Rice and Fertilizer Policies in Indonesia

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GLOSSARY

Expression	Description
BULOG	(Badan Urusan Logistic) is the National Agency for regulating supply, demand, and price of principal food crops in Indonesia.
C.i.f.	Cost, Insurance and Freight.
F.o.b.	Free on board.
Gabah	Unhusked Rice
GATT	General Agreement on Trade and Tariffs.
Ha	Hectare.
HYV	High Yielding Varieties of Rice.
KCl	Potassium chloride.
Kg	Kilogram.
KUD	Koperasi Unit Desa (The Cooperative which organize farmers on Supply and Demand for Agricultural inputs and output Production and usually offer soft-loan credit to its members).
LADANG	Slopeland of varying steepness and altitude, which is usually located quite far from settlements but close to forest. Food crops, vegetables and tuber crops are intercropped with tree crops.
MMT	Million Metric Ton.
MT	Metric Ton.

Rp	Rupiah (Indonesian Currency).
SAWAH	Flat lowland on downhill sites or on floodplains and terraced land on upper slopes. The major crops is wetland rice while upland crops are planted in the off-season. Lowland crops are usually irrigated, while those on upper slopes are rainfed.
TEGALAN	Gently sloping land which has no access to any irrigation system, and which is usually located quite close to settlements (Home gardens). Such land is planted in a patchwork of tuber crops, maize, grain legumes, and tree crops.
TSP	Triple super phosphate.
ZA	Ammonium sulphate.

ABSTRACT

To promote rice production, the government of Indonesia implemented various agricultural policies. Some agricultural inputs had been subsidised heavily, particularly fertilizers. The combination of lower inputs prices, improved technology and better infrastructure such as irrigation schemes increase rice production significantly.

However, higher rice production and lower fertilizer prices encouraged farmers to use more fertilizers. In some areas the use of fertilizers has exceeded that recommended and in some areas production has even declined. It is likely that higher farm incomes that resulted from higher production and increased product prices affected the demand for fertilizers and other inputs to production. As demand for fertilizer increased the cost of the fertilizer subsidy became an important part of government expenditure.

In recent years, the government of Indonesia has introduced policies to reduce the fertilizer subsidy. These policies have had substantial impacts on farmers' costs and incomes. On the one hand, the reduction of the fertilizer subsidy reduced demand for fertilizers. However, this policy was estimated to have little effect on rice production since the use of fertilizer was in general more than was recommended. On the other hand, while the rice price had been hold constant, increased farm costs reduced farmers' incomes. In order to offset the increased farmers' costs the government could allow the rice price increases.

This study is concerned with the effects of the reduction in urea subsidy and the increase in rice support price to maintain self-sufficiency, or to offset the producers loss, due to the increase in urea price. A model developed by Baker and Hayami is adopted for this analysis, to examine their effects on demand for urea, rice

production, producers surplus, government expenditure, and foreign exchange earnings.

The results indicate that the joint policies can meet either the income compensation or self-sufficiency goals, but not without increasing government expenditure. In addition, these policy actions would distort the rice and urea markets.

Chapter 1

INTRODUCTION

1.1. Study Background and Motivation

Government intervention in the agricultural sector has been a common practice since the beginning of trade. The main objectives included an increase in farmers' income, to protect consumers from high food prices, and to increase farm production. However, since the Uruguay Round of the General Agreement on Trade and Tariffs (GATT) was launched in September 1986, the policy interventions in the agricultural sector became the main issue in many countries. Each of the GATT member countries will have to reduce their subsidies and tariffs in agriculture, depending on the final agreement that may be reached. The problem is how to synchronize foreign trade policy with domestic interests to support farmers' income and the rural sector.

For Indonesia, where more than 60 percent of the population rely on the agricultural sector for employment, the issue of free trade has become a dilemma. On one hand, Indonesia has to increase exports to raise foreign exchange earnings. Therefore, because Indonesia is a signatory to the GATT agreement, every policy intervention on internationally traded products must be in accord with GATT law. On the other hand, the reduction or elimination of government intervention such

as input subsidies and price supports could have substantial impacts on farmers' incomes and farm production.

Particularly in rice and other commodities related to rice such as fertilizers, policy intervention has been the major issue in Indonesia. Rice is the main staple in Indonesia. Since the beginning of government interventions in the agricultural sector, the objective has been to increase rice production to achieve self-sufficiency in rice. Demand for rice has more than doubled, from 12 million metric tons (MMT) in 1970 to 26 MMT in 1990. The major factors responsible for the fast growing demand for rice are rapid population growth and higher per capita incomes.

Indonesian population has grown dramatically from 97 million in 1961 to 182 million in 1990 at an average growth rate of 2.1 percent. In the same period economic growth has increased substantially at an average growth of 8 percent. As gross domestic product increased, income per capita also increased. This eventually resulted in a higher per capita consumption of rice.

The income effects on the per capita consumption of rice are often different for urban and rural areas, i.e., a declining per capita consumption in urban areas but an increasing per capita consumption in rural areas. The reason for the increase in per capita consumption in the rural areas is that the higher income stimulates people to convert their diet from traditional staples such as corn and cassava to rice.

Before 1984 rice production had never exceeded domestic demand. As a result, a large amount of rice was imported. During the 1970s Indonesia was the largest rice importer in the world. Over this period the foreign exchange expenditure on rice imports also increased. This affected the balance of payments and the amount of expenditure on other activities such as capital investment in

other sectors. To overcome these problems one alternative was to promote domestic production of rice.

Since the 1960s the government of Indonesia has carried out various strategies to increase rice production. It began with extension services conducted by the Bogor Institute of Agriculture in West Java, continued by the government agency called "BIMAS" (*Mass Guidance*) followed by other programs including INMAS (*Mass intensification*), INSUS (*Special intensification*), and OPSUS (*Special Operation*). Basically, there are four programmes that have been used to promote rice production: *intensification*, *extensification*, *diversification*, and *rehabilitation*.

To support these programmes various agricultural policies were also put in place. Some agricultural inputs were subsidised heavily including fertilizers, pesticides and irrigation schemes. Government agencies and private companies had also been established to ensure the programmes success. The results were substantial. The combination of low input prices to producers, improved technology and better farm infrastructures such as irrigation schemes, transportation facilities and farm information increased rice production.

The government of Indonesia also established some agencies to carry out price stabilization programmes such as BULOG (National Logistic Agency), KUD (Farmers' Cooperatives), and Bank in rural areas. The prices of agricultural products usually fluctuate over time. Factors such as the distance between the location of farms and the consumers, the condition of infrastructures between the farms and the consumers, and the marketing and processing factors can be largely influenced by government intervention. These factors, which determine the margin between farmgate price and retail price, are mostly beyond the farmer's control. However, higher production is not a necessary condition for increased

farmers' income because excess supply, in turn, could reduce prices. Therefore, to protect farmers, government intervention was seen as important to stabilize farmers' income.

In recent years, however, the government has evaluated these policies, including the possible reduction subsidies for agricultural inputs and the stabilisation of agricultural product prices. There were several reasons for doing this. First, there was a substantial decline in the government's development budget due to lower export earnings and an unfavourable exchange rate. Second, in relation to subsidies, low fertilizer prices encouraged farmers to use more fertilizer than was economically efficient. Reducing the subsidy on fertilizers was seen one way to encourage efficient use of fertilizers. Third, the success of self-sufficiency in rice was not without its critics. High rice production is claimed to have been achieved under heavy subsidies and a large amount of investment for irrigation systems and other farm infrastructures. Finally, subsidised rice production has in some cases been claimed to have negative impacts on the environment. The need for food forced farmers to cultivate critical upland for rice production. Since most of the rivers flow from the upland area, the use of upland for agricultural production has increased soil erosion and resulted in siltation in the irrigation schemes of the lowland areas.

Based on the above considerations, one possible and urgent policy requiring implementation is the reduction of input subsidies such as on fertilizers and pesticides. Indonesia terminated subsidies on all pesticides in 1989 while the reduction of subsidies on fertilizers had been carried out gradually to avoid a substantial decline in rice production.

Reducing fertilizer subsidies is a policy that has been used by many countries that might have substantial impacts on fertilizer demand, rice production

and farm incomes. Its effects on rice production from farm to farm depends on local conditions such as the climate and soil type. The reduction of rice input subsidies could have a substantial impact on the agricultural sector and the economy as whole. This sector still contributes a large portion to the GDP and accounts for more than 60 percent of employment. Moreover, rice is not only a principal food and a commercial product, but has also become a political product.

Therefore, if the government of Indonesia wishes to reduce intervention in the markets for fertilizers and rice, this raises questions such as; what type of policy is appropriate, how the policy should be undertaken, how large is the policy impact on production, consumption, and on the welfare of society; by how much should the fertilizer subsidies be reduced or rice prices stabilised to maximize the overall policy objectives, and finally what if any is the effect of such a policy on the environment.

1.2. The Objectives of the Study

This study is focused on the reduction of urea subsidies and the increase of rice support price, either to compensate for farm income losses or to offset reductions in rice production, and the impacts of these policies on demand for urea, rice production, rice farmers' incomes, government expenditure and foreign exchange earnings.

1.3. Organization of the Thesis

This thesis is organized in seven chapters. The next chapter gives an overview of the markets for rice and fertilizers in Indonesia. It includes discussion of rice consumption and production. Supply, demand and international trade in fertilizers, and price stabilizing policies in the agricultural sector are also examined.

Chapter 3 gives a detailed review of alternative agricultural price policy instruments to improve farmers' income such as price support, subsidy, control of imports, and control of supply. This chapter also shows the impacts of these policy instruments on production and consumption of a product, its effects on producer and consumer surplus, the cost of the program to government, changes in foreign exchange earnings, and its effects on the welfare of society.

Chapter 4 reviews recent studies of government intervention in agriculture especially with respect to price policies including agricultural support policy, structural policy, and marketing policy, and a relevant approach for this study is explained.

Chapter 5 contains the modelling approach. This chapter shows the formulation of the model used in this study, the base scenario, the basic data and assumptions.

Chapter 6 describes the results of the analysis followed by discussion and interpretation of the general findings.

Finally, Chapter 7 collates the study findings and the policy implications and gives recommendations for further actions or study.

Chapter 2

THE MARKET FOR RICE AND FERTILIZERS IN INDONESIA

2.1. The Market for Rice

2.1.1. Rice Production, Consumption and Trade

Rice Consumption. Around two-thirds of its population consumes rice. Some studies also indicate that expenditure on food is a major component of total household expenditure and at least one third of the average food budget is accounted for by expenditure on rice (Timmer and Alderman, 1979; Chernichovsky and Meesook, 1984; and Johnson, Teklu, and Jensen, 1988/1990).

The size of the population also accounts for the high demand for rice. In 1992, Indonesia had the fourth largest population in the world, after the Peoples' Republic of China, India, and the United States of America. Its annual population growth rate in the period 1960-1970 was 2.1 percent, which is increased over the period 1970-1980 to 2.32 percent, but dropped to 1.97 percent in the period 1980-1990 (Figure 2.1).

The pattern of food consumption varies geographically. Most of the population in West Indonesia including the islands of Sumatera, Java, Kalimantan, and Sulawesi have rice as their main staple while people in East Indonesia mostly

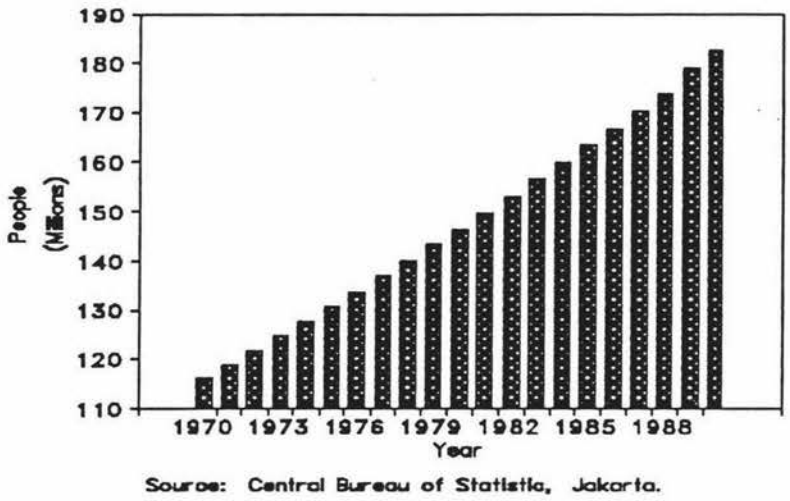


Figure 2.1 Population

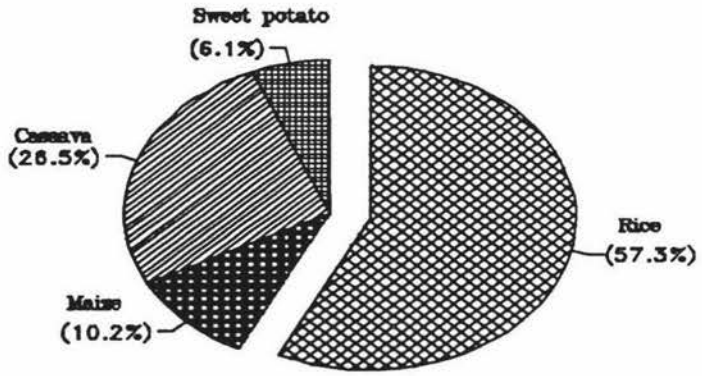
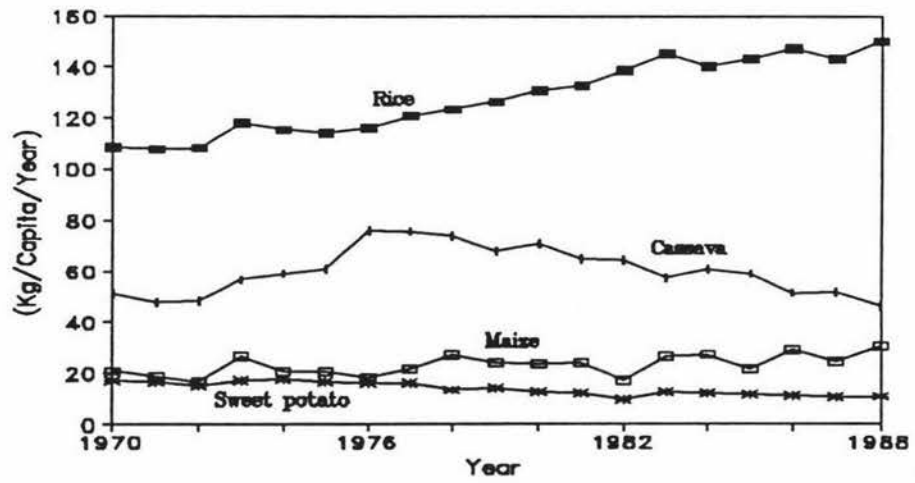


Figure 2.2 Consumption Pattern (Main Staples)

consume corn and sago. However, compared with the other staples of the Indonesian diet such as cassava, maize, and sweet potato, more than 50 percent of the calories needed, particularly carbohydrates, are taken from rice (Figure 2.2).

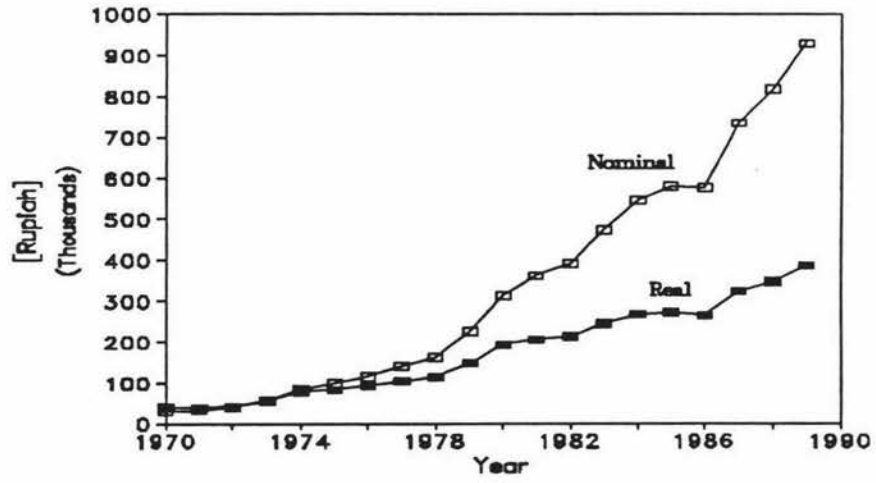
Since the beginning of the independence of Indonesia in 1945, consumption of rice increased substantially while the growth of rice production was insignificant, and even dropped in some years particularly the early 1970s. Consequently, a rice shortage compelled people to find substitutes for rice such as maize and cassava. This situation persisted until the early 1980s. However, consumption per capita still increased almost 50 percent over the two decades, i.e., from 108 kg to 153 kg per capita per year (Figure 2.3).



Source: Food Balance Sheet, Central Bureau of Statistic, Jakarta

Figure 2.3
Per Capita Consumption of Rice, Maize, Cassava, and Sweet-potato (kg/capita/year)

At least two factors were responsible for the increasing demand for rice. Firstly, increasing income per capita (Figure 2.4) and secondly, a change in consumption patterns. As income increased, people who previously consumed rice increased their rice consumption while people who previously consumed maize, cassava, or sweet potatoes converted their diet to rice. Figure 2.3 shows that non-rice consumption, particularly cassava, increased mostly in the mid 1970s due to the rice shortage, then decreased over the following years. This phenomenon is a common feature in the early stage of development in countries where more than 60 percent the household expenditure is spent on food.



Source: Central Bureau of Statistic, Jakarta

Figure 2.4 Per Capita GDP

Rice Production. About 55 percent of Indonesian employment is in the Agricultural Sector and, of this number, rice farmers account for more than 70 percent. The strong preference for rice had made *sawah* (paddy fields) the most desirable form of agricultural land use. In Indonesia, rice is grown on three types of land: (i) *sawah* (wet paddy field or irrigated land); (ii) *tegalan* (dry unirrigated land); and *pekarangan* (the garden land of the house compound).

During the period of 1950-1970, the area harvested of paddy increased substantially from 6 million hectares in 1950 to about 8 million hectares in 1970. However, growth of rice production was insignificant. Several events contributed to varying productivity over this period. In the 1950s efforts were made by the government to improve rice production and to achieve self-sufficiency in rice. During this period rice production increased substantially. However, these efforts had been discouraged when the government forced farmers to sell rice below the market price particularly to provide food for the civil servants, the military, and the urban population.

The period of the 1970s was the most difficult stage for Indonesia. There were several natural disasters such as earthquakes, floods and drought. The shortage of rice supply in the market and high prices for rice motivated farmers, who were planting export crops, to grow paddy to meet their need for rice and for selling in the market. As a result, the area of land devoted to export crops declined substantially. Consequently, with the decline in production of exportable goods, it was more difficult for the country to finance the import of rice to meet the growth in domestic demand.

Even though rice production increased by an annual growth rate of 4.5 percent over the period of 1970s, consumption of rice has increased by an annual growth rate of more than six percent. In 1980 rice consumption was 1.9 MMT

(Figure 2.5). The high demand for rice was not only caused by the 29 percent increase in the population (Figure 2.1), but also by the 22 percent increase in per capita rice consumption from 108.5 to 132.5 kg per year (Figure 2.3). Imports of rice increased dramatically to above one million metric tonnes (MMT).

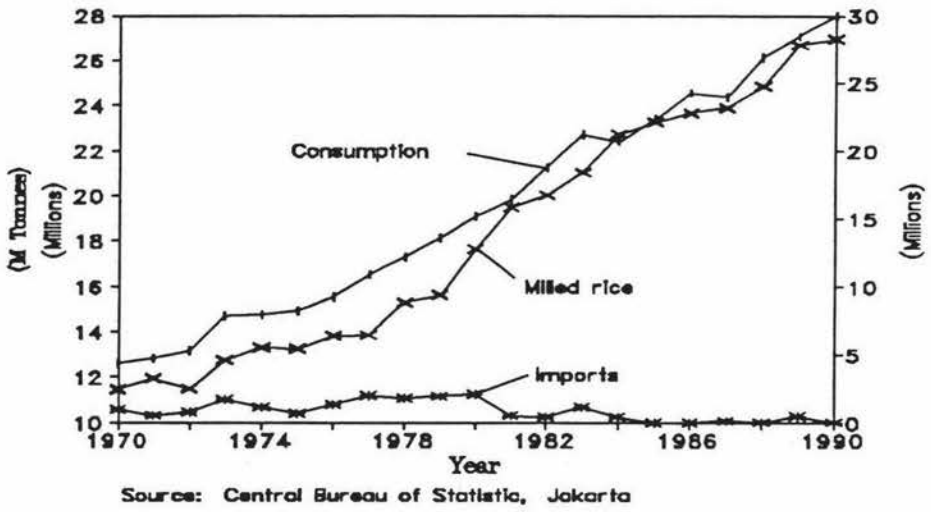


Figure 2.5

Rice Production, Consumption and Import

Self-sufficiency was achieved at the end of 1984. Rice production was 2.3 MMT and domestic consumption was 2.2 MMT (Figure 2.5). However, in 1991 Indonesia again had to import rice when production dropped due to natural disasters such as a long drought and increased pest populations. As occurred in the late 1960s and early 1982, the 1991 drought ruined hundreds of thousands of hectares of *sawah* (wet paddy field). This affected production of rice severely. Around 550 hectares of paddy could not be harvested and 200 hectares was

estimated lost in the following year. Nevertheless, this problem did not persist. In 1992, rice production was back to normal and the excess supply was exported to some countries in Asia and Africa.

Import and Export of Rice. Demand for rice has increased substantially while production of rice could not keep pace with the growth of rice demand. As a result, Indonesia had to import rice from other countries. Donald W.Fryer (1970) depicted this situation as the following:

> *"Perhaps the most important is that Indonesia, formerly self-sufficient in food when it was the Netherlands Indies is now increasingly in deficit as the rate of population growth outstrips the rate of increase in food production.....".*
>
> *"Under the pressure of a rapidly increasing population, the Netherlands Indies ceased to be a major food exporter during the latter half of the nineteenth century. Throughout most of the present century it was in food deficit, although net food import, principally rice, fluctuated greatly".*

The first imports of rice were recorded in 1847 and were imported from Saigon (Timmer, 1975). Then in 1927 net imports of rice were nearly half a million tons (Fryer, 1970). After the Government of Indonesia had undertaken state administration, imports of rice were still carried out to meet domestic consumption. In the 1970s, more than one million metric tonnes (MMT) of rice were imported. The largest imports into Indonesia were in 1980, when two million metric tons of rice or about a quarter of total international rice production was imported.

After self-sufficiency was achieved in 1984, rice production exceeded domestic consumption. The surplus was exported to several Asian countries under

the condition that the importing countries would not pay for the rice but would later export to Indonesia an equivalent value of rice exports. As shown in Figure 2.5, Indonesia did receive (imported) rice that was indeed in return for rice "borrowed" by some countries in 1984/86.

2.1.2. Government Intervention in the Rice Market

As rice production, trade and prices became major concerns in Indonesia, various government interventions have been carried out to stabilise the rice market. In the early stage of the Government of Indonesia, an agency (called 'BAMA') was establish for the government's rice ration scheme to the armed forces, the bureaucracy and other privileged classes (the 'budget group'). The BAMA was established to replace the preceding agency (called 'VMF') (Piggot, R.R. and E.M. Treadgold, 1990,). The VMF, which originated in 1939, was the predecessor of the present agency, BULOG.

In 1952 the Kasimo Plan was introduced to attain self-sufficiency which was targeted to be achieved by 1956. The unsuccessful Kasimo Plan was replaced by the 'Five-Year Plan 1956-1960' in 1956. In 1959, the *Paddy Centra*, which was initiated by the Department of Agriculture, was launched. This programme introduced *Panca Usaha Tani* (the five principles of improved rice production) including better seed, fertilizers, pesticides, water management, and better farming (Teken and Soewardi, 1982). However, none of these policies succeeded in increasing rice production.

Experiences in the early 1960s showed that a lagging production in agriculture led to the lack of food supplies for a growing population and higher

food prices. Consequently, while real income was still low these conditions were responsible for widespread famine. Foods were imported while agricultural products made little contribution to the government foreign exchange earnings. As a result, both factors reduced the value of foreign exchange available for the importation of industrial equipment essential in the early stage of industrialization.

