies/exporters might not consider such partnerships necessary because, hitherto, their businesses have been profitable without such arrangements.
- Agreement between farmers and processing companies/exporters on prices is difficult to secure.
- It may be difficult to develop trust between the two parties. In the case of cassava, for example, farmers are suspicious of the way tapioca processing companies measure the moisture and starch content of cassava, which determines the price paid to the farmer. Local (provincial or district) governments can play a significant role in facilitating the partnerships. As facilitator and mediator, the government might not have to bear the high costs of developing a 'Memorandum of Understanding' between the two parties because such tasks entail only minor costs.

5. According high research priority to CGPRT crops.

Based on the Policy Analysis Matrix Framework, the results of the economic analysis indicate that Indonesia has comparative advantage in all CGPRT crops, except soybean. A sensitivity analysis also concluded that the comparative advantages of maize and groundnut, for example, are relatively robust in the face of changes in import parity prices or changes in yields, whereas the comparative advantage of soybean is not. In the era of free trade, however, continuous research on increasing the production efficiency of CGPRT crops is important so farmers are motivated in spite of price fluctuations. To increase the demand for CGPRT commodities, the government should also prioritize research and development on industrial uses of CGPRT crops. For example, the Agency for Technology Assessment and Application (BPPT) is developing the use of sweet sorghum for bio-fuel.

6. Improving marketing efficiency.

The marketing systems for soybean and potato are relatively efficient; but those for maize, fresh cassava and dried cassava are inefficient due to the oligarchical power of processing industries (feed mills and tapioca) and less-developed infrastructure. Marketing efficiency can be improved by bolstering

infrastructure, enhancing market information, expanding access to credit for traders and those willing to enter marketing and processing, and developing vertical co-ordination between farmers and processing units.

7. Advancing institutions supporting agricultural diversifications.

   Factors that may discourage farmers to diversify crops on irrigated land include: (i) the status of rice as the major staple food; (ii) lack of technological competence; (iii) access to capital; (iv) farmers' risk aversion; and (v) marketing constraints of non-rice crops. Therefore, crop diversification, which integrates various alternative crops to mitigate risks and stabilize farm income, requires several supporting programmes, such as (a) the improvement of agricultural extension programmes concerning both farm and off-farm activities (post harvest, processing and marketing) of CGPRT crops; (b) increasing the availability and access to credit, especially for CGPRT crop production; (c) improving the market structures of CGPRT commodities; and (d) strengthening farmer institutions and encouraging partnerships between farmer and private companies to overcome the marketing constraints of CGPRT commodities.

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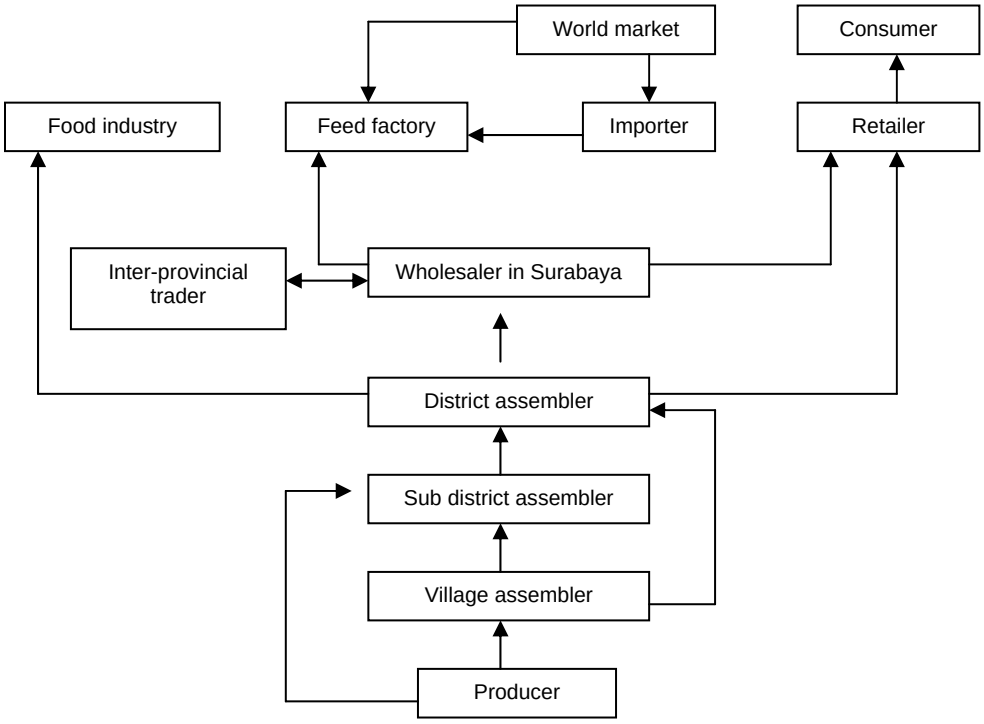
Appendices