In early 1960s, while aggregate rice production dropped due to droughts, an extension programme called "BIMAS" (Bimbingan Masal or Mass Guidance), initiated by the Bogor Institute of Agriculture, succeeded in increasing rice production in West Java. Then, in the mid 1960s, the BIMAS programme was taken over by the Department of Agriculture. However, BIMAS, which supplied farmers with fertilizers and offered credits, failed to achieve its goal. The reasons were lack of fertilizer supply and limited fund for credits.

In 1968 the BIMAS programme was ended and replaced by a new BIMAS programme called "BIMAS *Gotong-royong*" (*mutual self-help*). Nevertheless, this programme also suffered from some shortcomings and was terminated in May 1970. The new government, lead by President Suharto, started a new programme that was more intensive than the "BIMAS *Gotong-royong*", the "BIMAS *yang disempurnakan*" (*Improved or Perfected* BIMAS) which included *intensification*, *extensification*, *rehabilitation*, and *diversification*.

Intensification. The intensification programme was carried out by introducing new technologies such as high yielding rice varieties (HYV), fertilizers, and pesticides. These technologies were performed in several packets, i.e., INMAS (*Mass intensification*), INSUS (*specific intensification*), OPSUS (*Special Operation*), and the latest programme, SUPRA-INSUS. INMAS, started in 1968, provided modern inputs on the private market at the same subsidized

prices extended to BIMAS farmers. INSUS, begun in 1980, organized farmers in the better-irrigated areas into 50-hectare production groups while OPSUS, which was also started in 1980, provided free inputs for a limited period to farmers settling in the frontier region (Kasryno, 1988). The latest programme was the SUPRA-INSUS, initiated after drought had damaged rice crops and led to falling rice production in the early 1980s. As with the previous programmes, the SUPRA-INSUS was established to organize farmers so as to achieve an economic scale of rice production.

Rehabilitation. In the case where the level of production was low because farmers could not afford to apply new technology, for example to change to a new crop variety, a rehabilitation programme was implemented. Farmers were given necessary information and agricultural inputs to maintain production in a particular crop. This programme gave advantages to the low income farmers who were generally characterised as: (i) less than 1 hectare of land; (ii) their crops have never been replaced and were not of the best variety; (iii) traditional technologies; (iv) less-educated; and (v) most importantly, their source of income was solely from farming activities.

Extensification. More than 50 percent of the Indonesian population resides on Java, which account for only one-seventh of Indonesia's land area. Large areas of land are still available on the other islands. In relation to this, the government of Indonesia introduced the extensification programme, particularly outside Java. This programme coincides with the programme of transmigration that was carried out to reduce population pressure in Java and to cultivate new agricultural land in the islands of Sumatra, Kalimantan, Sulawesi, and Irian Jaya.

Diversification. Another important aspect is that agricultural activities involve high risk. First, the prices of agricultural products often fluctuate. Second, the production of crops is usually influenced by natural factors including temperature, rainfall, drought and humidity. As Fryer (1970) said that:

> *"The changes in atmospheric circulation have long been known in the country as monsoons. From November to April over much of Indonesia the winds are from the west or north wet; this is the period of the West Monsoons, synonymous with the rainy season in Central and East Java and Sunda Kecil, but from April to October, the period of the East Monsoons, these area experience dry conditions....."*
>
> *"The practical effect of such complexity is to produce very varied agricultural rhythms so that a rice harvest of some magnitude is taken in every month, not only in the country as a whole but also in most of the major islands".*

Most of these factors are beyond the farmers control, hence, there is uncertainty about the production and farm revenue. This situation causes adverse effects particularly to monoculture farming where failure in harvesting cannot be compensated for by other crops grown in the same land. Therefore, the government encouraged the diversification programme to reduce the effects of price fluctuations. Farmers were recommended to grow more than one commodity in their land.

Irrigation schemes. Better irrigation is one of prerequisites for the use of modern inputs for wet paddy fields. Many studies show that high yielding varieties, fertilizers and other modern inputs must be incorporated in a complementary package. In other words, a better harvest would be obtained only if these inputs were also used.

In order to support the adoption of modern technology in the rice fields, the Government of Indonesia had developed irrigation schemes since 1969. Since then, irrigated paddy fields have grown at an average rate of 1.6 percent per year. In the early 1980s irrigation schemes in Java covered about 94 percent of the rice area, while in Sumatera and South Sulawesi they were 80 and 96 percent of the rice area, respectively (Kasryno, 1988). The investment in irrigation schemes and the ongoing maintenance costs were paid from the government budget. According to World Bank (1987), only 12 percent of these expenditures were charged to the users (farmers).

In practice, most of the farmers are very unlikely to adopt these programmes and technologies, even though the government offers credit to the farmers. These farmers are traditional and only have a small farm, just enough to supply their needs. Only a little or sometimes none of the production can be sold to gain cash. As a result, they have little cash to buy inputs, such as fertilizers and better seeds, to increase production. To overcome this problem the government introduced various economic policies to stimulate agricultural production including price support programme, the subsidization of modern inputs such as fertilizers and insecticides, various credits and soft loans. Some institutions were also established to implement the policies including BULOG[1], farmers'cooperatives[2] (KUD), and bank services. Kasryno (1988) said that:

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[1] **BULOG** (Badan Urusan Logistik) *is the national food logistic agency which has authority to carry out food price policies, such as price support and stabilization programs, by exclusively monopolising food trade such as import and export of rice, soyabeans, corn, sugar and wheat.*

[2] **Farmers' Cooperative** (KUD or Koperasi Unit Desa) *is an organization of farmers which is built in every district to organize farmers in buying and selling agricultural products and inputs production. KUD is also permitted to participate in distribution of fertilizers in the villages.*

"After 1970, a central coordinating committee was established with direct links to the provincial Agricultural Extension Service, which was made responsible for extension activities under Bimas intensification programme. Banking services were more fully integrated with the programme, with Bank Rakyat Indonesia in particular, providing specially trained staff for the programme. In addition, private fertilizer distributors, farmers' cooperatives (KUD) were permitted to participate in the programme, improving competition in distribution of fertilizer to the villages. BULOG, a Government Logistic Agency, was given responsibility to carry out price support and stabilization programmes. The BULOG purchases rice through farmers cooperative and also monopolize import and export of food commodities (i.e., rice, corn, soyabean, wheat, and sugar)".

Price support. A price support policy has been in place since 1969 (see Table 2.1). The main objective is to provide sufficient return to rice producers and affordable prices for consumers. Every year, a team constituting representatives from several government agencies evaluates and determines the support prices. The agencies involved are the Department of Agriculture, Department of Cooperatives, Department of Trade, Department of Finance, BAPPENAS (National Planning Agency) and BULOG (National Logistic Agency). Details of the institutional structure of the rice policy are given in Appendix B.

The floor price[3] policy was started in 1969. The government fixed the floor prices for dry paddy or unhusked rice based on production cost. Since then, every year the floor price is set and usually comes into effect from 1 February. In 1974, the formula was changed, with the floor prices based on retail prices of rice, the growth rate of paddy farms' BC Ratio and the government budget available for subsidisation (Baharsyah, 1990). The detailed formula used in the determination of the floor price is given in Appendix C.

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[3] Floor price or Legal Minimum Price, see Gardner (1987. pp. 36-37).

Table 2.1
The Floor Price and Purchasing Price of Rice by the Government 1969-91

Year	Floor price of unhusked rice	Purchased Price (Rp/Kg)				Market price (Rp/Kg)
		Unhusked Rice		Milled Rice		
		KUD	NON KUD	KUD	NON KUD	
1	2	3	4	5	6	7
1969/70	20.90	-	-	37.00	37.00	45.0
1970/71	20.90	-	-	37.00	37.00	45.3
1971/72	20.90	-	-	37.00	37.00	49.4
1972/73	20.90	-	-	37.00	37.00	83.5
1973/74 I	25.55	-	-	45.00	45.00	99.6
1973/74 II	30.40	-	-	52.00	52.00	99.6
1974/75	41.80	41.80	41.80	68.50	68.50	107.8
1975/76	58.50	59.00	59.00	97.00	97.00	128.5
1976/77	68.50	69.50	69.50	108.00	108.00	132.6
1977/78	71.00	72.00	72.00	110.00	110.00	140.5
1978/79	75.00	77.50	77.50	119.50	119.50	170.2
1979/80 I	85.00	88.00	88.00	140.00	139.00	198.8
1979/80 II	95.00	100.00	98.00	158.00	156.00	198.8
1980/81	105.00	111.00	108.00	175.00	172.00	226.7
1981/82	120.00	128.00	123.50	195.00	191.00	254.8
1982/83	135.00	146.00	139.50	214.00	210.00	304.7
1983/84	145.00	156.00	152.00	238.00	233.00	328.2
1984/85	165.00	177.70	172.70	270.00	264.00	320.4
1985/86	175.00	187.70	182.70	285.00	279.00	346.1
1986/87	175.00	187.70	182.70	285.00	279.00	387.6
1987/88	190.00	202.70	197.70	313.00	307.00	469.2
1988/89	210.00	222.70	217.70	344.00	338.00	500.9
1989/90	250.00	262.70	257.70	405.00	399.00	523.7
1990/91	270.00	282.70	277.70	436.00	430.00	567.5

Source: *Badan Urusan Logistic (BULOG), Jakarta.*

Table 2.1 shows that since the floor price formula was changed, the floor prices set by the government (column 2) were lower than the purchase prices of the KUD (column 3) and of non-government corporations (column 4). However, the purchase prices of the KUD were slightly higher than those of the NON-KUD.

In the case of a rice shortage, the market prices are such that many consumers cannot afford to buy rice. The government then sets a ceiling price[4], that is, the maximum price at which rice can be sold by retailers in the market. The objective is to protect consumers from high rice prices. The ceiling price is normally based on the cost of storage, the purchasing power of the population in certain regions, and the need to promote both interseasonal and interregional (interisland) trade (Soegeng Amat, 1982).

To maintain this price BULOG implemented "*market operations*", i.e., increasing the supply of rice to the market to reduce prices. The rice is supplied from the buffer stocks which were collected in the harvesting time. The "*market operations*" are carried out until the market prices are back to normal. The market prices of rice (column 7), that is the price the consumers pay, are usually higher than the ceiling prices.

However, to implement a support price, i.e., to raise the floor price while maintaining the market price of rice at a low level for consumers, is often costly. Since the floor and ceiling prices are closer, there is an inadequate margin for stocks to be held at a normal profit. Consequently, a large amount of subsidy has to be spent to maintain the marketing margin. Therefore, under some conditions, farmers are also allowed to sell rice in the free market (NON-KUD or Non Farmers' Cooperatives), for example when BULOG cannot buy the excess supply

[4] Ceiling price or Maximum price, see Gardner (1987. pp.37).

due to limited storage and budget, or cannot release rice due to rice shortages and limited stocks. Nevertheless, the free market prices are often below the KUD prices (column 3 vs 4 and column 5 vs 6).

Buffer Stock. The national buffer stock is operated to reduce fluctuations in rice prices. BULOG cooperates with the DOLOGs (State Logistic Agency in the local area) and Farmers' Cooperatives carry out the national buffer stock scheme. During harvesting time the farmers' cooperatives buy the excess supply of both types of rice, unhusked and milled rice, at the price set by the government plus margin and storage costs and store it at DOLOGs. Then, some of both types of rice is distributed to the civil servants, the military and the privileged classes (the budget group). The remainder is kept for national buffer stocks, to be used to stabilize market prices when there is any shortage in the market and upward movement in prices. Buffer stocks are also used to provide rice in emergency circumstances, for example floods, earthquakes, and other natural disasters.

BULOG (The National Logistic Agency). BULOG was established in 1967. As the only national food agency, BULOG has an exclusive authority in the markets of some major crops in Indonesia such as rice, sugar, maize, soyabean, wheat and flour. Its responsibilities and activities include monitoring of prices, maintenance of stock, domestic procurement at the floor price, stock releases, imports and exports. As the role of BULOG is critical, the head of BULOG is responsible to the President. The head of BULOG also serves as the Minister of Cooperatives. The reason for this additional role is to promote the coordination between BULOG and the cooperatives. The detail of BULOG's responsibilities and activities is given in Appendix B.

KUD (Farmers' Cooperatives). KUD organizes and supports farmers by providing subsidized fertilizers and other inputs in the local area at the time needed. The cooperatives, initially called BUUD (Badan Usaha Unit Desa), were expected to be democratic village cooperatives and run by farmers themselves. However, in practice, most of the BUUDs are run by the local government officials. Basically, the BUUD/KUDs were established to purchase paddy or *gabah*, to process the unhusked rice through to milled rice, and then to sell the milled rice to BULOG.

2.2. The Market for Fertilizers

2.2.1. Fertilizer Supply, Demand and Trade

Fertilizer Utilization. To improve agricultural production the government of Indonesia offered subsidies on agricultural inputs, including fertilizers and pesticides. The objectives of the subsidies are to induce the adoption of modern technological packages, to increase export earnings, to increase farm income and stabilize consumer prices (Kasryno, 1988).

Initially, they were only given to BIMAS ("mass guidance") farmers for rice production. Then, the use of subsidies was expanded to other food crops and exported crops. At the beginning of the BIMAS programme, food crops consumed about 80 percent of the total 545.3 tons of fertilizer while plantation (exported crops) used 20 percent (Table 2.2). This proportion changed substantially over the period 1970 to 1980. A year before rice self-sufficiency

was achieved, the percentage of fertilizer used by food crops had increased to 87.2 percent.

Table 2.2
Percentage of Fertilizer Consumption by Food Crops and Plantation

Year	Food Crops (%)	Plantation (%)	Total (tons)
1969	79.5	20.5	545.33
1970	74.6	25.4	589.43
1971	85.2	14.8	595.83
1972	65.7	34.3	849.22
1973	87.1	12.9	954.92
1974	82.6	17.4	1060.09
1975	81.7	18.3	1126.67
1976	61.2	38.8	1143.64
1977	81.1	18.9	1493.98
1978	77.1	22.9	1738.01
1979	77.3	22.7	1995.55
1980	82.3	17.7	2774.88
1981	85.9	14.1	3273.44
1982	93.6	6.4	3542.62
1983	87.2	12.8	3520.77

Source: Nataatmadja, H and S. Tjakrawerdaja. 1984.

The use of fertilizers for several food crops is shown in Table 2.3. Among the food crops, paddy is the most intensive use of fertilizers. During the period 1970-1980 its utilization in the paddy crop increased substantially. By the beginning of the 1980s, the use of fertilizers in paddy fields on average was 183 kg per hectare while corn used about 76 kg per hectare and the remaining crops

used 50 kg per hectare or less. Fertilizers used for food crops include Nitrogen fertilizer (Urea and ZA), Phosphate fertilizer (TSP) and Pottassium fertilizer (KCL). According to Syarifuddin Baharsyah (1990), over the last decade about 70 percent of the total urea and 50 percent of the total TSP used for food crops are applied in rice production.

Table 2.3
Fertilizer Utilization for Major Food Crops 1972/80
(Kg/hectare)

Year	Paddy	Maize	Cassava Potato	Sweet	Peanut	Soyabean
1972	78.1	32.3	6.5	8.1	9.1	5.3
1973	78.4	25.0	5.0	1.9	7.9	5.2
1974	83.4	40.3	7.3	14.4	12.4	15.1
1975	69.0	44.6	9.8	18.6	14.2	12.8
1976	82.2	48.7	14.0	8.7	19.9	14.6
1977	127.3	52.7	13.2	32.7	25.2	18.8
1978	145.1	55.2	16.5	27.1	35.6	14.6
1979	141.8	43.7	7.9	9.6	27.0	15.9
1980	183.2	76.7	18.7	28.7	50.6	38.5

Source: Nataatmadja, H and S. Tjakrawerdaja. 1984.

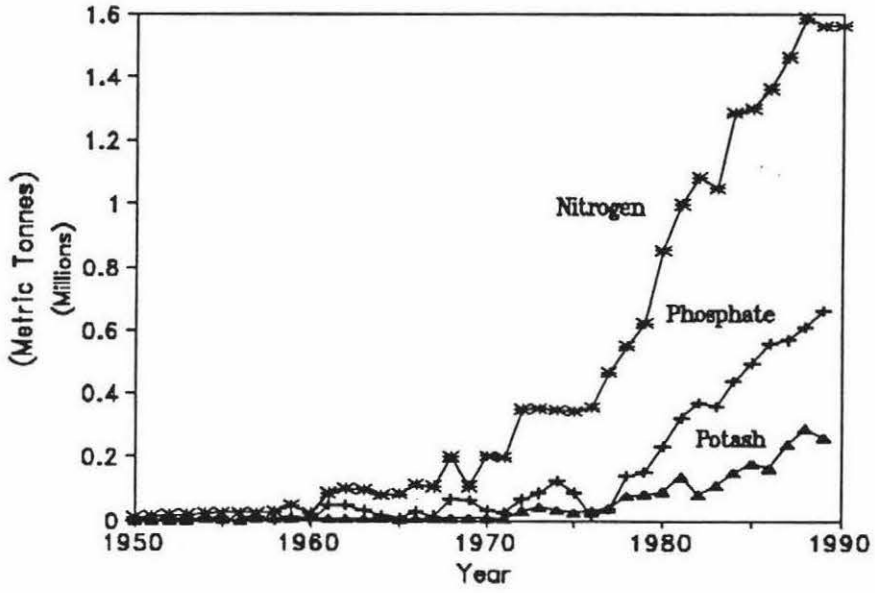
Since early 1950, urea (nitrogen) fertilizer has been the dominant fertilizer followed by phosphate and potash (Figure 2.6). Table 2.4 shows the use of four principal fertilizers: Urea, TSP (Triple super phosphate), ZA (Ammonium Sulphate), and KCL (Potassium chloride).

Table 2.4
Utilization of Four Main Fertilizers for Food Crops[5]
(Thousand MT)

Year	Urea	ZA	TSP	KCL	TOTAL
1970	342	76	65	14	497
1971	413	67	55	4	539
1972	485	157	39	55	736
1973	669	65	136	21	891
1974	604	139	193	16	952
1975	676	94	235	34	1039
1976	686	122	211	24	1043
1977	962	140	183	69	1354
1978	1080	155	205	109	1549
1979	1240	196	268	122	1826
1980	1680	330	439	123	2572
1981	2021	282	644	148	3095
1982	2181	335	752	125	3393
1983	2004	306	701	92	3104
1984	2336	213	841	100	3491
1985	2300	280	889	96	3566
1986	2336	285	979	101	3703
1987	2529	357	1066	146	4099
1988	2529	385	1085	211	4211
1989	2623	451	1142	222	4439
1990	2691	508	1147	209	4556

Source: Ministry of Agriculture, 1990

[5] Data for fertilizers were collected from various sources within the Department of Agriculture (Ministry of Agriculture).



Source: Food and Agriculture Organization 1950/90

Figure 2.6
Fertilizer Utilization 1950-1990

More than 50 percent of the area sown in paddy is in Java island. Therefore, the BIMAS programme was concentrated in Java and the use of fertilizers was also dominant in Java. More than 75 percent of the urea is distributed in Java followed by Sumatera and Nusa Tenggara (Table 2.5).

Fertilizer Recommendation. Since fertilizers were introduced to farmers, their application, as well as the use of other inputs such as improved seed varieties and better farm management, in rice production has resulted in an increased yield per hectare. This has encouraged farmers to use more fertilizers (Table 2.7). The farmers often use the four different type of fertilizers at the same doses for every field.

Table 2.5
Urea Consumption of Food Crops and Area Harvested of Paddy in the Main Islands 1983-1990

Province	Urea Consumption (TMT)		Area Harvested (thousand hectares)	
	1983	1989	1983	1989
Java	1577	2059	4779	5448
Sumatera	228	298	2275	2534
Kalimantan	17	32	749	880
Sulawesi	71	115	807	1050
Nusa Tenggara	106	116	533	583
East Indonesia	3	2	17	24
Outer Java	425	563	4383	5073
Indonesia	2004	2691	9162	10521

Source: *Ministry of Agriculture, Jakarta.*

Since most of the farmers are traditional farmers, they have never been concerned about the capacity of their land to absorb such chemicals. In fact, they use fertilizers without knowing which particular fertilizer has the greatest effect on yields (Quizon, 1990). Fertilizer recommendations made by the Ministry of Agriculture through *Bupati* (Head of District) were the only information available to the farmers (Table 2.6), and since the 1950s nitrogen fertilizers such as urea and ZA have been predominantly used (see Figure 2.6).

Table 2.6
Recommended Used in West Java
(Kg/hectare)

	Recommended used			
	Urea	ZA	TSP	KCL
Subang	200	100	100	100
Indramayu	200	100	100	100
Krawang	200	100	100	100
West Java	200	100	100	100

Source: *Quizon, et al (1990)*

Table 2.7
Fertilizer Used for Rice in 3 Key Rice Growing Areas in West Java
(Kg/hectare)

	Fertilizers used			
	Urea	ZA	TSP	KCL
Subang	196.9	11.9	148.3	41.3
Indramayu	247.6	22.9	155.8	29.3
Krawang	222.2	18.6	133.3	36.9
West Java	221.8	17.7	146.2	35.9

Source: *Quizon, et al (1990)**

A study conducted by Quizon (1990) in three key rice growing areas shows that the quantity of fertilizer used per hectare was more than the recommended amount (see Table 2.6 and 2.7). For example, in the three key rice areas in West Java, i.e., Subang, Indramayu, and Krawang, the recommended use of fertilizers was 200 kg per hectare for urea and 100 kg per hectare for ZA, TSP and KCL (Table 2.6). In practice, farmers used more than the amount recommended for all fertilizers, except ZA and KCL. The reason might be that the price of ZA is more expensive than urea while KCL mainly used for tree crops.

Fertilizer production. To meet the growing demand for urea, urea plants have been established since 1965, including PT. PUSRI in South Sumatera, PT. Pupuk Iskandar Muda in Aceh, PT. Pupuk Kujang in West Java, and PT. Petro Kimia Gresik in East Java. However, some fertilizers such as TSP, KCL, KS and ZK still have to be imported.

Even though PT. PUSRI has produced urea since 1965, production could not keep pace with the increased demand for urea. In the early 1980s Indonesia still had to import urea; for example in 1980 imports of urea were 210000 metric tons while TSP, ZA, and KCL were 160000, 82000, and 136500 metric tons, respectively (Table 2.8).

Five years later, another three domestic manufacturers started to produce urea. After 1984, urea production had exceeded domestic demand and Indonesia become a net exporter (Table 2.9, Figure 2.7 and 2.8). Imports were therefore terminated for urea, but it was still necessary to import TSP, KCL, and KS.

Table 2.8
Imports of Fertilizers 1980-91
(1000 MT)

Year	Urea	TSP	ZA	KCL	KS	ZK
1980	210	160	82.4	136.5	-	-
1981	150	125	205.0	248.5	-	-
1982	435	393	145.5	138.5	-	-
1983	-	-	140.0	257.0	4.0	-
1984	300	-	32.8	125.0	4.3	-
1985	-	-	-	300.0	7.5	-
1986	-	-	-	224.4	2.0	-
1987	-	-	-	563.0	6.0	-
1988	-	25	-	340.9	6.0	-
1989	-	262	-	440.1	-	6.0
1990	-	148	-	703.5	5.5	8.0

Source: *Ministry of Trade, Jakarta.*

Table 2.9
Exports of Urea 1986-90
(Metric Tons)

Year	Volume (Metric Tons)	F.o.b (US $)
1986	1 412 778	131 723 314
1987	1 012 813	98 628 250
1988	1 024 417	128 042 712
1989	1 680 669	180 266 736
1990	1 598 201	213 396 257

Source: *Ministry of Trade, Jakarta.*

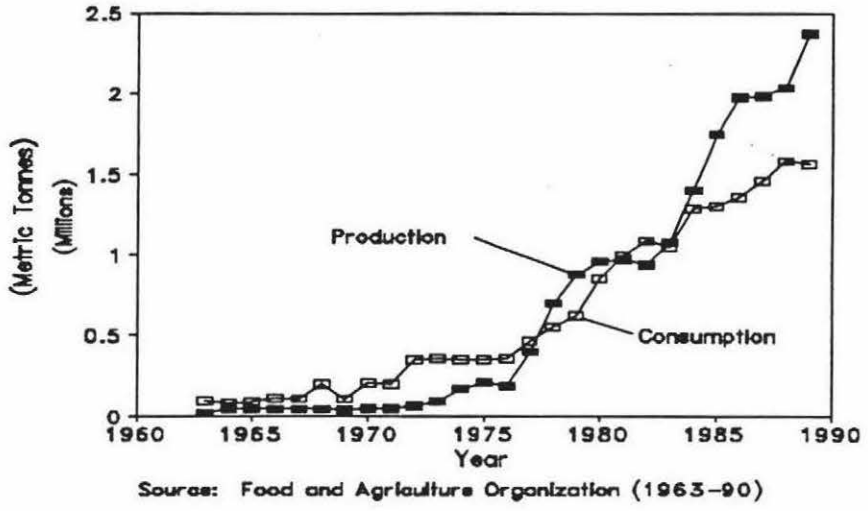


Figure 2.7
Indonesian Urea Production and Consumption 1963-90

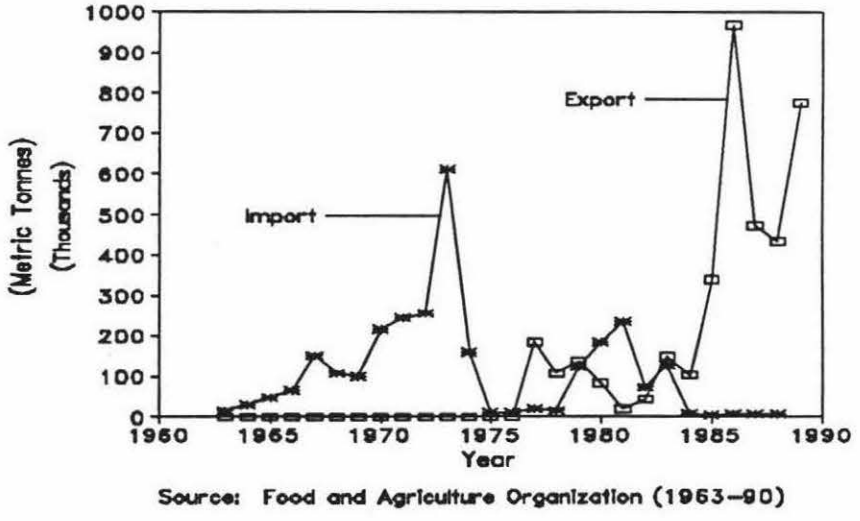


Figure 2.8
Indonesian Imports and Exports of Urea 1963/90

2.2.2. Government Intervention in the Fertilizer Market

The market for fertilizers is regulated by the government as part of its policy to support agricultural production through subsidies. The subsidies meet the costs of selling fertilizers at below world prices, that is, c.i.f prices for imported fertilizers and f.o.b prices for exportable production. For examples in 1988/89 farm-gate prices of urea and TSP were about 45 percent and 59 percent below the border prices plus transportation costs (Table 2.10) and were about 50 percent lower than farm-gate prices in some other Asian Countries.

Table 2.10 shows the unit subsidies at the farm-gate, calculated by subtracting the retail price from the sum of the border price and the distribution cost. In the fiscal year 1989/90 the paid on the various fertilizer subsidies were reduced by between 9 and 18 percent, compared with the previous year. The border prices are determined by the f.o.b. prices for domestically produced exportable fertilizers such as urea and TSP and the c.i.f. prices for imported fertilizers.

Basically, there are four types of subsidy applied to fertilizers: (i) the 'Direct' subsidy, (ii) Forgone tax and non-tax revenue, (iii) Manufacturers' "profit margins" and (iv) the PUSRI handling fees. The "direct" subsidy is the largest part of the fertilizer subsidy.

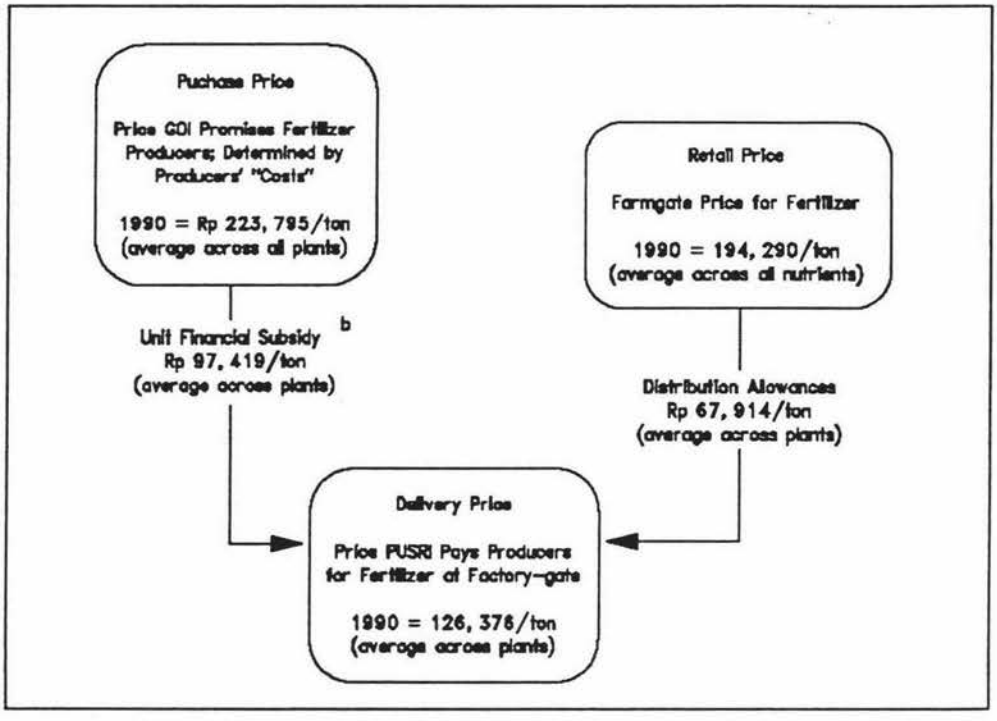
Each year between April and July, based on the plant's "cost of production", domestic manufacturers determine the price of fertilizers while the government sets the official purchase price which can exceed the border price, that is, the guaranteed price per ton of fertilizer sold by each producer for domestic agriculture. As shown in Figure 2.9, in 1990 the Government of Indonesia set the purchase price at Rp 223,795 per ton while the PUSRI, the only

Table 2.10
Economic Unit Subsidies at the Farm-gate in Fiscal Year 1989/90
(Rp/kg)

	Economic Border Price	Official cost of distribution	Retail price	Unit subsidy	Subsidy rate 89/90	Subsidy rate 88/89
	(A)	(B)	(C)	(D)	(E)	(F)
Urea	187	68	185	70	27%	45%
ZA	173	44	185	32	15%	24%
TSP	331	49	210	170	45%	59%
KCL	243	47	210	80	28%	43%
KS	417	47	210	254	55%	65%
ZK	463	46	210	299	59%	

Source: * *Quizon, et al (1990).*
** *The Ministry of Finance Decree, 1989*

(A) *1989/90 average FOB price for bagged urea, price adjusted for domestic share of bulk fertilizer;*
(B) *Based upon average current distribution allowance for each nutrient and the assumption that current distribution allowances overstate the economic cost of distributing fertilizers by 15 percent.*
(C) *Official retail prices set in October 1989.*
(D) *= (A) + (B) - (C)*
(E) *= unit subsidy / economic value of fertilizer at the farm-gate; (D)/[(A)+(B)].*



Source: *Quizon, et al (1990)*

a) *Including current average unit subsidy values (all nutrients)*
b) *Does not include handling fees to PUSRI of Rp 1,100/ton or "profit margin" to the fertilizer manufactures that average about Rp 5,000/ton. Nor does this include forgone and non-tax revenues.*

Figure 2.9
Schematic Diagram for the Direct Financial Subsidy to Fertilizer[a]

firm allowed to distribute fertilizers, purchased from the manufacturers at a factory-gate price of Rp 126,4/ton (delivery price). The different between the purchase price and the delivery price is the Unit Financial Subsidy, that is, Rp 97,4 per ton. The total direct subsidy for each producer is equal to the quantity sold multiplied by the financial unit subsidy.

Table 2.11
Retail Price of Subsidized Fertilizers
(Rp/kg)

Year	Date	Urea	TSP	ZA	KCL
1986	1/1-2/4	100	100	100	100
	3/4-31/12	125	125	125	125
1987	1/1-7/10	125	125	125	125
	8/10-31/12	135	135	135	135
1988	1/1-5/10	135	135	135	135
	6/10/31/12	165	170	165	165
1989	1/1-3/10	165	170	165	165
	4/10-31/12	185	210	185	210
1990	1/1-3/10	185	210	185	210
	4/10-31/12	210	260	210	260
1991	1/1-8/10	210	260	210	260
	9/10-31/12	220	280	220	280
1992	1/1-	220	280	220	280

Source: *Ministry of Finance, Jakarta.*

PUSRI then distributes the fertilizers at a retail price set officially by the government, that is, the maximum price at which fertilizers may be sold at the farm-gate (Table 2.11 shows the maximum level of prices of subsidized fertilizers 1986-1992). For this activity, in 1990, PUSRI gained distribution allowances of Rp 67,914, or the difference between the delivery price and the retail price. At the end of the fiscal year, depending on the number of tonnes of fertilizer sold, PUSRI receives the handling fees while each fertilizer producer receives a "profit margin" that is on average about Rp 5000 per tonne of fertilizer sold domestically.

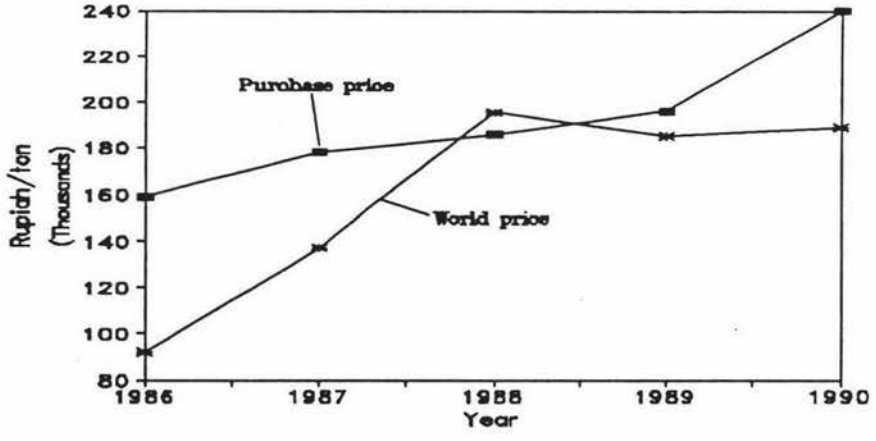


Figure 2.10
World Urea Price (F.O.B. Indonesia) vs.
Urea Ex-Factory Adjusted Purchased Price

The profit received by manufacturers depends on the world price. If the official purchase prices are less than the world prices, manufacturers are subject to a net tax, because they can export the excess supply and compete in the

international market. However, if the price is higher than the world price, an economic subsidy accrues to fertilizer producers, that is the government pays the difference between the domestic cost of production and the world price. Figure 2.10 shows the world urea price and the urea ex-factory adjusted purchased price.

Table 2.12 describes the allocation of economic benefits from the fertilizer subsidy in fiscal year 1989-90. The economic subsidy on the fertilizer measured the market value of the fertilizer subsidy while financial subsidy measures the financial government expenditure on the subsidy. The total economic fertilizer subsidy in the 1990 was Rp.917.5 billion while the financial subsidy was Rp.734.2 billion. This because the natural gas and KCL Grant are not included in the subsidy.

The largest portion (77.5 percent) of the economic benefit from the subsidy was received by farmers while fertilizer producers and distributors were 16.3 and 6.3 percent, respectively. However, the highest (48.4 percent) financial subsidy was on TSP while urea was 25.2 percent. As mention previously, the exclusion of natural gas lead to reduce financial subsidy to urea. Table 2.11 also shows that the quantity urea use accounts for 54.5 percent of the total fertilizer use.

The total amount of the fertilizer subsidy has grown dramatically. In fiscal year 1977-78 the amount of the subsidy was 31.8 billion rupiah, while in 1989-90 the figure was 734.2 billion rupiah or 13.5 percent of the government's development budget. In recent years, the capability of the government budget to subsidise fertilizer has considerably weakened.

Since 1986, the government has gradually reduced the fertilizer subsidy. As Syarifuddin Baharsyah (1990) has said, the reasons for reducing the subsidy include a drop in national income due to lower gas and oil export receipts and a lower exchange rate with the US dollars and Yen.

Table 2.12
Allocation of Economic Benefits of the Fertilizer Subsidy (in billion rupiah)

	Urea	TSP	ZA	KCL	KS	Total	(%)
Recipient:							
Manufactures	39.1	75.1	35.3	-	-	149.5	16.3%
Distributors	36.8	13.3	5.0	3.0	0.03	58.1	6.3%
Farmers	290.1	340.5	42.5	35.1	1.70	709.9	77.4%
Total Economic Subsidy	366.0	428.8	82.8	38.1	1.70	917.5	100.0%
Subtract "Off Budget" Elements of the Subsidy:							
Natural Gas	180.9					180.9	
KCL Grant				2.4		2.4	
Total Financial Subsidy	185.1	428.8	82.8	35.7	1.70	734.2	
Percent of:							
Financial Subsidy	25.2%	48.4%	11.3%	4.9%	0.2%	100.0%	
Quantity of Fertilizer Used	54.5%	27.6%	11.4%	6.4%	0.1%	100.0%	

Source: *Ministry of Agriculture, Jakarta.*

* *The world price used to determine the subsidy benefits accruing to producers of TSP and ZA is the c.i.f price. For urea, an adjusted f.o.b. price has been used: adjustments were made in the manufactures' ex-factory prices to remove the effect of subsidized gas used in urea production. The opportunity cost of gas was assumed to be $2.00/MBTU.*

* *Estimate of the subsidy going to distributors are based on the (conservative) assumption that the actual costs of transporting fertilizer are 15% lower than the distribution allowances set for fertilizer distributors.*

Factors that should be taken into consideration when analysing possible reduction of the fertilizer subsidy include: first, the changes in demand for fertilizers, and rice production. Secondly, the level of rice prices and its impact on farmers' income. Finally, the government budget available to finance the subsidy. If the ultimate goal is the elimination of the subsidy, then strategies need to be developed on how this policy should be implemented so as to minimize its negative impacts.

Chapter 3

AGRICULTURAL PRICE POLICY TO IMPROVE FARMERS' INCOMES

The use of agricultural price policy has been popular in many countries to improve the standard of living for the agricultural population. Price support, such as the output and input subsidy for rice in Asia and the deficiency payment or acreage control to raise price in US and Canada, is used to stimulate farm production. However, the objective of government intervention has varied from country to country. In many developing countries, the policy objectives include obtaining government revenue, achieving internal price stability, providing low cost food for consumers, providing the necessary surplus for industrial development and improving incomes in the agricultural sector (Lutz & Scandizzo). However, in developed countries it was found that income in the agricultural sector could not keep pace with the fast growing income in the remaining sectors and the main objective of a price support policy has been to raise farmers' income (Ritson, 1977).

In general, it is also mentioned in Article 39, of the Treaty of Rome, 1958 (Ritson,1977), that government intervention in the agricultural sector might have the following objectives:

(a) To increase agricultural productivity by developing technical progress and by ensuring the rational development of agricultural production and the optimum utilization of the factors of production, particularly labour.

(b) To ensure thereby a fair standard of living for the agricultural population,particularly by the increasing of the individual earnings of persons engaged in agriculture.

(c) To stabilise markets.

(d) To guarantee regular supplies.

(e) To ensure reasonable prices of supplies to consumers.

These objectives are often achieved simultaneously with the overall objective of government policies such as increasing employment, economic efficiency, stabilising and manipulating exchange rates, maintaining low consumer prices, maintaining on equitable income distribution, economic growth and maintaining relations with foreign countries. Among these, as Ritson (1977) stated, the distribution of income, economic efficiency and international relations are the most relevant in the case of agricultural policy.

Government support in the agricultural sector can be categorised into three broad areas (Ritson, 1977): (a) Government expenditure directed specially towards rural areas to improve rural infrastructure, provide social services, subsidise transport facilities, and provide water and electricity in isolated areas; (b) Development of farm-based non-farm occupations such as part-time farming and (c) Direct income supplementation including subsidy and deficiency payments. Many governments prefer direct income supplementation to the first two. The reasons are first, by using direct income supplementation, government's policy towards income redistribution can be carried out simultaneously with the distribution and collection of the income transfer and second, there is no

substantial conflict between direct income support and other goals of agricultural policy (Ritson,1977). Therefore, in practice, the main objective set by governments is often to improve the living standard of the agricultural population by raising farm incomes.

Basically, raising farm incomes involves at least two measures, reducing farmers' costs and increasing farmers' revenue. Reducing farmers' costs can be achieved by subsidising agricultural inputs such as fertilizer. This measure is implemented to provide cheaper inputs to production by dropping input prices by the amount of a subsidy or a deficiency payment. The impacts of an input subsidy could be an increase in the quantity demanded of the inputs, increased supply of the products, a change in the quantity demanded of other inputs and possibly an increased farm profit depending on the interdependecies between price and quantity of both inputs and outputs. That is, the effect of an input subsidy depends on the quantity supplied and the subsidised product price and also on the quantity demanded for the input caused by the change in factor price. In relation to this, Ritson (1977) stated as follows:

> *"an attempt to increase farm income by subsidising input prices may not be successful unless it is combined with a policy towards product prices".*

Price support policy is used to raise farmers' revenue. This policy influences the quantity supplied and the product price. Excess supply could reduce the price of the product and a low price discourages farm production. Control of production, deficiency payments or price supports could increase farmers' revenue.

In this chapter we will focus on the agricultural policy measures implemented to raise farmers' revenue and reduce their costs. These policy measures, in practice, are not only implemented to improve farmers' income but

also to achieve several other objectives simultaneously such as price stabilization, providing incentives to increase domestic production, reduce imports of food and foreign exchange costs, and to achieve self-sufficiency in particular agricultural commodities for example rice and corn (Rosegrant, 1980). In the simplest form, the relationship between farm revenue and farm costs can be represented as the following:

Farm Income = Revenue - Cost

$$\textit{Farm revenue} \quad R = \sum_{i=1}^{n} P_i Q_i \qquad (3.1)$$

$$\textit{Farm Cost} \quad C = \sum_{i=1}^{n} p_i q_i \qquad (3.2)$$

where p_i = the input prices
q_i = the quantity demanded for inputs
P_i = the product prices
Q_i = the supply of the product

If a government adopts the objective to improve farmers' income, the following alternatives could be undertaken separately or simultaneously: first, the support of product prices to increase farmers' revenues either by subsidizing product prices, deficiency payments, controlling imports or supply management quotas; second, subsidisation of input prices to reduce farmers' costs; third, the improvement of technology to increase productivity such as the use of high yielding varieties (HYV) of crops and improved farm management; fourth, marketing improvement including processing and storing; fifth, improving infrastructure such as irrigation schemes, transportation and information schemes.

3.1. Policies Towards Raising Farmers' Revenue

Factors affecting farmers' revenues are the quantity of a product, its price and the quality of the product. Even though the quality of a product can differs the product price, it is common to use only the quantity and price of the product as the main factors of farm revenue in farm-gate level. The quality of the product is often diverged in the processing and marketing stage.

As shown in equation 3.1, farm output can be increased either by using more inputs in the process of production or improving technology to yield higher output per unit of input. However, in an isolated country, increased output does not guarantee an increase in farmers' revenue. If domestic supply exceeds domestic demand at any particular price, then the price of the product would decline. In a free trade country, the excess supply can be sold on the international market. Therefore, stabilisation of product prices is often attempted, particularly when the government objective is to improve farmers' revenues.

3.1.1. Product Price Subsidies

Producer prices can be supported by adding a subsidy to the prevailing market prices or setting a deficiency payment to farmers if the prices of a particular commodity they produce are below the guaranteed price. Figures 3.1.a and 3.1.b shows the consequence of producer product subsidy. First, consider a situation where the market is isolated from the rest of the world (Figure 3.1.a). The equilibrium price is Pe and the quantity traded is Qe. If a government applies a subsidy payment per unit output, Ts, farmers will receive price Pg. At

this price, the farmers are willing to produce more output, Qg. The supply curve shifts from Sd to Sd'. Consequently, while the demand curve is still unchanged the higher supply will lead to a fall in the output price to Pm.

The total subsidy payment is area PmPgAB, that is, the amount of subsidy per unit output, Ts, multiplied by the quantity Qg. Producers gain is increased by the area PePgAE from being able to sell the quantity Qe at a higher price Pg (area PePgDE) plus the net gain on the additional product (Qg-Qe) they would produce at the new price (area DAE). Consumers gain area PmPeEB because they can buy the product at a lower price Pm (area PmPeEC) and can consume additional units of the product at the lower price on which they place a higher value than Pm (area EBC). Since the gain to producers and consumers (PePgAE + PmPeEB) is less than the total subsidy payment transferred from the government to farmers (PmPgAB), the net social cost of the subsidy program is the triangle ABE.

Next, the implications of a producer subsidy in a free trade market (Figure 3.1.b). Assume that the country is a net importer of the product, and that both producers and consumers are not significant in proportion to total world production and consumption and therefore their production and consumption are not large enough to influence market prices. Without a subsidy program the domestic price will drop to the world price Pw. Domestic producers will supply Qd while consumption will be Qg. The country imports QdQg.

If the subsidy per unit of output is Ts the output price increases to Ps and producers will supply Qs. The supply curve shifts from Sd to Sd' and the country now imports QsQg. Total revenue to producers increases from area OPwFQd to OPsCQs and the total subsidy payment transferred to farmers is area PwPsCD. In this case domestic consumption is unchanged because they still consume the same quantity at the same price as before the program. Therefore, this policy

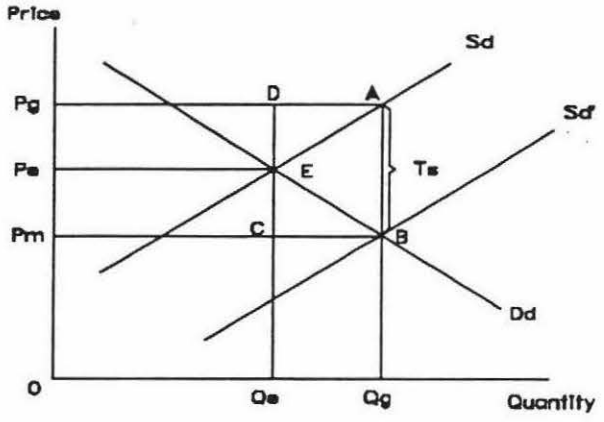


Figure 3.1.a
Effects of Product Subsidy in an Isolated Market

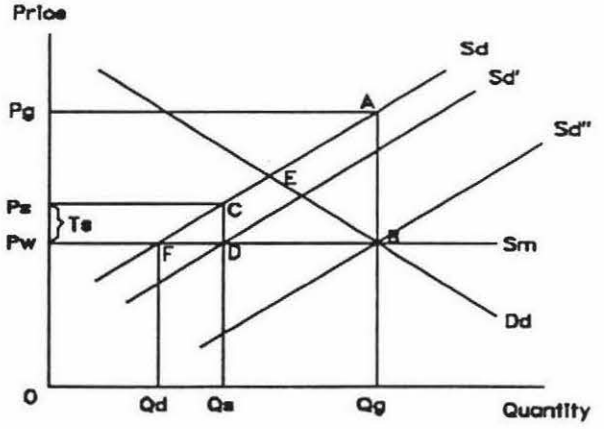


Figure 3.1.b
Effects of Product Subsidy in a Free Trade Market

only affects the welfare of producers, that is, area PwPsCF (the gain from a higher price due to the subsidy plus the net gain on the additional quantity they produce at the higher price). Since the government expenditure on this program is PwPsCD, the social cost due to the application of the program is area FCD. If the government objective is also to eliminate imports completely then the subsidy payment should increase domestic price to Pg, and the supply curve would shift to the right to Sd".