Appendix 1. Marketing chain of maize, East Java



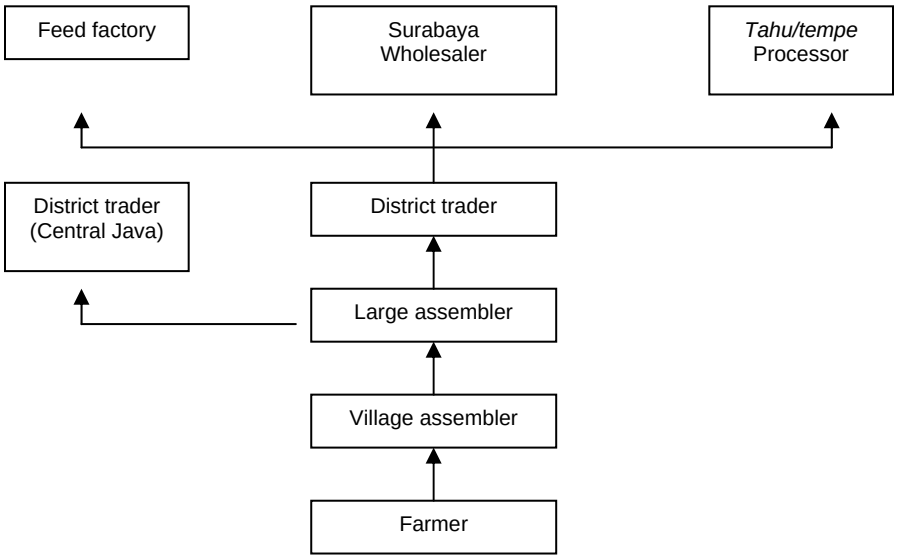
Source: Erwidodo and Hadi, 1999.

Appendix 2. Marketing margin of maize, East Java

I t e m	Rp/kg	Percentage
Producer	411.8	83.86
Transport	3.6	0.73
Village assembler's profit	5.7	1.16
Marketing margin (1)	9.3	1.89
Village assembler	421.1	85.76
Processing	2.7	0.55
Transport	3.8	0.77
Bag	2.8	0.57
Sub-district assembler's profit	6.4	1.31
Marketing margin (2)	15.7	3.20
Sub-district assembler	436.8	88.95
Transport	14.6	2.98
Village assembler's profit	12.4	2.53
Marketing margin (3)	27.0	5.50
District assembler	463.8	94.45
Transport	17.8	1.91
Wholesaler profit	9.4	3.63
Marketing margin (4)	27.24	5.55
Wholesaler to feed factory	491.0	100.00

Source: Erwidodo and Hadi, 1999.

Appendix 3. Marketing Chain of Soybean in East Java



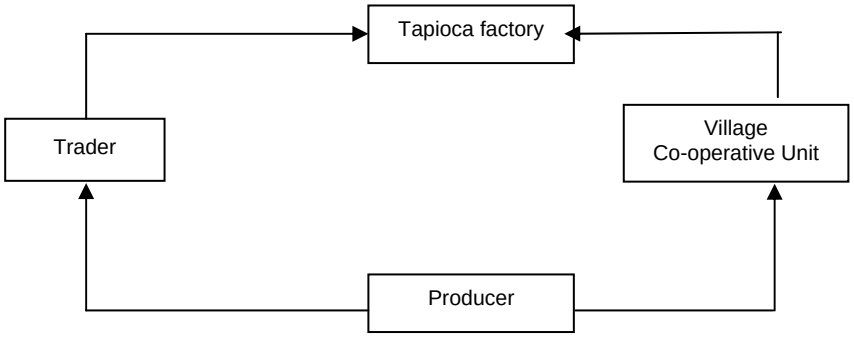
Source: Erwidodo and Hadi, 1999.

Appendix 4. Marketing margin of soybean grain in East Java

Chain	Price (Rp/kg)	Percentage of wholesale price
Surabaya wholesaler	1 320	100.00
District trader	1 200	90.91
Large assembler	1 140	86.36
Village assembler	1 080	81.82
Farmer	1 020	77.27

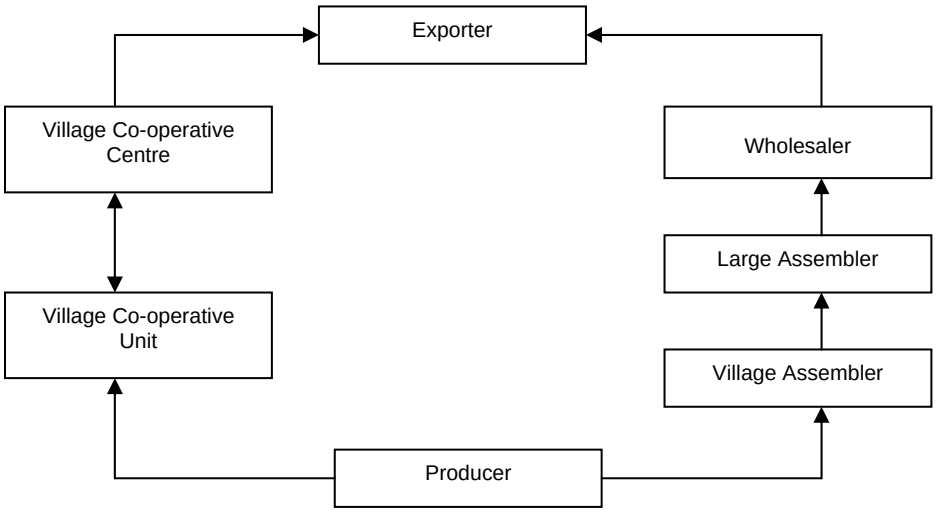
Source: Jierwiriyapant *et al*., 1992, in Erwidodo and Hadi, 1999.