The government may offer a deficiency payment instead of a subsidy. This can be illustrated by using Figure 3.1.b. It is similar to a subsidy, but a deficiency payment fills the gap between the guaranteed price (Ps) and the prevailing market price if the market price is lower than the guaranteed price. In this case, government will pay the amount Ts per unit. If the market price falls below Pw, the amount of payment per unit will be larger than Ts and will be less than Ts if the market price increases. However, the guaranteed price will not affect the supply curve when the market price exceeds the guaranteed price. The impacts on the welfare of producers and consumers are similar to the subsidy program but depend on the fluctuation of the market prices. This policy instrument is commonly-used to stabilise a domestic target price so as to insulate domestic markets from world price fluctuations.

3.1.2. The Control of Imports

If a product is an internationally traded product and the country is a net importer at the world price, the domestic market price can be raised by applying the following policy measures: (i) An import tariff, either a fixed amount or on

a percentage basis (ad valorem), (ii) a minimum import price and a variable levy, and (iii) quantitative control of imports (quotas). The following discussion distinguishes between a country where production or consumption is insignificant in relation to the total quantity of world trade of the product (the small country assumption), and where the country is a significant trader (the large country assumption).

3.1.2.a. Import Tariffs

Under the small country assumption, an import tariff can be applied to increase domestic prices by the amount of the tariff (Figure 3.2.a). As the government applies a tariff (PtPw = Ts), the country imports less than before the tariff, that is, imports fall from QsQd to QtQc. The domestic price increases from the world price Pw to Pt. At price Pt, domestic producers respond by increasing supply to Qt while consumers reduce their consumption from Qd to Qc. Government revenue from the tariff is area ABCD, the amount of tariff per unit imported product multiplied by the quantity imported. Domestic producers gain PwPtDF while consumers lose PwPtAG. Since the sum of the producers' gain and the government revenue are less than the consumers loss, the net social loss is the area CDF (production loss) plus area ABG (consumption loss). The change in foreign exchange expenditure due to the decline in imports is QsFCQt plus QcBGQd if the foreign exchange component of the increased domestic production is ignored.

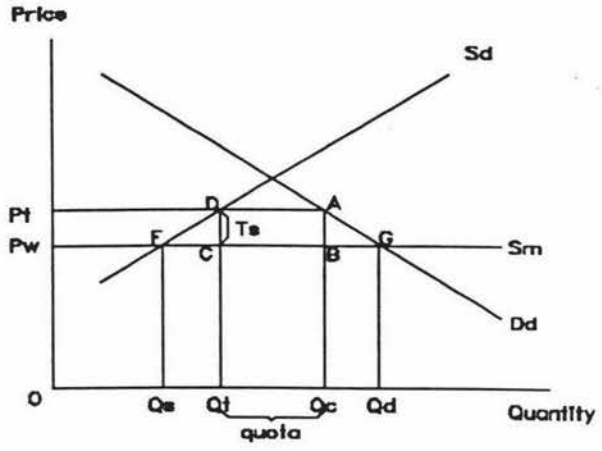


Figure 3.2.a
Effects of a Tariff in a Small Country

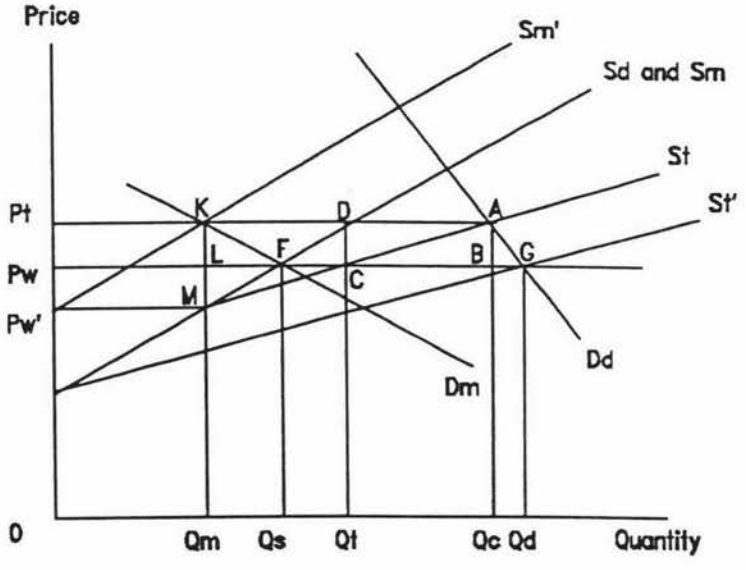


Figure 3.2.b
Effects of a Tariff in a Large Country

Alternatively, a minimum import price may be applied to stabilise the domestic price. In this policy,the government levies a variable tax on imported products and the amount of the levy varies as the difference between the prevailing world market price and the minimum import price. This ensures that imported supplies cannot be sold in the domestic market at less than the minimum import price. The difference between the import tariff, and the variable levy policies is that in the latter the amount of the levy changes as the world price of the product fluctuates. Thus, in terms of improved farmers' income, the effect of a fixed tariff, Ts, or a minimum import price of Pt (Figure 3.2.a) is identical to the price support program, i.e., a unit subsidy of CD or a deficiency payment, Ps (Figure 3.1.b).

Under the large country assumption, an import tariff could lead to a decrease in the world price of a particular product. This is illustrated in Figure 3.2.b. Domestic demand is represented by Dd while Dm represents demand for imports by the country. In this diagram the domestic supply (Sd) is, for simplicity, made identical to the imported supply (Sm). St represents the total of imported supply plus the domestic supply. At the world price, Pw, the country consumption is Qd while domestic supply Qs. The country imports QsQd (Qs).

A tariff of PtPw' will shift the supply curve of import from Sm to Sm' while the total supply to the country shifts from St to St'. The domestic price increase to Pt. At this price, foreign suppliers receive Pw', i.e., the new price, Pt, less the amount of tariff. Consequently, foreign suppliers supply quantity Qm. Domestic producers gain area PwPtDF while consumers loss PwPtAG. Government revenue from the tariff represented by area Pw'PtKM. Since consumer surplus loss is larger than the producers surplus gain, the net loss in economic surplus is area FDAG. Therefore, a welfare gain to the country will

depend on the total revenue from the tariff (area Pw'PtKM) and the net loss in economic surplus (area FDAG). As shown in Figure 3.2.b, this can also be illustrated as follows: the area PwPtKL is identical to area ABCD and therefore, geometrically the sum of area FDC and ABG must equal the area KLF. Thus, a welfare gain could be made if the area Pw'PwLM is larger than the area KLF.

3.1.2.b. Import Quotas

The domestic price can also be raised if imports are restricted (by a quota on imports), by reducing the total supply available to domestic consumers. As shown in Figure 3.2.a, if imports are restricted to QtQc, domestic price increases to Pt. An import quota of QtQc has the same impacts for producers and consumers as the tariff PwPt. However, there is not necessarily any government revenue. The area ABCD which in the tariff goes to government, in the quota system goes to whoever holds the quota right and can buy the quantity QtQc at the world market price and sell at the domestic price. The government could hold the quota right, for example an authorised agency which monopolised imports and exports (such as BULOG in Indonesia) or it could capture the economic rent by putting the quota right out to tender.

The previous discussion shows that both the price support programs and the control of imports can increase farmers' income through a higher output price and increased domestic production. However, government is unlikely to maintain the target price if domestic production expands, since government total support expenditure would rise. Consequently, governments also may attempt to control domestic supply.

3.1.3. The Control of Supply

If a country's output can influence the world market of a product, policies to increase domestic production may not be effective in raising farmers' income. Increased production could reduce the world price of the product and, depending on demand elasticity, also aggregate revenue. This will have implication for government expenditures.

In an isolated market, supply may be controlled, either by restricting the amount produced or by ensuring that part of what is produced is not sold in the domestic market. Methods to control domestic production may include a quota system or acreage controls.

Quota System. In a quota system each farmer is given a right to sell a limited amount of deliveries to an authorised marketing agency. The quantity supplied may be regulated by issuing rights to sell which are legally enforceable.

Figure 3.3.a shows the impacts of a supply management quota in an isolated market. Before the program, the equilibrium price is Pe and quantity traded, Qe. Producers' surplus is PeDE while consumers' surplus is PeAE. If the government, through the authorised marketing agency, determines a maximum quantity (quota) that all farmers can produce at Qq the price will rise to Pq. The Producers' surplus is PqDCB while the consumers' surplus declines to PqAB. The change in producers' surplus is area PqDCB less area PeDE (or area PePqBF minus area FCE). The consumers' loss is represented by the area PePqBE. Since the loss to consumers is larger than the gain to producers, the net social loss of the program is equal to area BFE plus area FCE or area BCE, i.e., PePqBE - (PePqBF-FCE).

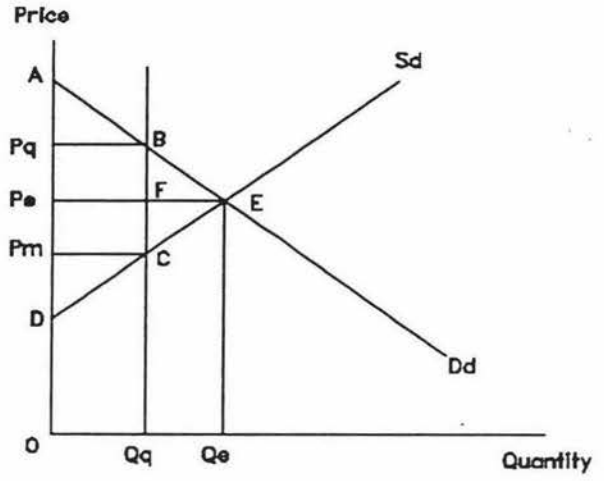


Figure 3.3.a
Supply Management Quota in an Isolated Market

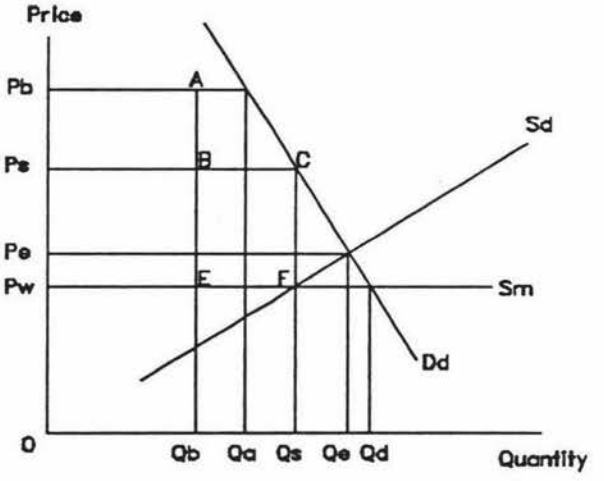


Figure 3.3.b.
The Two-tier Quota System

The production quota could raise a product price and increase farmers' income when demand is inelastic, or if demand is elastic and total cost fall by more then the decline in revenue. However, in practice this scheme has some disadvantages (Ritson, 1977): first, it preserves high cost producers and does not support expansion by low cost producers if the quotas could not be made saleable - the more efficient producers could not buy the right from the less efficient producers. However, if the quota rights could be sold in the market this involves an additional cost for new producers or producers who wish to expand.

A two-tier quota system could be an effective method to overcome these conflicting objectives. Producers could be given a higher price for a basic quota, with the excess supply then valued at a lower price. This system is illustrated in Figure 3.3.b. If a government applied this system, imports of the product must be restricted and all production must be sold to a central marketing agency to ensure that there will not be any quantity up to Qs sold by producers at price lower than Ps in domestic market. The agency will determine the basic unit each producer can sell at price Pb, for example the quantity Qb for all producers. Since the excess of the basic quota will be valued at world price by the agency, only the more efficient producers will continue to produce until quantity Qs. The agency receives revenue from being able to buy the excess supply at Pw and sell at Ps, represented by area BCFE which is used to fund the subsidy on the basic quota by area PsPbAB. For the scheme to be self-funding, area BCFE must be identical to the area PsPbAB).

The second disadvantage of the quota scheme is the administrative cost. If the product is a processing products (such as sugar) the operation of the scheme will be simpler than products that can be sold at farm-gate level (such potatoes

and eggs). Since in the latter case involves a large number of producers and agencies the administrative cost of the quota scheme will be greater.

Acreage controls. Acreage controls are implemented to withdraw land from the production of a particular crop. The objective of this program is to stabilise domestic price of particular crop by reducing domestic excess supply of the crop. Different from other production controls, this program does not issue marketing quota for all producers. The situation of producers in this program is more like the price support in Figure 3.4.a. Domestic producers supply Qg at price Pg. The excess supply reduce the domestic price to Pm. If the government wish to increase domestic price of the crop from Pm to Pc, then the domestic supply should be reduced to Qc by shifting the supply curve from Sd to Sd'. In this case, farmers are given a payment not to grow the crop. However, since the farmers are free to produce any quantity of the crop at price Pg, they only participate in the program if they could gain more than what they could earn in production of the crop at price Pg (area A). Consumer in this program is more like as in the case of production control in Figure 3.4.b. The program reduce domestic supply and increase the product price. Consequently, consumers lose area A plus area D.

In practice, this program may not be efficient and has some disadvantages. First, since in this program farmers are free to choose which part of their land to withdraw, they will choose the least productive land. Second, production per hectare of a particular land could be increased through more intensive input use such as fertilizer and other production practices.

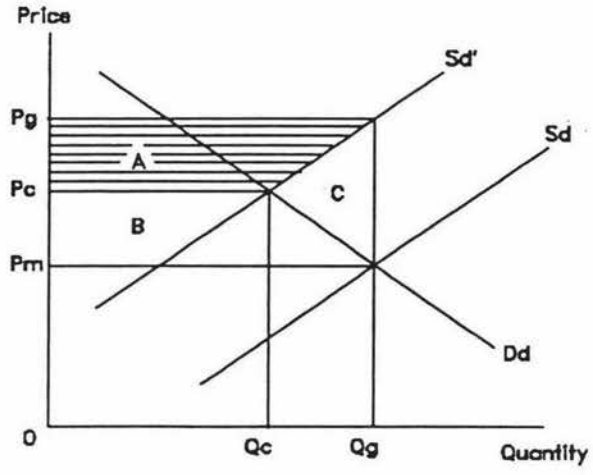


Figure 3.4.a
Payment to Producers

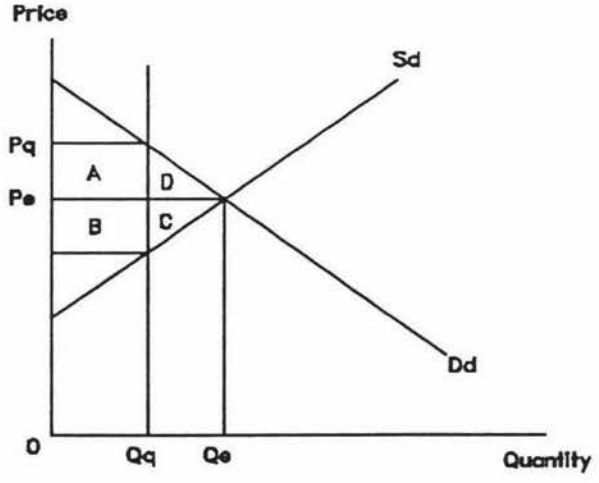


Figure 3.4.b
Quota System

Another alternative policy to increase farmer income is to reduce that part of the total supply sold on the domestic market. There are several possible methods of doing this (Ritson, 1977):

(i) government (official) agencies may buy a portion of the domestic production (the excess supply) and sell it on the world market at the prevailing price or via specially negotiated trading arrangements with other countries,

(ii) the excess supply can be sold in a market which does not compete directly with the domestic market, and for which there is some scope for replacing imports,

(iii) the produce may be sold cheaply to 'needy' groups within the domestic economy,

(iv) the excess supply can be donated as food aid to poor countries,

(v) the excess supply may be stored and resold when prices move up again,

(vi) the excess supply could be destroyed.

3.2. Policies for Reducing Farmers' Costs

Policy measures to improve farmers' income include cost reduction through the payment of subsidies on inputs. Subsidies can be given for a particular input, irrigation schemes, land rehabilitation, drainage systems, or loans can be made available at lower than market interest rates (soft loans). The following discussion focuses on the use of a subsidy payment on a production input.

There are several ways of delivery input subsidisation: (a) a subsidy paid to input producers, (b) direct support to farmers (i.e., the input users), and (c) a subsidy to retailers. Some countries apply the policy separately while others combine or implement the policies simultaneously, depending on their objectives. Even though it is possible to subsidise the input at the retailer, many countries prefer to pay subsidy to input producers (manufacturers) and the users of the input (farmers). This because the government objectives are often to achieve self-sufficiency in the supply of the input and to support farmers' income. These practices will be illustrated in Figures 3.5, 3.6, and 3.7.

3.2.1. Subsidy to Input Producers

A government may give a subsidy to input producers. Figure 3.5.a shows the effects of a subsidy to input producers in an isolated market. As a partial equilibrium analysis this graph ignores the effects on other inputs to farm production. Before the subsidy programme producers produce Qe at price Pe. The production subsidy of PpPm will increase price received by the input producers to Pp. At this price producers will increase production to Qp. Consequently, the supply curve shifts from Sd to Sd'. If the government let the market determine the price, then the market price would drop to Pm. Input producers gain area PePpAE while input users (farmers) gain area PmPeEB. The amount of subsidy would be the area PmPpAB. The net social cost of the program is area ABE because the gain to producers and consumers of the input is less than the cost of the programme. This is analogous to the farm output subsidy analysed in Figure 3.1.a.

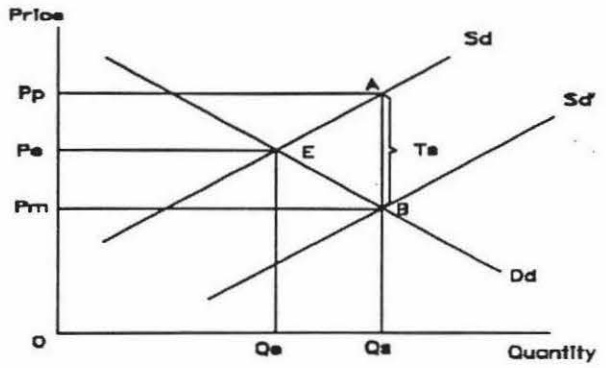


Figure 3.5.a
Effects of Subsidy to Input Producers in an Isolated Market

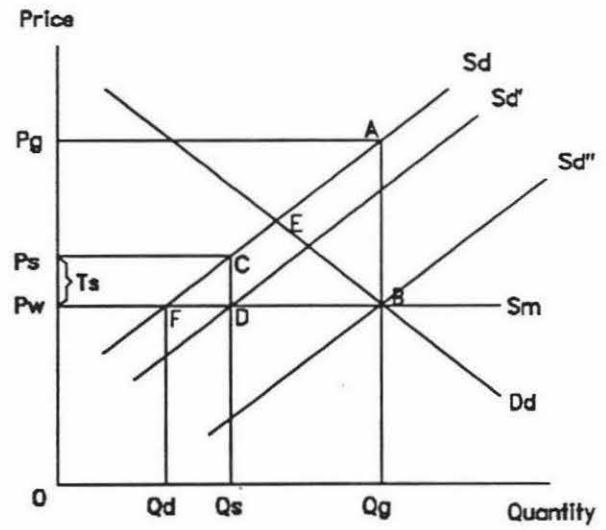


Figure 3.5.b
Effects of Subsidy to Input Producers in a Free Trade Market

The effects of subsidy to input producers in a free trade country is illustrated in Figure 3.5.b. As in the case of product subsidy in Figure 3.1.b., without the subsidy, at the world market price (Pw), domestic producers of the input supply Qd while the input users consume Qg. The subsidy of Ts would raise the input price to Ps and the input producers now supply Qs. The supply curve of the input shifts from Sd to Sd'. This will reduce import of the input from QdQg to QsQg. The cost to government is the area PwPsCD. If the government wish to achieve self-sufficiency in the supply of the input the subsidy should be increased to raise the input price to Pg. At this price, the input supply curve will shift to Sd". The government expenditure in this policy would be the area PwPgAB. This policy will not affect the users' welfare because they still receive the same price as before the implementation of the policy.

3.2.2. Direct Support to Farmers (Input Users)

A government may offer direct support to input users (farmers) by giving subsidy on an input price. The impacts of this policy in an isolated market is illustrated in Figure 3.6.a. Without government subsidy, quantity Qe would be used at price Pe. The subsidy reduces the input price to Pf. The demand curve shifts to Dd' and the farmers now use quantity Qs at the new price. Since Qs would be supplied by producers at price Pm, the amount of subsidy would be PmPf. The farmers' gain from this policy is the area PfPeEA and the cost to government is the area PfPmBA. Since the input producer also gain area PePmBE, the effect of the input subsidy to the farmers is equivalent to the subsidy given to the input producers in Figure 3.5.a.

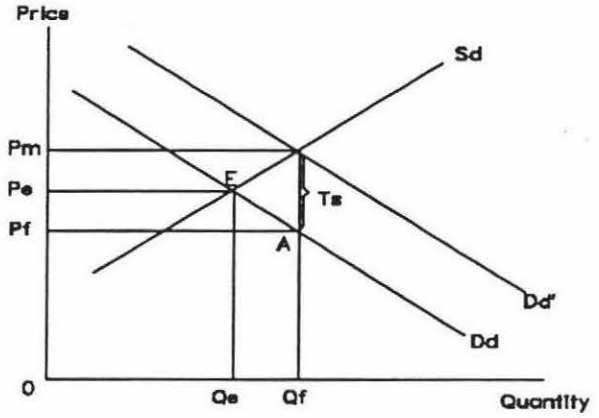


Figure 3.6.a.
Effects of Input Subsidy to the Input Users in an Isolated Market

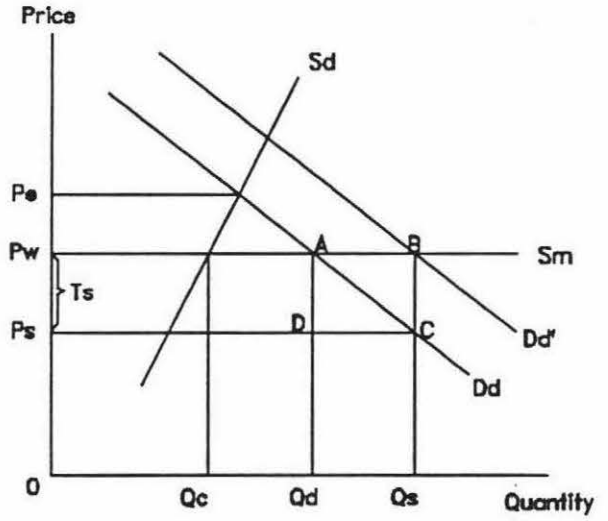


Figure 3.6.b.
Effects of Input Subsidy to the Input Users in a Free Trade Market

In an open market, if the country is a net importer and cannot influence the world market the situation is as shown in Figure 3.6.b. Before the subsidy program domestic demand of the input is Qd while domestic producer supply Qc. The country imports QcQd.

The subsidy on input to the farmers reduces the input price to Ps while demand curve shifts from Dd to Dd'. Farmers now consume Qs. In this case domestic producers of the input are not influenced by the program because the price they receive unchanged. Hence, imports increase from QcQd to QcQs. The farmers gain area PsPwAC and the total cost to the government is area PsPwBC. Therefore, the social cost of this program will be the area ABC.

3.2.3. Subsidies to Input Producers and Farmers

A government may wish to apply a subsidy to input producers to increase domestic supply to meet domestic demand for the input (self-sufficiency) and also wishes to decrease domestic input prices to meet farm income targets. Figures 3.7.a and 3.7.b show the effects of such a program in the isolated market and the open market, respectively.

The situation in an isolated market is shown in Figure 3.7.a. Increase input price to Pp will shift the supply curve to Sd' and the input producers supply Qs. In this situation producers gain PePpBE and farmers gain PfPeEA. If alternatively, the input subsidy is applied to the farmers this will reduce the input price to Pf. Demand curve of the input will shift to Dd' and quantity Qs will be used by farmers. In this alternative both the input producers and the farmers also gain the same surplus as the subsidy applied to the input producers. Thus. in the

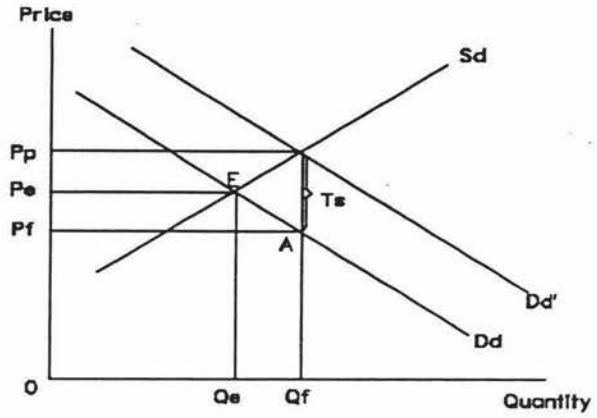


Figure 3.7.a
Effects of Subsidy to Input Producers and Consumers in an Isolated Market

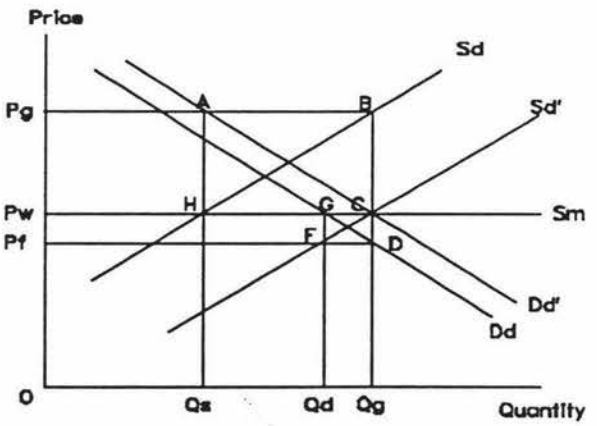


Figure 3.7.b
Effects of Subsidy to Input Producers and Consumers in a Free Trade Market

case of isolated market, either the input subsidy given to input producers or to farmers will have the same effects. Both will gain the same surplus. Thus, in an isolated market the objectives of self-sufficiency and support farmers' income can be achieved by applying one of these alternatives.

However, in a free trade country which lets the world market determines the domestic price and the country production is insufficient to influence the world price, these affects would be different because an input subsidy applied in one party will not affect other party. At the prevailing world price (Pw), world supply of the input Sm is assumed perfectly elastic. In the absence of government intervention, domestic producers supply Qs and consumption is Qd. Thus, the country imports QsQd.

The first objective of the government could be reducing the domestic input price below the world price (Pw) to Pf. Demand for the input increases from Qd to Qg. If the government also wishes to achieve self-sufficiency in the input supply, the support price to the input producer should be increased to Pg. The input producers will then produce Qg at that price. This is analogous to Figure 3.1.b for the output subsidy case. Producers of the input gain area PwPgBH while consumers (farmers) gain area PfPwGD. Compared to the world price, total subsidy to producers is area PwPgBC while the total subsidy to input user is PwPfCD. The cost of this program to government is represented by the sum of the total subsidies to producers and consumers, i.e., area PfPgBD. Foreign exchange saving because the country does not import the input is represented by area HGQdQs.

3.3. Interaction of Product and Input Markets

Since the farmers increase the use of the input under the subsidy program, output will be expanded. Thus, by lowering input prices paid by the users, the supply curve of the product will shift to the right. This could eventually eliminate any imports of the product and self-sufficiency in that commodity could be achieved. Figures 3.8.a and 3.8.b illustrate the interaction of the product and input market.

First, considers the case of an isolated market. Before program implementation the equilibrium price of the input and output is Pe and quantity traded Qe (Figures 3.8.a and 3.8.b). The subsidy program reduces the input price paid by the farmers from Pe to Pf in Figure 3.8.a. Quantity of the input used increases from Qe to Qf. A decrease in the input price shifts the output supply curve to the right from Sd to Sd' and the price of output drops to Pr (Figure 3.8.b). The users gain area PfPeEA in Figure 3.8.a from being able to purchase the input at a lower price. This is equivalent to the users gain in higher revenue from increased production, i.e., area PrBD less area PeEC (Figure 3.8.b). Since the input subsidy to the input users reduces their costs, its output effects is equivalent to a subsidy of PgPw on the output price[1], but the size of the change depends on the yield elasticity of the input and price elasticity of the output (see Figure 3.1.b).

Second, in a free trade market and under the small country assumption (Figures 3.9.a and 3.9.b). As shown in Figure 3.9.a, without the input subsidy domestic demand of the input is Qd. The subsidy program decrease the input

[1] A mathematical model of the identical effects of producers and consumers subsidies an be seen in Gardner, 1987 pp.30-35

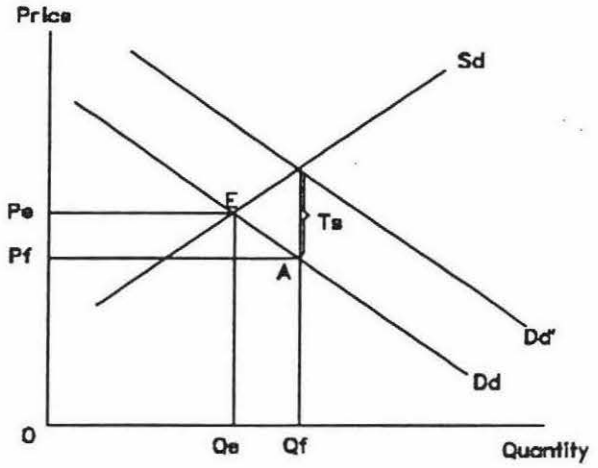


Figure 3.8.a
Effects of Input Subsidy on the Input Supply and Demand in an Isolated Market

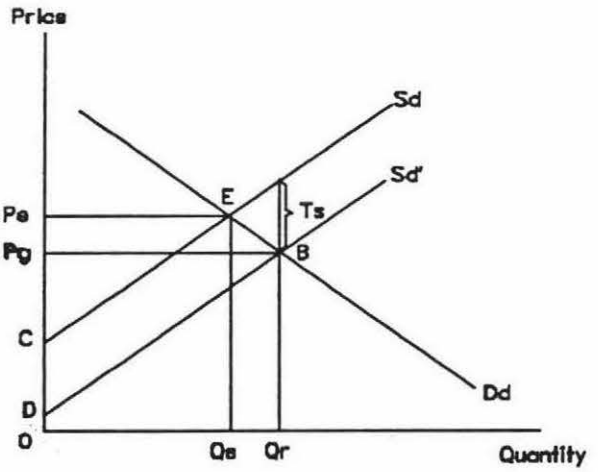


Figure 3.8.b
Effects of Input Subsidy on Output Supply in an Isolated Market

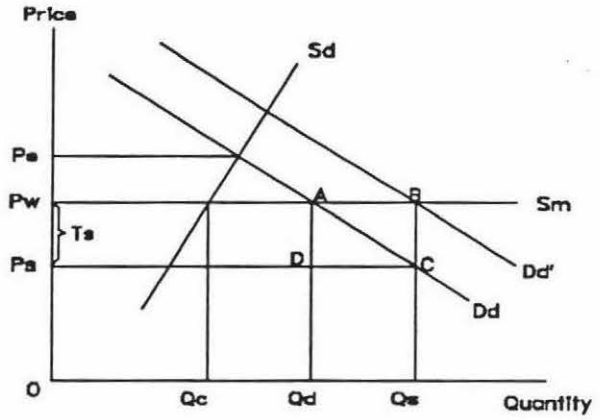


Figure 3.9.a
Effects of Input Subsidy on the Input Supply and Demand in a Free Trade Market

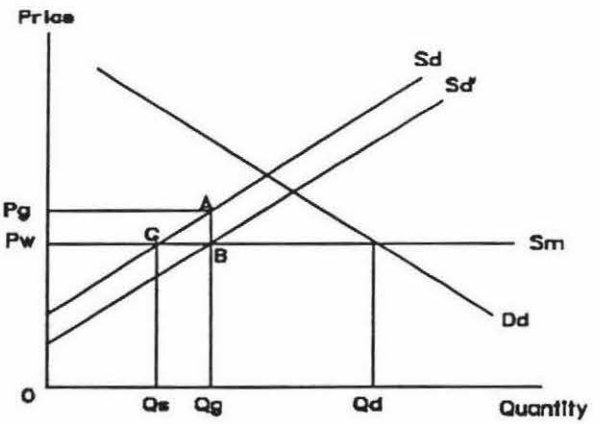


Figure 3.9.b
Effects of Input Subsidy on Output Supply in a Free Trade Market

price to Ps and farmers now use Qs. Demand curve of the input shifts to Dd'. Import of the input to the country increases from QcQd to QcQs. Since the use of the input increase, it will shift domestic supply of production from Qs to Qg. Import of the product now decreases from QsQd to QgQd. As it is also shown in Figure 3.5.b., if the government wishes to achieve self-sufficiency in this product the subsidy should be sufficient to shift the input demand to the right to meet the necessary input to shift the output from Sd to Sd". These situations are similar to the situation depicted in Figures 3.6.b. and 3.5.b.

3.4. Effects of an Input Subsidy on Demand and Supply of Other Inputs

Demand for other inputs may decline when the price of a particular input falls due to subsidisation, as farmers increase the use of this input as a substitute for the other relatively more expensive inputs. Figures 3.10.a and 3.10.b show the effects of an input subsidy on demand and supply of other production inputs in an isolated market. The subsidy programme decreases the input's price to Pf (Figure 3.10.a). Consequently, the demand for the input increases to Qf and consequently, depending on the magnitude of the elasticity of substitution between the two inputs, the amount of subsidy is Ts. The demand curve for the substitute input shifts from Dd to Dd'(Figure 3.10.b). The price of the substitute input will decline from Pe to Po, and the quantity demanded from Qe to Qo.

In a free trade market and under the small country assumption, the subsidy reduces the input price from Pw to Ps (Figure 3.11.a). This increases the quantity use of the input from Qd to Qs. Consequently, imports of the input increases to

QcQs from QcQd. However, since the country is also the price taker in other inputs, the subsidy only affects the quantity use for other inputs, i.e., from Qs to Qd. Thus, the demand curve of other inputs shifts from Dd to Dd' and the country import for these inputs decline from QcQs to QcQd.

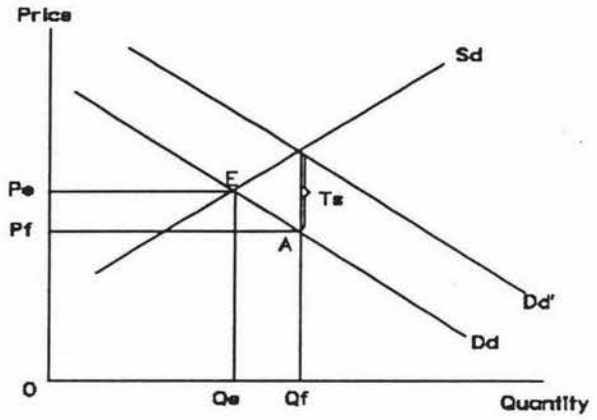


Figure 3.10.a
Effects of Input Subsidy on the Input Demand and Supply in an Isolated Market

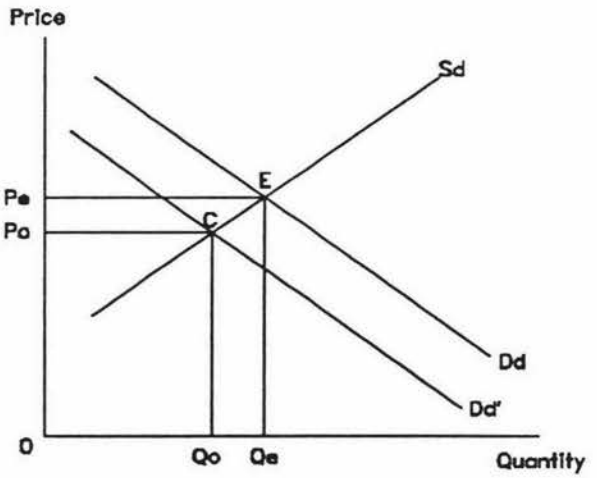


Figure 3.10.b
Effects of an Input Subsidy on Supply and Demand of Other Inputs in an Isolated Market

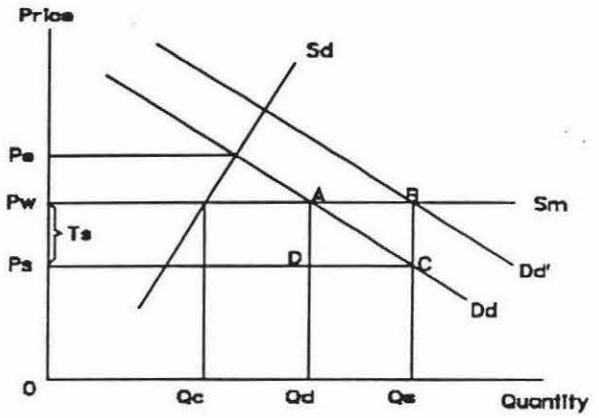


Figure 3.11.a
Effects of Input Subsidy on the Input Demand and Supply in a Free Trade Market

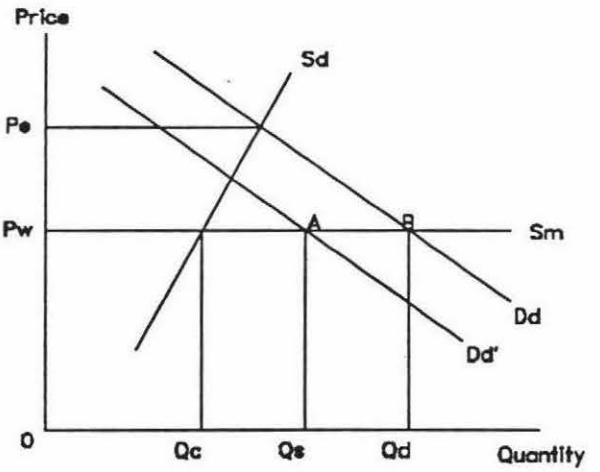


Figure 3.11.b
Effects of an Input Subsidy on Supply and Demand of Other Inputs in a Free Trade Market

Chapter 4

LITERATURE REVIEW

4.1. An Overview of Some Previous Studies of Government Intervention in the Agricultural Sector

Various adaptations of partial equilibrium analysis of price intervention and its welfare implications have been used to assess the impacts of government intervention in the agricultural sector. Some studies have focused on the supply side including Barker and Hayami (1976), Meyers and Devadoss (1987), and Quizon, et al (1990) while others were devoted to consumption, marketing and distribution, for examples Goldman and Ranade (1978), Mendoza (1982), and Gonzales (1982). Several studies were also conducted to evaluate the effects of government intervention on the welfare of society. Works in this area include Bale and Greenshields (1978), Chung Ming Wong (1978), Lutz and Scandizzo (1980), Scandizzo and Bruce (1980), Harling and Thompson (1983).

The measurement of government intervention has been analysed in many studies, for example Corden (1957) started with the calculation of the cost of protection. A similar study was conducted by Johnson (1960). During the 1960s and 1970s many studies addressed the impacts of government intervention on the welfare of society while others focused on the agricultural sector, for example, the

welfare cost of grain protection in the United Kingdom by Dardis (1967) and the cost of protection and taxation on sugar by Snape (1969).

On the supply side, many studies have examined the effects of government policies to improve production in the agricultural sector. Governments, particularly in developing countries, frequently provide incentives to farmers to encourage them to increase farm production such as output price supports, subsidies on inputs, and assistance through irrigation schemes.

Barker and Hayami (1976) evaluated government intervention on two policy options, i.e., support on rice prices and a subsidy on fertilizers. By using a partial equilibrium demand-supply model the study analyzed and compared the benefits and costs of these alternative policies, and examined the effects on income distribution. Other studies were conducted by Meyers and Devadoss (1987) which evaluated crop and fertilizer price policies. Quizon, et al (1990) also analysed the market for fertilizer and rice in Indonesia.

Many studies have also attempted to evaluate government intervention on marketing, distribution and consumption. David (1985) and Umali (1988) evaluated government intervention in maintaining high prices at farm level while maintaining low retail prices. Other studies examined the economic gains from buffer stocks, including there of Waugh (1944), Oi (1961) and Gustafon (1958). The latter, for example, attempted to develop a method to find an optimal storage policy at the national level when demand elasticities, storage costs, the discount rate and probability distributions of yield are known with certainty.

Some studies have sought to assess the cost of trade distortions and to measure the impacts on the welfare of society. Works in this area include Johnson (1960), Bhagwati (1971), and Magee (1973). These were attempts to develop theoretical works to measure the effects of trade distortions on the

welfare of society. The empirical application of these theories has also been conducted in several studies, for example, Basevi (1968) and Balassa (1971).

Lutz and Scandizzo (1980), Scandizzo and Bruce (1980), and Harling and Thompson (1983), used the producers' and consumers' surplus approach to measure the welfare effect for society. Lutz and Scandizzo (1980), for example, evaluated the impacts of government intervention in agricultural commodity markets in some developing countries and found that the agricultural sector was taxed heavily while consumption was subsidized which eventually discouraged agricultural production. The study also presented methodology for quantifying the effects of the distortions on prices, supply, demand, incomes, and foreign exchange.

Further study was conducted by Krueger, Schiff and Valdes (1991). The study attempted to provide a systematic estimation of the degree of price dicrimination and presented the principal concepts and measures used in the eighteen country studies. The study include the effect of government intervention in agricultural output, consumption, income distribution, and foreign exchange.

In Indonesia, a number of studies have been conducted to evaluate the performance of government policies in the agricultural sector including the effects of various policies on prices, supply, demand, incomes, and foreign exchange. Rosegrant et al (1985) evaluated government policies on prices and investment in the case of the food crop sector. They also assessed the impact of trade liberalization on Indonesian food crops using a multimarket food crop supply and demand model and found that a policy of trade liberalization would give substantial net benefits to Indonesian society because the losses in farmers' revenue would be less than the gains to consumers from a reduction in food expenditure.

Meyers and Devadoss (1987) developed a policy model to evaluate crop and fertilizer price policies in Indonesia. The model utilizes basic supply and demand behavioral parameters and assumes that the prices of domestic food crops increase with general inflation. Kasryno and Siregar (1988) examined the impacts of government agricultural incentive policies on production, employment, and the income of rural people with special reference to the results of a rural dynamic study.

The measurement of the effects of a reduction on government intervention in the agricultural sector has been evaluated by Quizon et al (1990) and Baharsyah (1990). These studies examined the impacts of policies towards subsidy reduction on rice production (self-sufficiency) and the real income of farmers.

Further studies were conducted by Nelson and Panggabean (1991) and Rae and Kasryno (1993). Both studies using the Policy Analysis Matrix developed by Monke and Pearson (1989). Nelson and Panggabean analysed the effects of Indonesian sugar policy on sugar production and identified the distribution of resource transfers while Rae and Kasryno estimated the divergences between private and social costs and returns in poultry and pig production.

Since a government is concerned about its budget constraints but wants to improve the living standard of the population, knowledge of the impacts of a policy on the welfare of society is very important. Even though many approaches have been used to measure distortions due to government intervention, there are still many questions about such approaches. This is relevant particularly to developing countries where governments may consider that protection to infant industries and the maintenance of low food prices to consumers as necessary for development.

4.2. Relevance of Literature to the Study

Many governments in developing countries apply a subsidy program to support agricultural product prices (a floor price) for producers while simultaneously maintaining a price for consumers equal to the world price. In such cases, the policy would only affect the welfare of producers while the welfare to the consumers would not change. Consumers still receive the same price and consume the same quantity of the product regardless of the support subsidy program.

However, evidence in many developing countries also shows that it has been difficult to maintain the subsidy required to raise farm income and achieve self-sufficiency while maintaining a low price to consumers (Barker and Hayami). This is because government export earnings and the exchange rate have declined while the budget spent on the subsidy has increased over time. Therefore, some countries have gradually reduced subsidies for agricultural inputs and/or increased the product price in the domestic market.

An approach developed by Barker and Hayami (1976) will be used as the basis of the study to assess government intervention in the Indonesia rice and fertilizer markets. The Barker-Hayami model to examine the implications of the policy alternatives is outlined in Figures 4.1 and 4.2. Figure 4.1 illustrates the impacts in the rice market and Figure 4.2 those in the fertilizer market. First consider Figure 4.1. The domestic supply curve for the rice is Sr while the domestic demand curve is shown by the curve Dr. It is assumed that some given quantity of rice products are consumed by the farmers (home consumption). This is represented by the vertical line DhQh while the horizontal difference between DhQh and DmDr measures the quantity sold in the market, i.e., the quantity

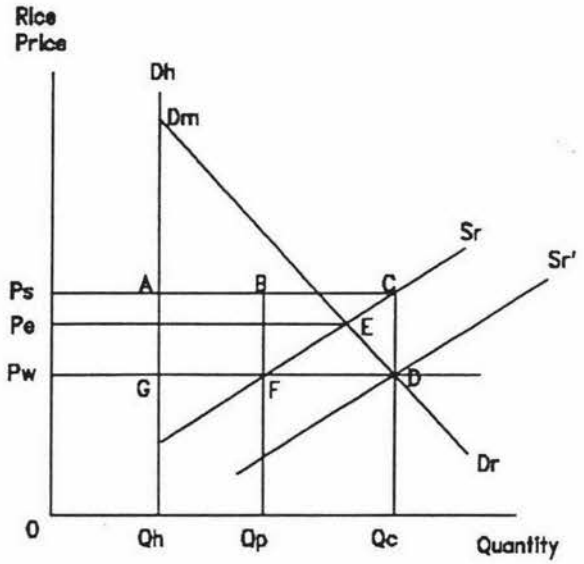


Figure 4.1
Effects of Rice Price Support and Fertilizer Subsidy

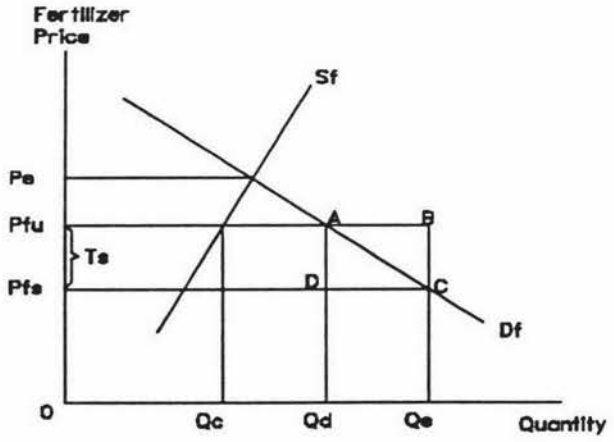


Figure 4.2
Effects of Fertilizer Subsidy on Its Supply and Demand

purchased by urban (non-farmer) households. The total demand for the rice is represented by DhDmDr.

Without government intervention the domestic rice price would drop to the world price Pw, and the amount Qc should be available for consumers while domestic production is Qp.

If government wished to eliminate these imports of rice, two alternatives are: (a) support the rice price received by producers at Ps, or (b) Subsidize fertilizer prices sufficiently to shift the supply function from Sr to Sr'

Policy Alternative I: Rice Price Support. Achieving the price Ps through payment of a per unit subsidy of PsPw stimulates rice producers to supply quantity Qc, and the supply curve shifts from Sr to Sr' (Figure 4.1). Compared with a free trade case, this policy will cost the government an amount equal to the area ACDG. The gain in producer surplus is represented by the area ACFG while consumer welfare remains unchanged because the retail price remain equal to the world price.

Policy Alternative II: Input Subsidy to Fertilizer. The second alternative is to subsidise the fertilizer price paid by farmers sufficiently to shift the rice supply curve from Sr to Sr' in Figure 4.1. The supply and demand for fertilizer is illustrated in Figure 4.2. The demand curve for fertilizer is Df and the domestic supply curve is Sf while the world supply curve is assumed to be completely elastic (The world supply curve is not shown in the graph). The fertilizer farmgate price is represented by Pfs while Pfu the unsubsidised price of the fertilizer.