Appendix 5. Marketing chain of fresh cassava, East Java



Source: Erwidodo and. Hadi, 1999.

Appendix 6. Marketing chain of dried-sliced manioc, East Java



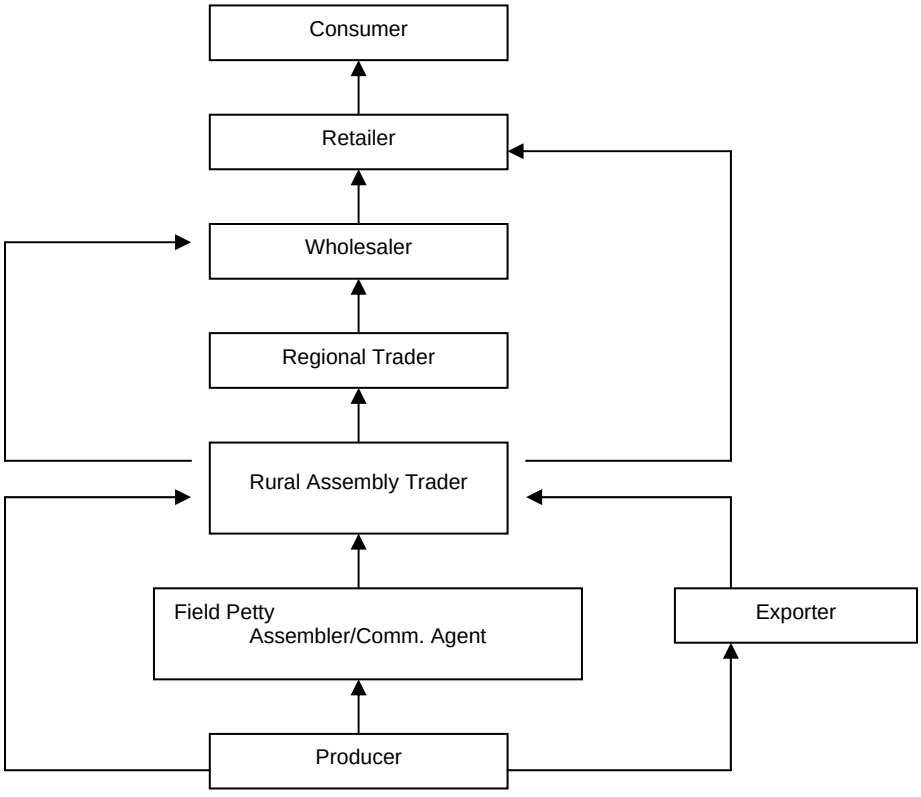
Source: Erwidodo and Hadi, 1999.

Appendix 7. Marketing margin of dried-sliced Manioc, East Java

Component	Price (Rp/kg)	Percentage of f.o.b.
Farmer selling price	191.48	65.11
Unloading	1.22	0.42
Drying	4.87	1.65
Loading	1.62	0.55
Transportation	3.24	1.10
Losses	12.15	4.13
Trader's profit	17.42	5.92
Marketing margin (1)	40.52	13.78
Wholesaler selling price	232.00	78.89
Processing into chips	2.65	0.90
Loading and transportation	19.51	6.63
Packaging	8.88	3.02
Losses	16.85	5.73
Trader's profit	14.18	4.82
Marketing margin (2)	62.07	21.11
f.o.b. price	294.07	100.00

Source: Erwidodo and Hadi, 1999.

Appendix 8. Marketing chain of potato, West Java



Source: Erwidodo and Hadi, 1999.

Appendix 9. Marketing Margin of Potato from Pangalengan to Jakarta,

I t e m	Buying price (Rp/kg)	Selling price (Rp/kg)	Marketing margin (%)
Village assembler	2 700	2 900	75
Transport and handling	16		0.4
Profit	184		5.1
Regional trader in Bandung	2 900	3 100	80.6
Handling	25		0.7
Transport	50		1.4
Profit	125		3.5
Wholesaler in Kramat Jati, Jakarta	3 100	3 300	86.1
Handling	25		0.7
Sorting and loss	66		1.8
Profit	109		3.0
Retailer	3 300	3 600	91.7
Cost of handling	75		2.1
Profit	175		4.9
Consumer	3 600		100

Source: Erwidodo and Hadi, 1999.