If government subsidises the price of fertilizer paid by farmers by the amount of Ts, the fertilizer price paid by farmers drops from Pfu to Pfs and the demand curve shifts to Dd'. As shown in Figure 4.2, rice producer welfare increases by the area PfsPfuAC. This welfare gain can be shown in two ways. First, area PfsPfuAD from being able to purchase quantity Qd at price Pfs plus area ADC, the additional fertilizer that they value higher than Pfs. Second, since the demand curve (Df) in Figure 4.2 measures the marginal value product of fertilizer, which is equal to the value of the additional rice output (area FDQcQp in Figure 4.1.), the net gain ADC in Figure 4.2 can be obtain by subtracting the additional cost of fertilizer (area DCQsQD in Figure 4.2) from the extra output (FDQcQp in Figure 4.1 or ACQsQd in Figure 4.2). Hence, the sum of the triangle ADC and area PfsPfuAD represents the surplus gain to the farmers.

The cost of this program to government is represented by area PfsPfuBC. The net foreign exchange saving is the net reduction in the cost of rice imports (area FDQcQp in Figure 4.1) minus the value of import additional fertilizer imports (area ABQsQd in Figure 4.2).

Chapter 5

FORMULATION OF THE MODEL

5.1. Model Analysis

This study evaluates two policy reforms in the urea fertilizer and rice markets in Indonesia. First, is the reduction of the subsidy on urea fertilizer and second, coupled to the first, is the rice price support programme. The latter support could be enhanced to offset the fall in rice production and/or the increase in farmers' costs due to the reduction of the urea subsidy.

This study assumes that the government maintains the prevailing market price of rice for consumers by stabilising the supply of rice in the domestic market. The price stabilisation is implemented by the BULOG (the National Logistic Agency) which buy and sell rice through "market operation", including exporting and importing rice. Hence, the implementation of these policy reforms will not affect rice consumers. Domestic producers and consumers are free to buy and sell rice at the prevailing domestic market prices, and it is assumed that these markets are perfectly competitive. The approach developed by Barker and Hayami (1976) is used as the basic model. This model assumes constant-elasticity of supply and demand functions, $Q = \Phi P^{\beta}$, where Φ is a constant term and β is the appropriate price elasticity parameter.

5.2. The Reduction of the Urea Subsidy

The main objective of this policy could be to reduce government expenditure on the urea subsidy. As discussed in Chapter IV, the government subsidises the fertilizer price to reduce farmers' cost and to encourage farmers to use fertilizer. As shown in Figure 5.1, the unsubsidised urea price paid by farmers is Pfu, that is, the border price plus the cost of distribution. The subsidy reduces the farmgate price of urea from Pfu to Pfs and shifts the demand curve of urea to the right from Df to Df'. In this case rice producers increase the use of urea from Qfu to Qfs.

However, since the capability of the government to fund the program is limited while the amount of the subsidy expenditure has increased over time, the government may reduce the rate of subsidy on the urea price. The policy of subsidy reduction is illustrated in Figure 5.1. The current price of urea paid by farmers is Pfs which is subsidised by the amount PfuPfs. It is assumed that the price of domestically produced urea is equal to the world price, and that the subsidies are paid directly to farmers. Since urea is the main nutrient in rice production and there is no substantial substitute for urea, this analysis ignores the effects of input substitution in rice production.

Given these assumptions, the urea subsidy will affect rice supply through the increased costs to rice farmers. Holding the rice price and the prices of other inputs constant, reducing the urea subsidy would raise the urea price and could increase farm costs and reduce farm incomes.

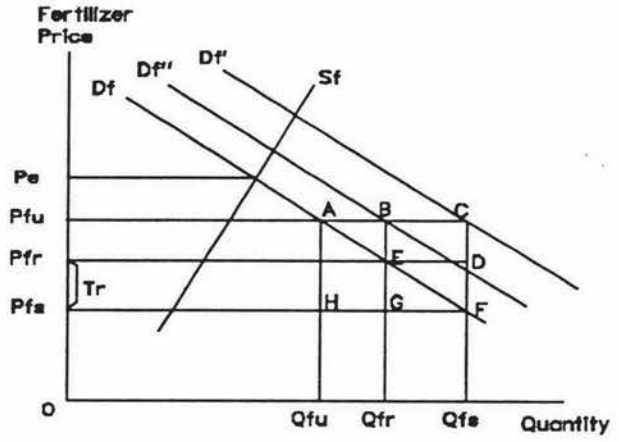


Figure 5.1.
The Impacts of the Reduction of Urea Subsidy on Supply and Demand for Urea

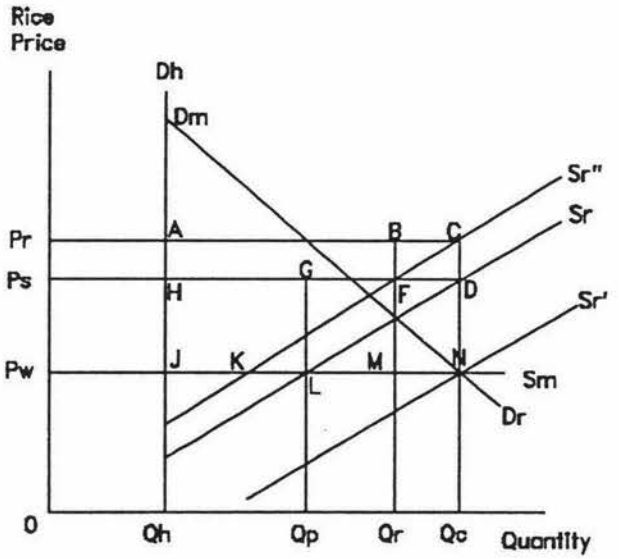


Figure 5.2.
The Impacts of the Increased Rice Support Price on Supply and Demand for Rice

As shown in Figure 5.1, the price of urea is raised from the current price (Pfs) to Pfr, i.e., above the current price but below the unsubsidised urea price (Pfu). Hence, demand for urea falls from Qfs to Qfr and the urea demand curve shifts from Df' to Df". Mathematically the impacts of the reduction in the urea subsidy are the following:

The new level of urea use after the subsidy reduction can be calculated as:

$$Qfr = Qfs \left(\frac{Pfr}{Pfs}\right)^{\gamma} \qquad (5.1)$$

and the new level of rice supply after the reduction of the urea subsidy is:

$$Qr = Qc \left(\frac{Qfr}{Qfs}\right)^{\alpha} \qquad (5.2)$$

where

Pfs = the base farm-gate price of urea (before the reduction of urea subsidy)
Pfr = the new level of urea price (after the reduction of urea subsidy)
Qfs = quantity of urea used at Pfs (before the reduction of urea subsidy)
Qfr = quantity of urea used at Pfr (after the reduction of urea subsidy)
γ = Price elasticity of demand for urea
Qc = quantity of rice produced before the reduction of urea subsidy
Qr = quantity of rice produced after the reduction of urea subsidy
α = Urea elasticity of rice yield

Using the predicted urea demand and rice supply from equations (5.1) and (5.2) the impacts of the reduction of the urea subsidy on producers' surplus, government costs and foreign exchange can be calculated.

Measurement of Change in Producer Surplus. If the urea price is increased to Pfr due to the reduction of the urea subsidy, rice producers' surplus will be reduced by the area PfsPfrEF in Figure 5.1. This area can be calculated as follows:

Loss in producer "surplus"

= fall in revenue plus increase in urea cost

$$= FDQcQr + (PfsPfrEG - GFQfsQfr) \quad (5.3)$$

The equation (5.3) should also equal to

= EFQfsQfr + (PfsPfrEG - GFQfsQfr)

$$= PfsPfrEF \quad (5.4)$$

if FDQcQr = EFQfsQfr

However, this will not hold if farmers do not use urea to the point where its price is equal to the value of its marginal product (VMP). This could happen when the farmers are risk-averse and not profit maximisers. Therefore, equation (5.3) will be used to calculate the producer "surplus".

Further, the "surplus" measure above ignores changes in non-urea variable costs due to the induced reduction in rice supply. Letting λ represents non-urea average variable costs per unit output[1], the change in producer surplus can be calculated as:

[1] λ is estimated as the average non-urea variable costs per unit output, and therefore an only be used to approximate the change in the total of such costs as output changes rom Qc to Qr.

Reduction in rice producers' surplus

= fall in revenue plus net change in urea cost
less reduction in other variable costs

$= FDQcQr + (PfsPfrEG - GFQfsQfr) - \lambda(QrQc)$

$= Ps(1-Mr)(Qc-Qr)+[Qfr(Pfr-Pfs)-Pfs(Qfs-Qfr)]-\lambda(Qc-Qr)$ (5.5)

where

λ = non-urea variable costs per unit output
Mr = the rate of processing and marketing margin for rice
Ps = government purchased price measured at retail price (base price)

Measurement of Change in Government Expenditure. The reduction of the urea subsidy will increase the price of urea from Pfs to Pfr. Formerly, the subsidy cost on the urea was the area PfsPfwCF. Under the new policy this reduces to PfrPfwBE. Therefore, the budget saving is the difference between these two areas, that is:

Saving in government expenditure

= area PfsPfrDF + area BCDE

$= Qfs(Pfr-Pfs)+(Pfu-Pfr)(Qfs-Qfr)$ (5.6)

Measurement of Change in Foreign Exchange Earnings. The effect of the reduction of the urea subsidy on foreign exchange earnings is represented by the area QfrQfsBC in Figure 5.1, which is the world-price value of the reduction in urea imports due to increased urea price, less the area QrQcNM in Figure 5.2

which is the world-price value of the increase in rice imports due to the decline in domestic rice production, plus the reduced expenditure on non-urea tradable inputs to domestic rice production due to the decline in rice production. This change can be written:

Saving in foreign exchange earnings

$$= QfsQfrBC - QrQcNM + \phi\ QrQc$$

$$= Pfu(1-Mf)(Qfs-Qfr)-Pw(Qc-Qr)+\phi(Qc-Qr) \qquad (5.7)$$

where
ϕ = world-price value of traded non-urea inputs per unit of rice output[2]
Mf = the cost of distribution for urea from the port to farmgate.

5.3. Compensatory Policies Aimed at Rice Self-sufficiency or Maintenance of Producers' Incomes

5.3.1. Increased Rice Price Support to Offset the Decrease in Rice Supply

The government may seek a rice self-sufficiency target, such as maintaining the rice supply at the 1990 level. In order to offset the reduction in rice production (as measured by equation (5.2)) due to the reduction of the urea subsidy, the government could increase its support of the farmgate price of rice. Therefore a second policy action, coupled with the reduction in the urea subsidy, would be to increase the support price of rice.

As in the case of λ, this average value can only approximate the change in these ditures as production declines from Qc to Qr.

As shown in Figure 5.2, an increase in the urea price would reduce rice production from Qc to Qr as the rice supply curve shifted to the left from Maintenance to Maintenance". Hence, if the government wished to increase rice supply to the 1990 level, the rice price should be supported to the level Pr to induce farmers to increase rice production to the level Qc.

The required level of rice price support to offset the reduction in rice supply due to the reduction of the urea subsidy can be calculated as:

$$Pr = Ps\ (1+k)^{\frac{1}{\beta}} \qquad (5.8)$$

where
- k = (Qc-Qr)/Qr
- Pr = the increased support price of rice measured at the retail level
- Qr = quantity of rice produced before the support price increase
- Qc = quantity of rice produced after the support price increase
- ß = price elasticity of rice supply

Given the new support price of rice measured in equation (5.8), the impacts of this increased support price in terms of increased urea use, producers surplus, government expenditure and foreign exchange earnings can be calculated.

Measurement of Change in Urea Demand. The higher rice support price will also affect the quantity of urea used by farmers. To increase rice production requires additional urea. This will shift the urea demand curve back to Df' from Df''. The quantity of urea demanded to produce the rice quantity Qc can be calculated as:

$$Qfs = Qfr\left(\frac{Qc}{Qr}\right)^{\frac{1}{\alpha}} \qquad (5.9)$$

where
Qfs = quantity of urea used at Pfr (after the rice support price increase)
Qfr = quantity of urea used at Pfr (before the rice support price increase)

Measurement of Change in Producer Surplus. The increased support price would induce an increased volume of rice production, so farmers' revenue would also increase. This policy action alone will increase rice producers' surplus[3] by the area PsPrCF in Figure 5.2. This area can be calculated as follows:

Gain in producer surplus

= increase in revenue less increase in urea cost less increase in other variable costs

= (ABFH + BCQcQr) - EDQfsQfr - λ(QrQc)

= (1-Mr)[(Pr-Ps)(Qr-Qh)+Pr(Qc-Qr)] - Pfr(Qfs-Qfr)-λ(Qc-Qr) (5.10)

Theoretically equation (5.10) should be equal to area HACF

if FCQcQr = EDQfsQfr + λ(QcQr).

However, analogous to the case of the equation (5.4), the farmers may not be profit maximisers and may not equate marginal cost with the rice price. Therefore, the equation (5.10) will be used to calculate the producer surplus.

[3] The gain in rice producers surplus does not include the value of rice consumed by farm household.

Measurement of Change in Foreign Exchange Earnings. The increase in rice production due to the increased support price will reduce rice import and save foreign exchange expenditure, represented by the area QrQcNM. However, to produce the rice quantity Qc requires additional urea plus other traded inputs. The foreign exchange expenditure for the imported urea is represented by the area QfrQfsBC in Figure 5.1. Thus, the saving in foreign exchange earnings due to the increase in the rice support price alone can be written as:

Saving in foreign exchange earnings

$= QrQcNM - QfsQfrBC - \phi\ QrQc$

$= Pw(Qc-Qr)-Pfu(1-Mf)(Qfs-Qfr)-\phi(Qc-Qr)$ (5.11)

Measurement of Change in Government Expenditure. The change in government expenditure required to increase the rice support price is represented by the area HACD plus FDNM in Figure 5.2 (increase in the rice subsidy) plus area BCDE in Figure 5.1 (increase in urea subsidy expenditure). This can be written as:

Increase in government expenditure

$= (HACD + FDNM) + BCDE$

$= (1-Mr)[(Pr-Ps)(Qc-Qh)+(Ps-Pw)(Qc-Qr)] + (Pfu-Pfr)(Qfs-Qfr)$ (5.12)

5.3.2. Increased Rice Price Support to Offset the Decrease in Farmers' Surplus

Should the government wish to maintain farmers' incomes, then government could increase its support of the farmgate price of rice so as to just offset the decrease in producers surplus caused by the reduction in the urea subsidy. Figures 5.1 and 5.2 can also be used to illustrate the changes where Pr', Qr', and Qfr' displace Pr, Qr, and Qfr, respectively. The level of increased rice support price can be written as:

$$Pr' = Ps\ (1+k)^{\frac{1}{\beta}} \qquad (5.13)$$

where k = (Qr'-Qr)/Qr
Pr' = the increased rice support price to compensate producers' loss
Qr' = quantity of rice produced after the support price increase

Measurement of Change in Urea Demand. Since the higher rice support price will encourage an increase in rice production, this requires additional urea. The quantity of urea demanded to produce rice quantity Qr' can be calculated as follows:

$$Qfr' = Qfr\left(\frac{Qr'}{Qr}\right)^{\frac{1}{\alpha}} \qquad (5.14)$$

where Qfr' = quantity of urea used at Pfr to produce rice at Qr'
(after the rice support price increase)

Various levels of the rice support price Pr' can be simulated until the gain in rice producers' surplus is equal to the loss in rice producers' surplus as already estimated in equation (5.5). This rice producers' gain will be:

Gain in producer surplus

= increase in revenue less increase in urea cost less increase in other variable costs

$= (ABFH + BCQr'Qr) - EDQfr'Qfr - \lambda(QrQr')$

$= (1-Mr)[(Pr'-Ps)(Qr-Qh)+Pr'(Qr'-Qr)] - Pfr(Qfr'-Qfr) - \lambda(Qr'-Qr)$ (5.15)

Given the change in rice supply from Qr to Qr' and the increased rice support price from Ps to Pr' simulated using equation (5.13), the impacts of the increased support price in terms of government expenditure and foreign exchange earnings can be calculated.

Measurement of Change in Foreign Exchange. In this policy, the saving in foreign exchange earnings is represented by the area QrQcNM in Figure 5.2 (the reduction of rice import) and the area QfrQfsBC in Figure 5.1 (the increase in imported urea). In this case, the saving in foreign exchange can be written as:

Saving in foreign exchange earnings

$= QrQr'NM - Qfr'QfrBC - \phi\ QrQr'$

$= Pw(Qr'-Qr)-Pfu(1-Mf)(Qfr'-Qfr)-\phi(Qr'-Qr)$ (5.16)

Measurement of Change in Government Expenditure. The change in government expenditure required to increase the rice support price in this policy is graphically also similar to the change in section 3.5.1 represented by the area HACD plus FDNM in Figure 5.2 (increase in the rice subsidy) plus area BCDE in Figure 5.1 (increase in urea subsidy expenditure). Since the change in the increased rice support price, rice production and urea demand could be different, this can be written as:

Increase in government expenditure

= (HACD + FDNM) + BCDE

= (1-Mr)[(Pr'-Ps)(Qr'-Qh)+(Ps-Pw)(Qr'-Qr)] + (Pfu-Pfr)(Qfr'-Qfr) (5.17)

5.4. Net Impacts of the Reduced Urea Subsidy and Compensation to Achieve Self-sufficiency.

Net changes in producers surplus, foreign exchange earnings and government expenditure from the joint implementation of both these policies is obtained by summing the relevant changes as follows:

Net gain in producers surplus = equation (5.10) - equation (5.5)

Net saving in foreign exchange earnings = equation (5.7) + equation (5.11)

Net change in government expenditure = equation (5.12) - equation (5.6)

Note that in this scenario, the level of domestic rice production and the urea demand do not change.

5.5. Net Impacts of the Reduced Urea Subsidy and Compensation for the Loss of Rice Producers' Income

In this policy, the increased rice price support should produce a gain in producers' income equal to the loss in producers' income, from reduction of the urea subsidy. Thus, the net change in producers surplus will be zero. Foreign exchange earnings and government expenditure from the joint implementation of both these policies is obtained by summing the relevant changes as follows:

Net saving in foreign exchange earnings = equation (5.16) + equation (5.11)

Net change in government expenditure = equation (5.17) - equation (5.6)

Note that in this scenario, there could be changes in domestic rice production and urea demand.

5.6. Baseline Scenario

The important issue in the implementation of these policies is the impact on government expenditure. Therefore, this analysis will focus on the estimation of the level of the urea price subsidy and the rice support price which can maintain the current level of producer surplus (or rice self-sufficiency) at the least cost to the government budget.

This study examines several scenarios of urea price rises. The baseline scenario serves as the benchmark against which all subsequent experiments are compared, and assumes that the urea price and the rice price are set at their actual values in the year 1990.

In the following scenarios (B to F) five levels of the urea price will be analysed. Firstly, the price of urea will be changed and its impacts on urea demand and rice production, and producer welfare will be determined. Secondly, that rice support price associated with each urea price that offsets the decline in rice supply (or compensates for the loss of producers welfare) will be determined. Total government cost is then calculated.

The following scenarios are simulated by increasing the price of urea between 5 to 30 percent:

Table 5.1
The Scenario of Policy Reforms
in the Reduction of the Urea Price and Rice Support Policy

Scenario	Urea	Percent change
A	185	0.0
B	200	8.1
C	210	13.5
D	220	18.9
E	230	24.3
F	240	29.7

5.7. Basic Data and Assumptions

The basic data for the policy analyses are presented in Table 5.1 while assumed parameter values are in Table 5.2. Data available for this study covered the period ending 1990. In the base year (1990), domestic production of milled rice was 27 million tons and it is represented by Qc in Figure 5.1.

Table 5.2
The Basic Data for Analysis of Urea and Rice Support Policy
(Base year 1990)

Domestic output of rice before reduction (Qc)	27190411 tons
Households consump.of rice producer (60%)(Qh)	16314247 tons
Government purchased rice price measured in retail price equivalent (Ps)	567 Rp/kg
Border price for rice (Pw)	503 Rp/kg
Urea used for rice (Qfs)	1883627 tons
Farmgate price for subsidised urea(Pfs)	185 Rp/kg
Farmgate unsubsidised price of urea (Pfu)	265 Rp/kg

Source : The Ministry of Agriculture and the Central Bureau of Statistics, Jakarta.[4]

For more than two-thirds of the Indonesian population, rice accounted for more than one third of the average food budget while the total budget forms the major proportion of household expenditure. Based on Food Balance Sheet data, rice producers are assumed to consume domestically 60 percent of their rice production. Therefore Qh is 60 percent of Qc in Table 5.2.

Even though there is no official data on urea used in rice fields, some estimations have been made. For example Syarifuddin Baharsyah (1990) estimated that the amount of urea used in rice fields is around 70 percent of total urea (2690896 tons) used on crops in Indonesia. This estimate will be used in this study.

The rice price used in this analysis is the unhusked rice price converted to milled rice equivalents at the farm-gate level. The import price of rice is the

[4] Detailed data on rice production and consumption are presented in Appendix D, ible 2.

export price of rice (25 percent broken) in Bangkok, Thailand[5]. As shown in Table 5.1 the government purchased price of rice measured at retailed price equivalent is 567 rupiah per kg and the import price (border price) was 503 rupiah per kg[6].

The domestic subsidised price of urea set by the government in 1990 was 185 rupiah per kg while the farmgate unsubsidised urea price 265 rupiah per kg. Thus, per unit subsidy is 80 rupiah or 30 percent.

Table 5.3
The Assumptions for Analysis of Urea and Rice Support Policy

Price elasticity of demand for urea (γ)	-0.50
Price elasticity of rice supply (β)	0.20
Urea elasticity of rice yield (α)	0.10
The rate of processing and marketing margin for rice (Mr)	0.23
The cost of distribution for Urea (Mf)	0.26
Non-urea variable cost per kg of rice output (λ)	15.30
World- price value of traded non urea inputs per kg of rice output (ϕ)	9.8

Source: Kasryno, 1986 and 1989.

[5] Details on rice prices are given in Appendix D, Table 6, 7, 8, and 9.

[6] The currency used is Rp 1980 for one US dollar.

Chapter 6

RESULTS AND DISCUSSION

Using the basic data and assumptions presented in Table 5.2 and 5.3, the impacts of the reduction of urea subsidy and the increased rice support price on urea demand, rice production, rice producers' surplus, government expenditure, and foreign exchange earnings are presented in Tables 6.1 to 6.9.

6.1. Impacts of the Reduction of Urea Subsidy

The first policy reform to be evaluated is the reduction of the subsidy on urea fertilizer. This study examines six scenarios of urea price. In the base scenario, the level of urea price is 185 rupiah per kg (scenario A), then the urea price is increased to 200, 210, 220, 230 and 240 rupiah per kg (by ten rupiah per kg (scenario B to F).

6.1.1. Impacts on Demand for Urea

The results in Table 6.1 shows that the reduction of the urea subsidy, which increases the price of subsidised urea at the farmgate level, reduces the

demand for urea. In the base scenario (scenario A), the urea demand is 1883.6 thousand metric tons (TMT). Increases in the urea price from between 8 and 30 percent reduce the demand for the urea by between 3 and 12 percent.

Table 6.1
The Effect of the Reduction of Urea Subsidy on Urea Demand

Scenario	Urea price (Rp/kg)	% chg	Urea demand (1000 tons)	% chg
A	185	0.0	1883.6	0.0
B	200	8.1	1811.6	-3.8
C	210	13.5	1767.9	-6.1
D	220	18.9	1727.3	-8.3
E	230	24.3	1689.3	-10.3
F	240	29.7	1653.8	-12.2

6.1.2. Impacts on Rice Production

Since the reduction of the urea subsidy decreases the use of urea, it affects rice production. Its impact on rice production is shown in Table 6.2. It can be seen that the higher the urea price, the lower is the level of rice production. The lowest reduction is in scenario B (0.39 percent or 105 TMT) while the largest reduction is in scenario F (1.29 percent or 351 TMT).

Table 6.2
The Effect of the Reduction of Urea Subsidy on Rice Production

Scenario	Urea price (Rp/kg)	% chg	Rice supply (1000 tons)	chg	% chg
A	185	0.0	27 190		
B	200	8.1	27 085	105	-0.39
C	210	13.5	27 019	171	-0.63
D	220	18.9	26 956	234	-0.86
E	230	24.3	26 896	294	-1.08
F	240	29.7	26 839	351	-1.29

6.1.3. Impacts on Rice Producers' Surplus

Increases in the urea price raises farmers' costs. If the rice price is unchanged, this reduced farmers' income. As shown in Table 6.3, the loss in rice producers' surplus increases with increasing urea prices. In these scenarios the loss in rice producers' surplus varies between 58.4 and 196.5 billion rupiah. These changes in rice producers' surplus and relatively small because the share of urea in the total cost of rice production is also small (8.9 percent of the total rice production costs).

6.1.4. Impacts on Government Expenditure

The reduction of the urea subsidy will save government expenditure by the amount of the subsidy reduction multiplied by the new urea demand, plus the

decline in subsidy due to the reduction in the use of urea. By increasing the urea price by between 8 and 30 percent, government could save by between 32.9 and 109.3 billion rupiah (Table 6.3). As shown in Table 2.12, the total financial subsidy on urea price was 185.1 billion rupiah in 1989-90. In scenarios B to E, these levels of urea price reduce the government expenditure by between 17.7 and 88.70 percent. However, if the urea price is increased by 29.73 percent (scenario F) the urea subsidy could be eliminated.

Table 6.3

The Impacts of the Reduction of Urea Subsidy

Scenario	Urea price (Rp/kg)	Producers surplus loss	Saving in government expenditure	Foreign exchange earnings
		----------billion rupiah----------		
A	185			
B	200	58.42	32.94	-38.05
C	210	95.17	53.45	-62.04
D	220	130.35	72.96	-85.03
E	230	164.10	91.56	-107.10
F	240	196.55	109.35	-128.32

6.1.5. Impacts on Foreign Exchange Earnings

The effect of the reduction of the urea subsidy on foreign exchange earnings is shown in Table 6.3. Since the use of urea declines, so does rice production. Consequently, to meet domestic demand for rice, the government has

to import rice. For each scenario, the value of the imported rice is higher than the foreign exchange saving from the reduction in urea use. Hence, the value of foreign exchange earnings declines. For these six scenarios, the decline in foreign exchange earnings varies from 38.0 to 128.3 billion rupiah.

6.2. Impacts of Increased Price Support to Offset Decrease in Rice Production

In order to offset the reduction in rice production (as measured by equation (5.2)) due to the reduction of the urea subsidy, the government could increase its support of the farmgate price of rice. As shown in Table 6.4, for each level of urea price, the required levels of supported price to offset the reduction in rice supply are between 578.2 and 605.1 rupiah per kg of retailed milled rice or 445.2 and 465.9 rupiah per kg of milled rice at farmgate level. Since the farmgate milled rice price in 1990 was 436 rupiah per kg, the increase in farmgate rice price would be between 2.1 and 6.9 percent, given the levels of increased urea price (scenarios B to F).

6.2.1. Impacts on Rice Producers' Surplus

The increased rice support price would induce an increased volume of rice production. Both the higher rice price and the production increase would raise both farmers' revenue and costs. As shown in Table 6.4, for each urea price, this policy action alone will increase rice producers' surplus between 123.6 and 412.2 billion rupiah.

6.2.2. Impacts on Government Expenditure

The change in government expenditure required to increase the rice support price to offset the reduction in rice supply is also shown in Table 6.4. The cost of this program to government is relatively high. To compensate the effect of increasing the urea price to 200 rupiah per kg requires government expenditure of 103.4 billion rupiah. This increases as the urea price is increased. For each of the urea price levels the increase in government expenditure varies between 103.4 and 342.3 billion rupiah.

Table 6.4

The Impacts of the Increase in Rice Support Price to Offset the Decrease in Rice Supply

Scenario	Urea price (Rp/kg)	Support price retail (Rp/kg)	Support price farmgate (Bill.rp)	Producers surplus gain (Bill.rp)	Increase in government expenditure (Bill.rp)	Foreign exchange earnings (Bill.rp)
A	185					
B	200	578.2	445.2	123.6	103.4	38.1
C	210	585.3	450.6	200.9	167.7	62.0
D	220	592.1	455.9	274.6	228.8	85.0
E	230	598.7	461.0	344.9	286.9	107.1
F	240	605.1	465.9	412.2	342.3	128.3

6.2.3. Impacts on Foreign Exchange Earnings

The increase in rice production due to the increased support price reduces the volume of imported rice and therefore saves foreign exchange expenditure. However, to produce the rice requires additional urea plus other traded inputs. The saving in foreign exchange earnings due to the increase in the rice support price alone is shown in Table 6.4. For each urea price, the change in foreign exchange earnings varies between 38.1 and 128.3 billion rupiah.

6.3. Impacts of Increased Price Support to Offset the Decrease in Farmers' Surplus

If the government objective is to maintain farmers' incomes at base-year levels, then government could increase its support of the farmgate rice price so as to just offset the decrease in producers surplus caused by the reduction of the urea subsidy (Table 6.3, third column). Its affects is shown in Tables 6.5 and 6.6.

6.3.1. Impacts on Rice Production

Since the assumed objective of the government is to offset the loss in rice producers' surplus, the increase in the rice support price will not necessarily compensate for the reduction in rice production. The results in Table 6.5 show

that the increased support price in this policy increases rice production by less than in the target of self-sufficiency (section 6.2). However, compared with the base year, the change in rice production due to this support price is also lower than the change caused by the reduction of urea subsidy alone.

Table 6.5
The Effect on Rice Production of the Increased Rice Support Price to Offset the Decreased in Farmers' Surplus

Scenario	Urea price (Rp/kg)	Rice supply (1000 tons)	chg	% chg
A	185	27 190		
B	200	27 135	55.6	-0.20
C	210	27 100	90.1	-0.33
D	220	27 068	122.6	-0.45
E	230	27 037	153.4	-0.56
F	240	27 008	182.6	-0.67

6.3.2. Impacts on Urea Demand

The additional urea required to produce the rice supplies of Table 6.5 is shown in Table 6.6. The quantity of urea demanded in each scenario is lower than in the cases in the reduction of urea subsidy alone.

Table 6.6
The Effect on Urea Demand of the Increased Rice Support Price to Offset the Decrease in Farmers' Surplus

Scenario	Urea price (Rp/kg)	Urea demand (1000 tons)	% chg
A	185	1883.60	0.00
B	200	1845.40	-2.03
C	210	1822.10	-3.27
D	220	1800.40	-4.42
E	230	1780.00	-5.50
F	240	1760.80	-6.52

6.3.3. Impacts on Government Expenditure

The change in government expenditure required to increase the rice support price is measured by the increase in the rice subsidy plus the increase in urea subsidy expenditures. The increases in government expenditure vary between 48.5 and 159.8 billion rupiah (Table 6.7). For each of the scenarios, this value is less than the cost of the "self-sufficiency" programme.

Table 6.7

The Impacts of the Increase in Rice Support Price to Compensate the Decrease in Rice Producers' Income

Scenario	Urea price (Rp/kg)	Rice support Price (Rp/kg)	Producers surplus gain (Bill.rp)	Increase in government expenditure (Bill.rp)	Foreign exchange (Bill.rp)
A	185				
B	200	572.3	58.4	48.5	18.1
C	210	575.6	95.2	78.6	29.7
D	220	578.9	130.4	107.1	40.9
E	230	582.0	164.1	134.1	51.7
F	240	585.1	196.6	159.8	62.3

6.3.4. Impacts on Foreign Exchange Earnings

As shown in Table 6.7 the change in foreign exchange earnings is also less than in the case of the "self-sufficiency" programme. This is because the quantity of rice supply to be supported (Tabel 6.5) is less than the quantity required to be produced to compensate the reduction caused by the increased urea price (Table 6.2). In this policy, the saving in foreign exchange earnings varies between 18.1 and 62.3 billion rupiah.

6.4. Net Impacts of the Reduced Urea Subsidy and Compensation to Achieve Self-sufficiency

Should government reduce the urea subsidy and also increase the rice support price to secure self-sufficiency in rice production, the net changes in producers surplus, foreign exchange earnings and government expenditure from the joint implementation of both policies is shown in Table 6.8. The net gain in producers surplus varies between 65.2 and 215.7 billion rupiah while to implement these policies requires government expenditures between 70.4 and 233.0 billion rupiah.

In this situation, the changes in demand for urea and rice production due to the reduction of urea subsidy are compensated by the support price policy. Hence, the joint policy implementation does not change the level of domestic rice production or the quantity of urea used. Hence, the net foreign exchange earnings do not change.

Table 6.8
The Net Impacts of the Increase in Rice Support Price to Offset the Decrease in Rice Supply

Scenario	Urea prices (Rp/kg)	Net gain in producer surplus (Bill.Rp)	Net saving in foreign exch. earnings (Bill.Rp)	Net change in government expenditure (Bill.Rp)
A	185	0.0	0.0	0.0
B	200	65.2	0.0	70.4
C	210	105.8	0.0	114.2
D	220	144.3	0.0	155.9
E	230	180.9	0.0	195.4
F	240	215.7	0.0	233.0

6.5. Net Impacts of the Reduced Urea Subsidy and Compensation for the Loss of Rice Producers' Income

In the case of compensation of the loss in farmers' income, the impacts of the joint policy affects both rice production and the use of urea. The results are shown in Table 6.9. The increase in rice support price was chosen to results in no change in rice producers' surplus. However, the increase in government expenditure varies between 15.6 and 50.4 billion rupiah. For each scenario in turn, the increased government expenditure in this joint policy is less than for the joint policy to compensate the reduction in rice production (Table 6.8). However, rice production does not meet domestic demand. The value of increased imports of rice is higher than the value of savings in the use of imported urea. The net decrease in foreign exchange earnings in this joint policy varies between 20 and 66 billion rupiah.

Table 6.9

The Net Impacts of the Increase in Rice Support Price to Compensate the Decrease in Rice Producer Loss

Scenario	Urea price (Rp/kg)	Net gain in producer surplus (Bill.Rp)	Net saving in foreign exch. earnings (Bill.Rp)	Net change in government expenditure (Bill.Rp)
A	185	0.0	0.0	0.0
B	200	0.0	-20.0	15.6
C	210	0.0	-32.4	25.1
D	220	0.0	-44.2	34.1
E	230	0.0	-55.4	42.5
F	240	0.0	-66.0	50.4

6.6. Policy Implications

The objective of the urea subsidy reduction is to save government expenditure through increase in the urea farmgate price. However, this program would also affect rice production. The government may also increase its support of the rice price, either to offset the reduction in rice production or to compensate for the loss in rice producers' income.

In October 1989 the Government of Indonesia set the retail price of urea at 185 rupiah per kg (Table 2.10) and the subsidy on the urea price was 45 percent of the farmgate unsubsidised urea price (Table 2.9). This price was maintained until November 1990. The amount of the subsidy declined in 1990 to 27 percent due to a fall in the world price of urea[1]. In the 1991, the world price increased from 187 to 196 rupiah per kg (f.o.b. price) and the farmgate unsubsidised urea price increased to 265 from 255 rupiah per kg. If the government were to maintain the farmgate urea price at the 1990 level, the subsidy would increase to 30.2 percent. However, the government wishes to reduce expenditure on urea subsidy. Therefore the farmgate price of urea should be increased.

The results show that if the urea price is increased between 5 and 30 percent (scenarios B to F), the range of decrease in demand for urea would be between 3 and 12 percent (72 and 229 TMT). The increase in the urea price will also reduce rice production between 0.3 and 1.3 percent (or by between 105 and 351 TMT). As expected the higher the urea price the larger the fall in rice production.

Following the reduction of the urea subsidy, government could change the rice support price. The objective of the support policy could be: (i) to maintain self-

[1] Detailed data of Rice production and its price are presented in Appendix E, Table

sufficiency or (ii) to offset the producers loss due to the increase in urea price. If the government priority is to maintain rice production, this would increase government expenditure by between 70.4 and 155.9 billion rupiah for urea price increases to between 200 and 220 rupiah per kg.

The government may wish to just maintain farmers' revenue at the level prior to the reduction of urea price, instead of seeking a self-sufficiency target. Two alternative policies could be considered to offset the increase in the urea price, either raising rice support price at farmgate level or increasing the market price of rice. If the government wished to support the rice price to offset the producers loss, the increase in government expenditure would be between 15.6 and 34.1 billion rupiah for urea price increase to between 200 to 220 rupiah per kg.

It can be seen that following the reduction of the urea subsidy, both alternative support price policies will result in increased cost to the government. Since the government objective of these policy reforms is to curtail expenditure while securing rice production and farmers' incomes, these policy programmes will not be successful. Moreover, these actions will offset a less-distorted fertilizer price with a more-distorted rice price.

In the compensation for self-sufficiency, the gain in rice producers' surplus is less than the cost to the government. Hence, the loss to the welfare of society will be 11.6 billion rupiah (scenario D). The program to compensate the loss in rice producers' surplus is even more costly. Under scenario D, the society welfare loss is the cost to government (34.1 billion rupiah) plus increased foreign exchange expenditure (44.2 billion rupiah) or a total of 78.3 billion rupiah.

The above discussion indicates that the joint policies can meet either the income compensation or self-sufficiency goals but not without increasing

government expenditure. Moreover, these actions will only continue to distort the rice and urea markets.

6.7. The Efficiency of Fertilizer Use

Following the gradual withdrawal of fertilizer subsidies to farmers, efficient use of fertilizer at the farm level can be encouraged. Adjustments in nutrient-use recommendations to suit local conditions and more efficient techniques for fertilizer use could improve the efficiency of fertilizer use. These could lead to reductions in producer incomes less than those suggested above.

The following methods of improving the nutrient delivery system are widely recommended: (i) Deep-placement methods for urea prill, briquettes/liquids, (ii) the use of green manure, (iii) alternative cropping systems and (iv) improving existing practices.

The methods of deep-placement for urea prill and briquettes/liquids is one of the highly recommended methods to improve the efficient use of urea. The deep placement of urea briquettes can be done by hand or machine. Agronomic evidence shows that the use of urea briquettes for deep-placing nitrogen into the soil results in higher production of unhusked rice (*gabah*) and/or lower urea use. Since this method could improve urea efficiency, it could be used to save the government budget spent on the urea subsidy while maintaining rice self-sufficiency. However, in application the following factors should be considered: (i) the soil characteristic, (ii) crop factors, and (iii) input management.

Green manure has been used in traditional rice production in many tropical countries with farmers using nitrogen-fixing, leguminous crops as a biofertilizer.

Basically, nitrogen (N) is delivered by soil N and biologically-fixed N. Leguminous green manure is grown like any other crop, either before or after the rice crop. In Indonesia leguminous crops have been used in some areas such as West Java. Some commonly used leguminous food crops are soybeans and mung beans.

As in the use of green manure, some cropping systems such as fish cultivation in rice fields and livestock-fish farming system can improve the efficient use of fertilizer in rice production.

Finally, an improvement in existing rice farming practices, such as more intensive land preparation, better timing in the application of fertilizer, changes in the method of fertilizer application, and the use of animal manure, can increase the efficient use of fertilizer and help reduce the negative impacts of reductions in the urea subsidy.

Chapter 7

SUMMARY AND RECOMMENDATION

7.1. Summary

Reducing the subsidy on urea is one policy option to save government expenditure. As the urea price increases due to the reduction of subsidy, demand for urea declines. This policy alternative is expected to be one way to encourage the efficient use of urea. Since reduction in the use of urea could affect rice production and farmers' income, the main issue in the application of this policy is the extent of the increase in urea price. Even though its effects on rice production will vary from farm to farm, and will depend on local conditions such as soil type and the climate, it can influence aggregate rice production in a country, particularly a target of self-sufficiency. If the government of Indonesia wishes to reduce the urea subsidy then its impact on rice production and farm income could be offset by an increase on rice support price. However, the increased support price would increase government expenditure, further distort the market price of rice, reduce social welfare.

Any saving in government expenditure derives only from the reduction of the urea subsidy. For example, with a urea price of 220 rupiah per kg, the saving

in government expenditure would be 72.9 billion rupiah. However, from the rice farmers' point of view, without any increase in the rice support price, the program will reduce their income by 130.4 billion rupiah or 4.8 rupiah per kg of rice produced. Hence if the average farmer produces 4300 kg of rice, the loss will be 20 683 rupiah per farm, or only 3.2 percent of farm profit. In addition, some methods improving the efficiency of fertilizer use should be considered such as deep-placement of methods for urea prill, briquettes or liquids, the use of green manure, alternative cropping system and better farm practices.

7.2. Recommendation

This study recommends the reduction of the urea subsidy. This policy action has several advantages: first, it could save government expenditure, second, it encourage the efficient use of urea, third, it reduce government intervention in the urea market and reduce distortion in the urea price, and finally, it has relatively little impact on producers' income. The application methods for efficient use of fertilizer such as deep-placement for urea, green manure, cropping system and better farming practice are also highly recommended. Farmers should be encouraged to increase the efficiency of fertilizer use, to reduce the negative impact of higher fertilizer prices on farm incomes.

APPENDICES

Appendix A. Calender Events of Rice Economy in Indonesia

1945	Indonesia declared its independence. The state administration was taken over by Indonesia. Government intervention in the rice sector firmly initiated.
1951	BAMA, Government agency, begin rice rations to the civil servants, the military and the privilege classes.
1952	Kasimo Plan proposed rice self-sufficiency by 1956.
1956	A Five-Year Plan (1956-60) designed, but the overall frameworks was extremely ample.
1958	*Padi Centra* program introduced the 'five principles' for expanded rice production. This was the beginning of the introduction of modern inputs and become the basis for most programs to the present.
1963	Students of Bogor Institute of Agriculture undertake on-farm extension programme called BIMAS. This program, then, was taken over by the Ministry of Agriculture.
1965	The New Order Government inherits a disorder economy.
1967	BULOG was established and replaced the previous government agency. The introduction of INMAS as part of the BIMAS program, But the program was failure.
1968	*BIMAS Gotong-royong* (Mutual self-help) replaced the previous program and new IRRI varieties introduced. *Rumus Tani* (farmer's formula) induced farmers interests.
1969/70	Repelita I[1] commenced. BIMAS *Gotong-royong* was neglected on 20 May 1970 and succeeded by the BIMAS *yang disempurnakan* (Perfected BIMAS).
1972	A rice crisis. Production was failure due to prolong drought.

[1] Repelita (Rencana Pembangunan Lima Tahun) is the Five-Year Development Planning. The first Repelita was started in 1969.

1973	The government established the BUUD[2], later called KUD as farmers' cooperative. This institution was futile.
1974	The beginning of Repelita II. Rising oil prices strengthen the general economic prospect. Finance for rice imports increased. Floor and fertilizer prices raised, but fertilizer was available in two physical instalments. BULOG was to purchase only *gabah* (unhusked rice) for the national stock. The BUUDs set up small rice mills, leading to the collapse of large scale milling.
1975	The emergence of *wereng* pest in Java and Bali. The emergence of problems of BIMAS/INMAS participation rates.
1976	Non-BIMAS farmers were allowed access to fertilizer subsidy. Fertilizer price was reduced after a series of price rises (over the previous two years) resulting in reduce usage. Drought added to the existing problems. IR-36 and IR-38 varieties held control *wereng*.
1977	Prolonged drought reduced rice production and crop prospects.
1978	Favourable weather allowed a third crop in some areas. Production increased after virtual stagnation between 1974-1977, but imports remained high. Devaluation undertaken for structural purposes.
1979	The beginning of Repelita III. Quality standard led to low procurement and imports of 1.95 million tonnes.
1980	Production exceeded 20 million tonnes, over 2 million tonnes higher than 1979.
1981	Production increased again by 2 million tonnes and imports of rice declined.
1982	Prolong dry season again reduced production increase to 0.5 million tonnes. For the first time the fertilizer price has been since 1976. Declined in the oil price affected the general economy.
1983	Problems of oil led to further currency devaluation. Rice production increased by over 1 million tonnes.

[2] BUUD (Badan Usaha Unit Desa) is the farmers' cooperatives in the village that later was called 'KUD' (Koperasi Unit Desa).

1984	The Beginning of Repelita IV. Good harvest resulted in a high rate of BULOG procurement, low level of market injection and stock build up.
1985	High production lead to storage problems and problems of maintenance of floor price.
1986	Production incentives restrained (the existing floor price was retained and the fertilizer price was increased). Marginal rice land was switched to soybean. Oil price dropped sharply. Further currency devaluation.
1987	BULOG stocks declined. Drought and *wereng* resurgence lowered production increase to 0.2 million tonnes (total 27.25 million). The SUPRA INSUS programme was launched. The fertilizer subsidy touched a record high.
1988	Imports became necessary again. BULOG stocks were down to 600,000 tonnes by April and BULOG production forecast was only 27.3 million tonnes. More optimistic forecasts were between 28 and 29 million tonnes. The floor and fertilizer prices increased for the 1989 season. Rice was again the major focus of agricultural policy.
1989	The beginning of Repelita V. Pesticide subsidy were terminated.
1990	Long drought and pest infestation. Floor and fertilizer prices increased.
1991	The combination of a delayed monsoon and a drought-reduced dry season crop resulted in production falling 2 percent. Import of 685 metric tons was arranged to maintain buffer stock.
1992	Good wet season harvest increased production. Surplus of rice has been exported to some counties.

Source:
1. Ministry of Agriculture, Jakarta.
2. BULOG (National Logistic Agency), Jakarta.
3. Piggot, R.R. and E.M. Treadgold. 1990.

Appendix B. Institutional Structure Affecting Agriculture, Food Trade, Marketing, and Distribution

The basic responsibility for promoting agricultural production and thereby improving the income and well-being of farmers and fishermen lies with the Department of Agriculture, whose field of competence covers: (1) food crops, (2) commercial crops (small holder and plantation), (3) livestock and animal production, (4) fisheries (agriculture and marine fisheries), and (5) forestry. Promotion of trade in general falls within the responsibility of the Department of Trade and Cooperatives, while the Department of Health holds responsibility over matters relating to nutrition.

One of the basic elements in the government food policy is the assurance of adequate food supply at stable prices for the country's large and growing population. The achievement of this policy objective is pursued through the National Food Price Stabilization Program, the implementation of which is entrusted to BULOG. Established in 1969, BULOG is a nondepartmental agency reporting directly to the President of Indonesia. Its principal task is the maintenance of national stocks of basic food commodities and the management of buffer-stock operations. Today, BULOG's field of responsibilities covers the commodities and activities shown in Table 1.

The relationship between BULOG and other Agencies/ Departments is as follows:

1. Financing of BULOG's operations. BULOG's operations are not financed out of the State Budget, but by credits from the Central Bank (Bank of Indonesia) on the basis of a budget annually submitted by BULOG and approved by Minister of Finance.

2. Determination of the floor price. This is done by the government annually, base on proposals by an Inter-Agency Team representing the

Departments of Agriculture, Finance, Trade, and Cooperatives, National Planning (BAPPENAS), and BULOG.

3. Domestic procurement. This is undertaken by BULOG as far as possible through the Village Cooperatives, the latter receiving loans from the People's Bank.

4. Import planning. BULOG is primarily responsible for staple-food import planning, based on crop forecasts. Account is taken of recommendations from the Department of Agriculture and the Central Bureau of Statistics, as well as from the Department of Trade and Cooperatives.

As of March 1978, the Chairman of BULOG has been appointed by the President as State (Junior) Minister of Cooperatives.

Table 1. BULOG's Responsibilities and Activities

Responsibilities and Activities	Rice	Sugar	Wheat and Flour	Maize	Soybean	Peanut and Mungbean	Meat
Monitoring of prices	x	x	x	x	x	x	x
Maintenance of stock	x	-	-	x	x	x	-
Dom. procurement at floor price	x	-	-	x	x	x	-
Import							
Control	x	x	x	x	x	x	-
As sole importer	x	x	x	-	-	-	-
As one of several importers	-	-	-	x	x	-	-
Stock releases							
Market operations	x	-	-	x	x	x	-
Distribution	-	x	x	-	-	-	-
Coordination of supply for some cities in some months of the year	-	-	-	-	-	-	x

Source: National Logistics Agency (BULOG).

Source: Soegeng Amat. 1982. Promoting National Food Security: the Indonesian Experience. in Chisholm, A.H. and R. Tyers (Eds), Food Security: Theory, Policy, and Perspectives from Asia and the Pacific Rim. LexingtonBooks, D.C. Heath and Company, Lexington, Massachusetts, pp.165-166

Appendix C. The Concept of the Incremental Benefit/Cost Ratio[1]

The government (BULOG) domestic rice procurement year is from February (the start of the main harvest) to January. For Stalk paddy, paddy, and milled rice, purchases are made at floor or minimum prices that are announced at the beginning of the foregoing (main) planting season (October/November). These prices which are reviewed every year, have since 1973/1974 been based on the concept of an incremental benefit/cost ratio. Prior to 1973, the concept of cost of production was used. This was found unsatisfactory, however, mostly because of the large variation in cost from location to location and between different types and intensities of farming. This does not mean that the benefit/cost ratio concept is fully satisfactory. It also has undergone some modifications since its implementation.

The incremental benefit is defined as the increase in return the farmer receives as a result of his participation in BIMAS. The incremental cost is the increase in cost the farmer has to bear on account of his participation in the program. This incremental cost is evaluated based on the value of so-called BIMAS package (Consisting of HYV-seed, fertilizer, chemicals, and a certain amount of cash) made available to the participation farmer on a credit basis.

A simplified version of the formula used in the determination of the floor price is as follows:

$$\frac{B}{C} = \frac{\textit{Benefit per hectare (BIMAS)}}{\textit{Cost per hectare (BIMAS)}}$$

$$= \frac{\textit{(increase yield of stalk paddy per hectare) . Price}}{\textit{Cost of BIMAS package per hectare}}$$

where

1. The increase in yield is calculated net of land tax (5%) and the cost of harvesting, mostly in kind (16%).

2. The cost of the BIMAS package includes credit interest.

3. The benefit/cost ratio should at least be 1.5, in order that the floor price should be attractive enough to farmers. (in fact, the benefit/cost ratio adopted since 1974-75 has consistently exceeded 2.0).

The floor price of stalk paddy for the 1976-1077 procurement year was calculated as follows:

1. The increase in yield associated with program participation was estimated at 2,006 kg of stalk paddy per hectare.

2. The cost of the BIMAS package including interest, was calculated to be Rp 36,851 per hectare.

3. The benefit/cost ratio was then calculated as follows:

$$\frac{B}{C} = \frac{0.79 \times 2{,}006 \times Price}{36{,}851}$$

4. Price of stalk paddy per kg is

$$\frac{36{,}851}{1{,}585}\,\frac{B}{C} = 23.2\,\frac{B}{C}$$

5. The Inter-Agency Team, after having taken into account such important factors as the country's rate of inflation, proposed a benefit/cost ratio of 2.24, giving a floor price of Rp 52 per kg of stalk paddy.

6. On the basis of the prevailing conversion factors, the following prices were arrived at:

Rough rice (Gabah)	Rp 68.50/kg
Milled rice	Rp 108.00/kg

[1]Source: Soegeng Amat. 1982. Promoting National Food Security: the Indonesian Experience. in Chisholm, A.H. and R. Tyers (Eds), Food Security: Theory, Policy, and Perspectives from Asia and the Pacific Rim. LexingtonBooks, D.C. Heath and Company, Lexington, Massachusetts, pp.169-170

Appendix D.

Table 1. Gross Domestic Product, Exchange Rates and Inflation Rates

Year	Gross Domestic Product by Industrial Origin (billion rupiah)							Inflation Rate	Exchange Rate
	Agriculture	Percent of Tot.GDP	Mining & quarrying	Industry	Trans. & Comm'n	Services & Others	GDP At current market price	Calender year	Exch.rate (nominal)
1	2	3	4	5	6	7	8	9	10
1970	1575.0	47.15	172.6	311.8	95.8	169.1	3340.2	8.73	379.00
1971	1646.0	44.83	294.0	301.0	162.0	180.6	3672.0	8.73	389.75
1972	1837.0	40.25	491.0	448.0	182.0	197.0	4564.0	8.73	413.58
1973	2710.0	40.13	831.0	650.0	257.0	264.0	6753.4	8.73	414.17
1974	3497.0	32.66	2374.0	890.0	442.0	380.0	10708.0	8.73	415.75
1975	4003.4	31.67	2484.8	1123.7	521.2	472.8	12642.5	8.73	415.67
1976	4812.0	31.11	2930.0	1453.3	662.6	546.5	15466.7	8.73	415.00
1977	5905.7	31.07	3599.7	1816.9	820.6	607.1	19010.7	8.73	415.17
1978	6706.0	29.48	4357.6	2420.4	1031.6	668.2	22746.0	8.73	446.42
1979	8995.7	28.09	6979.8	3310.6	1421.5	835.3	32025.4	8.73	630.78
1980	11290.3	24.84	11672.5	5287.9	1965.3	995.8	45445.7	15.97	631.78
1981	13642.5	25.25	12970.6	5821.7	2353.2	1119.0	54027.0	7.09	636.58
1982	15668.3	26.27	11707.8	7680.7	2795.2	1292.8	59632.6	9.69	666.40
1983	17696.2	24.01	13967.9	8211.3	3978.0	3000.8	73697.6	11.46	894.29
1984	20333.9	23.36	15985.8	11081.6	5112.5	3717.9	87054.8	8.76	1030.08
1985	22413.2	23.66	15403.6	12903.8	6050.5	3998.6	94720.8	4.31	1114.83
1986	24695.9	25.77	10274.1	13584.7	6408.0	4134.8	95823.1	8.83	1282.85
1987	29116.0	23.33	17266.8	21150.4	7442.6	4902.5	124816.9	8.90	1649.55
1988	34193.4	24.08	17161.8	26252.4	8139.6	5351.1	142020.3	5.47	1692.20
1989	38998.4	23.45	21729.6	30573.3	9085.0	5856.7	166329.5	5.97	1772.14
1990								9.53	1980.00

Source: The Statistical Year Book of Indonesia 1970-1992, Central Bureau of Statistics, Jakarta.

Appendix D.
Table 2. Rice Production and Consumption

Year	Area Harvested (Ha)	Yield Rate (00kg/ha)	Unhusked rice (tonnes)	Feed (tonnes)	Seed (tonnes)	Waste (tonnes)	Manufacture for (tonnes)	Rice (tonnes)	Waste (tonnes)	Beginning Stocks (tonnes)	Imports (Rice) (tonnes)	Exports (Rice) (tonnes)	Per Capita consumption (kg / year)	Population	Consumption (tonnes)	Ending Stocks (tonnes)
	1	2	3	4	5	6	7	8	9	10	11	13	15	16	17	18
1970	8135078	23.76	19330967	386619	3192	1043872	17897283	11633234	290831	261944	955629		108.52	116175000	12607311	261944
1971	8324322	24.25	20190014	403800	3266	1090261	18692687	12150246	303756	530415	493482		108.00	118809000	12831372	530415
1972	7897638	24.56	19393599	387872	3099	1047254	17955374	11670993	291775	530613	733511		108.27	121632000	13169097	530613
1973	8403604	25.57	21489499	429790	3298	1160433	19895978	12932386	323310	167961	1656677		118.00	124601000	14702918	167961
1974	8506598	26.41	22473016	449460	3339	1213543	20806674	13524338	338108	569334	1070774		115.64	127586000	14754045	569334
1975	8495096	26.30	22339239	446785	3333	1206319	20682802	13443821	336096	887150	672665		114.24	130597000	14919401	887150
1976	8368759	27.85	23309900	466198	3284	1258735	21581683	14028094	350702	730926	1280582		116.19	133650000	15528794	730926
1977	8359568	27.93	23347132	466943	3280	1260745	21616164	14050507	351263	541046	1964069		120.85	136766000	16528171	541046
1978	8929169	28.86	25771570	515431	3504	1391665	23860970	15509631	387741	461587	1762111		123.35	139960000	17264066	461587
1979	8803564	29.85	26282663	525653	3455	1419264	24334291	15817289	395432	1047612	1929488		126.53	143246000	18124916	1047612
1980	9005065	32.93	29651905	593038	3534	1601203	27454130	17845185	446130	783182	2026550		130.70	146201000	19108471	783182
1981	9381839	34.93	32775807	655516	3681	1769894	30346716	19725365	493134	1666749	525442		132.53	149677000	19836693	1666749
1982	8988455	37.36	33583677	671674	3527	1813519	31094958	20211723	505293	2216805	382188		138.77	152988000	21230145	2216805
1983	9162469	38.53	35303106	706062	3595	1906368	32687081	21246603	531165	1666138	1154928		145.21	156372000	22706778	1666138
1984	9763580	39.06	38136446	762729	3831	2059368	35310518	22951837	573796	1587778	375158	11	140.20	159831000	22408306	1587778
1985	9902293	39.42	39032945	780659	3886	2107779	36140621	23491404	587285	2754018	0	405	143.16	163367000	23387620	2754018
1986	9988453	39.77	39726761	794535	3919	2145245	36783061	23908990	597725	2724684	0	205	147.36	166489000	24533819	2724684
1987	9922594	40.39	40078195	801564	3894	2164223	37108515	24120535	603013	2128271	124200	109	143.17	170179000	24364527	2128271
1988	10138155	41.11	41676170	833523	3978	2250513	38588155	25082301	627058	1508257	26000		150.03	173799000	26075064	1508257
1989	10521207	42.47	44725582	894512	4129	2415181	41411760	26917644	672941	746111	443907		151.00	179136110	27049553	746111
1990	10502357	43.02	45178751	903575	4121	2439653	41831402	27190411	679760	1882616	46000		153.00	182650358	27945505	1882616

Source: 1. The Statistical Year Book of Indonesia 1970-1992, Central Bureau of Statistics, Jakarta.
2. Ministry of Agriculture, Jakarta.

Conversion:

- Dry stalk paddy to unhusked rice	0.765
- Unhusked rice to milled rice	0.650
- Seed rate unhusked rice per ha planted area	0.392
- Unhusked rice for animal food	0 020
- Unhusked rice waste	0 054
- Milled rice waste	0 025
- Transportation cost of fertilizer (% of price)	0.300

Appendix D.

Table 3. Monthly Ending Stock of Rice in Indonesia 1969-1991 (000 tonnes).

Year	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1969	268274	317965	366414	276289	293477	314253	315863	237750	189128	127554	164870	261944
1970	257076	261985	236134	276392	306583	314992	341984	386478	407679	383767	441535	530944
1971	514390	460366	417461	363562	335113	373599	381403	429340	444430	493414	525432	530613
1972	465448	452885	387477	332474	247411	216089	206756	204513	139410	125015	109641	167961
1973	130585	191889	198216	196336	195643	253014	324617	366810	455962	495776	533347	569334
1974	537257	497067	417953	405489	596370	762282	932088	919077	935226	945839	942200	887150
1975	870046	795948	778005	795605	899452	1002047	1047046	1064170	1021678	985678	871493	730926
1976	544766	495080	521523	636276	720400	712868	778169	786973	886124	934259	791869	541046
1977	572336	585645	572027	702472	733868	805006	827136	835303	841429	651891	526971	461587
1978	489969	498183	470252	692932	965743	1204217	1314227	1396749	1450420	1424448	1319812	1047612
1979	816305	723669	707851	843306	953218	1050853	1035523	1030632	1031684	977101	873818	783182
1980	532982	545287	885665	1350640	1817292	2134302	2253652	2471280	2300630	2182823	1972444	1666749
1981	1324293	1101600	1191950	1624568	1898965	2108424	2384759	2602676	2633459	2516805	2471888	2216659
1982	1870458	1649253	1593212	1841782	2236216	2550040	2749819	2867804	2745316	2566514	2140156	1666138
1983	1265770	1011554	911062	918507	1140458	1431390	1549973	1597668	1661187	1655594	1684609	1587778
1984	1365378	1330108	1441654	2037710	2402899	2710578	2925476	3028429	3006872	2915944	2870270	2754018
1985	2612514	2180992	2315541	2495134	2932508	3175080	3373624	3349620	3282327	3270747	2940718	2724684
1986	2502886	2220039	2130963	2169633	2288377	2402459	2144411	2627381	2250902	2496013	2325158	2128271
1987	1493538	1455827	1551769	1844317	2081168	2281285	2318915	2238689	2081564	1968571	1770947	1508257
1988	1209673	916212	769201	1080720	1422828	1572104	1432765	1293993	1132345	992095	869536	746111
1989	668976	667179	1114977	1731266	2235476	2488520	2578075	2659172	2353581	2234829	2118225	1882616
1990	1751698	1601016	1568953	1816798	2085464	2136935	2078514	1980840	1882151	1707571	1638113	1432396
1991	1253005	1078273	1071950	1368862	1772646	1799967	1672856	1536619	1300815	1155863	1017774	898817

Source : Badan Urusan Logistik (BULOG), Jakarta
Note : tahun 1987, 1988, 1989, dan 1990 pengembalian pinjaman.
Year 1987, 1988, 1989, and 1990 export repayment.

Appendix D.

Table 4. Area Harvested, Yield Rates and Production of Cassava, Maize, Sweet Potatoes, Soyabean and Peanuts.

Year	CASSAVA			MAIZE			SWEET POTATOES			SOYABEAN			PEANUTS (Groundnuts Shelled)		
	Area Haversted (Ha)	Yield Rate (00kg/ha)	Production (tonnes)	Area Haversted (Ha)	Yield Rate (00kg/ha)	Production (tonnes)	Area Haversted (Ha)	Yield Rate (00kg/ha)	Production (tonnes)	Area Haversted (Ha)	Yield Rate (00kg/ha)	Production (tonnes)	Area Haversted (Ha)	Yield Rate (00kg/ha)	Production (tonnes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1970	1398070	75	10478308	2938611	9.61	2825215	357568	61	2175317	694732	7.17	497883	380060	7.40	281309
1971	1406093	76	10689691	2626595	9.92	2606494	356866	62	2211360	679625	7.59	515644	375752	7.55	283773
1972	1468412	71	10384952	2160053	10.44	2254382	337811	61	2066329	697500	7.43	518229	353818	7.98	282205
1973	1428813	78	11185592	3433167	10.75	3689802	378719	63	2386764	743657	7.28	541040	415831	6.98	290104
1974	1509440	86	13030674	2666868	11.29	3010781	330250	75	2469208	768027	7.67	589239	410663	7.48	307166
1975	1410025	89	12545544	2444866	11.87	2902887	310917	78	2432614	751689	7.85	589831	474519	8.00	379683
1976	1353328	90	12190728	2095054	12.28	2572139	301055	79	2381213	646336	8.07	521777	414211	8.23	341088
1977	1363552	92	12487664	2566509	12.24	3142654	326239	75	2460364	646121	8.09	522821	507249	8.06	408950
1978	1382903	93	12902011	3024611	13.32	4029201	300540	69	2082801	733142	8.41	616599	506445	8.80	445812
1979	1439315	96	13750767	2593621	13.90	3605535	286878	76	2194409	784489	8.67	679825	473246	8.97	424362
1980	1412481	98	13773778	2734940	14.60	3993771	276048	75	2077597	732346	8.91	652762	506401	9.28	469808
1981	1387536	96	13300911	2955039	15.26	4509302	274905	76	2093572	809978	8.68	702811	507958	9.34	474591
1982	1323709	98	12987891	2061299	15.69	3234825	219655	76	1675657	607788	8.58	521394	461338	9.47	436822
1983	1220808	99	12102734	3002227	16.94	5086875	280173	79	2213027	639876	8.38	536103	480514	9.58	460421
1984	1350404	105	14167090	3086200	17.13	5287825	263925	82	2156529	858687	8.96	769384	537503	9.95	534815
1985	1291887	109	14057027	2440000	17.74	4329503	256101	84	2161493	896616	9.70	869718	510002	10.35	527852
1986	1169885	114	13312119	3142759	18.84	5920374	253065	83	2090568	1254322	9.78	1226727	601009	10.68	641878
1987	1222128	117	14356336	2626429	19.63	5155680	229280	88	2012846	1100439	10.55	1160963	550729	9.68	533106
1988	1302611	119	15471111	3405999	19.53	6651917	247805	87	2158629	1177403	10.79	1270418	607490	9.70	589265
1989	1407900	122	17117249	2944609	21.03	6192512	240288	93	2224346	1197735	10.98	1315113	620827	9.98	619585
1990															

Source: 1. Statistical Year Book 1970-1991, Central Bureau of Statistics, Jakarta.

Appendix D.
Table 5. Per Capita Consumption (kg/year)

Year	Rice	Maize	Cassava	Sw.potato
1	2	3	4	5
1970	108.52	20.83	51.20	16.85
1971	108.00	18.70	47.90	16.70
1972	108.27	16.71	48.12	15.28
1973	118.00	26.46	56.58	17.24
1974	115.64	20.69	59.08	17.42
1975	114.24	20.61	60.75	16.77
1976	116.19	18.34	75.97	16.04
1977	120.85	21.52	75.72	16.19
1978	123.35	27.21	73.99	13.40
1979	126.53	24.14	67.95	13.79
1980	130.70	23.55	71.01	12.52
1981	132.53	24.31	64.67	12.31
1982	138.77	17.19	64.40	9.63
1983	145.21	26.58	57.41	12.46
1984	140.20	27.35	60.66	11.88
1985	143.16	21.61	59.13	11.64
1986	147.36	29.25	51.49	11.05
1987	143.17	24.71	51.72	10.41
1988	150.03	30.72	46.28	10.93
1989	151.00			
1990	153.00			
average	130.22	23.18	60.21	13.82

Source: Food Balance Sheet, Central Bureau of Statistics, Jakarta.

Appendix D.

Table 6. Prices of Unhusked Rice and Milled Rice.

Year	Exch.rate (nominal)	Reference Price (US$/MT)	Reference Price (Rp1000/MT)	MILLED RICE				UNHUSKED RICE			
				R of Chg GCPrice	(Purchase Price) GCPrice (Rp/kg)	Non KUD (Rp/kg)	Consumer Price (Rp/kg)	R of Chg GPPrice	(Purchase Price) GPPrice (Rp/kg)	Non KUD (Rp/kg)	Floor Price (Rp/kg)
1	2	3	4	11	12	13	14	15	16	17	18
1970	379.00	188	71		37.0	37.0	45.0				20.9
1971	389.75	107	42	0.0	37.0	37.0	49.4				20.9
1972	413.58	122	51	0.0	37.0	37.0	83.5				20.9
1973	414.17	294	122	31.1	48.5	48.5	99.6				27.9
1974	415.75	459	191	41.2	68.5	68.5	107.8		41.8	41.8	41.8
1975	415.67	313	130	41.6	97.0	97.0	128.5	41.1	59.0	59.0	58.5
1976	415.00	223	92	11.3	108.0	108.0	132.6	17.8	69.5	69.5	68.5
1977	415.17	237	99	1.9	110.0	110.0	140.5	3.6	72.0	72.0	71.0
1978	446.42	335	150	8.6	119.5	119.5	170.2	7.6	77.5	77.5	75.0
1979	630.78	309	195	24.7	149.0	145.5	198.8	21.3	94.0	93.0	90.0
1980	631.78	395	250	17.4	175.0	172.0	226.7	18.1	111.0	108.0	105.0
1981	636.58	417	266	11.4	195.0	191.0	254.8	15.3	128.0	123.5	120.0
1982	666.40	251	167	9.7	214.0	210.0	304.7	14.1	146.0	139.5	135.0
1983	894.29	247	221	11.2	238.0	233.0	328.2	6.8	156.0	152.0	145.0
1984	1030.08	235	242	13.4	270.0	264.0	320.4	13.9	177.7	172.7	165.0
1985	1114.83	198	221	5.6	285.0	279.0	346.1	5.6	187.7	182.7	175.0
1986	1282.85	172	221	0.0	285.0	279.0	387.6	0.0	187.7	182.7	175.0
1987	1649.55	202	334	9.8	313.0	307.0	469.2	8.0	202.7	197.7	190.0
1988	1692.20	283	479	9.9	344.0	338.0	500.9	9.9	222.7	217.7	210.0
1989	1772.14	297	525	17.7	405.0	399.0	523.7	18.0	262.7	257.7	240.0
1990	1980.00	255	505	7.7	436.0	430.0	567.5	7.6	282.7	277.7	270.0

Source: 1. BULOG (National Logistic Agency), Jakarta.
2. Ministry of Agriculture, Jakarta.
3. Central Bureau of Statistics, Jakarta.

Table 7. Consumer Prices of Medium Rice 1969/91 (Rupiah per Kg).

No.	Kota/City	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1	Banda Aceh	38.7	41.0	41.4	44.6	90.5	87.8	113.3	120.8	133.4	139.5	167.7	202.8	221.4	220.3	296.1	304.2	298.2	313.3	361.5	451.7	484.7	500.2	532.5
2	Medan	36.5	42.9	46.4	48.0	100.0	98.8	119.8	126.9	137.0	141.7	172.1	200.6	217.9	236.5	306.7	302.4	316.1	347.9	395.9	490.2	546.6	533.8	589.8
3.a.	Pekanbaru	51.5	50.1	47.2	50.8	98.5	111.7	118.8	135.0	137.7	144.5	175.1	200.6	231.8	254.4	313.7	357.3	356.6	357.7	403.8	479.7	525.0	535.9	570.6
b.	Tg. Pinang	38.8	47.8	49.9	52.3	102.7	115.0	121.4	136.8	138.1	145.4	175.4	203.0	237.3	265.1	316.6	365.4	334.3	371.9	420.8	479.5	523.2	550.6	566.3
4	Padang	44.3	43.2	47.8	45.5	81.3	101.6	106.6	129.4	135.5	142.3	172.6	199.2	230.6	236.8	311.9	347.1	366.9	379.0	396.6	475.8	505.2	515.6	553.6
5	Jambi	42.3	46.0	44.6	49.6	91.6	98.1	101.6	131.2	129.0	138.4	174.5	206.7	231.9	260.2	309.7	321.4	314.0	347.9	403.6	473.6	512.6	538.1	571.0
6.a.	Palembang	43.3	47.6	46.0	49.4	91.1	111.1	112.6	134.4	142.8	149.6	176.4	195.6	224.0	244.2	303.7	346.5	297.3	329.3	407.1	452.5	486.3	483.4	548.1
b.	Pk. Pinang		50.6	49.1	51.1	98.7	116.1	120.4	138.2	141.3	147.8	174.2	207.8	234.5	248.4	304.4	329.7	315.0	334.6	406.5	485.3	531.8	546.0	573.0
c.	Tg. Pandan	46.9	51.3	48.5	51.0	85.8	118.0	118.3	136.8	141.8	154.2	175.2	205.9	231.1	259.2	321.8	336.4	323.1	343.1	406.4	482.4	536.7	535.9	569.8
7	Bengkulu		47.0	44.2	49.2	89.7	103.9	105.3	134.3	144.9	148.8	172.0	202.7	231.7	258.2	311.7	350.1	332.6	392.7	417.3	516.9	574.1	520.4	554.2
8	Lampung	41.9	47.0	42.3	51.1	89.4	111.8	103.4	129.4	133.4	140.3	179.8	202.3	223.5	247.4	296.7	291.5	277.9	326.7	370.5	467.6	460.4	499.3	534.6
9	Jakarta	39.0	45.8	44.7	52.3	73.1	81.7	102.6	120.5	127.0	133.0	170.1	191.7	216.0	234.0	281.8	308.5	310.5	326.4	364.5	497.7	505.4	539.5	570.4
10	Bandung	42.0	46.0	43.2	47.9	76.1	80.8	98.2	121.1	126.3	131.8	164.5	188.9	211.5	228.6	268.9	283.4	277.2	324.1	367.0	472.6	502.8	512.3	540.8
11	Semarang	37.9	44.8	44.0	50.9	75.4	80.1	100.6	122.1	123.7	130.4	164.6	189.6	208.6	229.8	269.8	277.2	265.4	307.5	345.7	436.1	435.8	486.7	527.8
12	Yogyakarta	34.9	40.7	40.0	47.8	69.8	72.1	93.5	119.0	121.2	126.4	159.9	187.6	209.6	228.2	272.0	296.2	289.6	337.9	374.7	410.0	420.8	486.9	534.6
13	Surabaya	52.2	39.8	41.0	46.5	69.7	76.9	97.7	119.5	126.5	132.2	160.0	189.2	204.5	228.4	268.8	281.1	273.4	298.5	335.1	438.3	465.9	504.9	528.1
14.a.	Pontianak	45.5	50.8	49.2	56.5	108.1	114.0	119.8	137.4	140.4	149.0	179.0	212.8	241.3	266.4	295.6	326.5	282.1	367.8	393.0	466.5	511.0	531.6	574.3
b.	Singkawang	44.0	48.4	46.0	55.1	95.4	115.1	110.3	136.3	137.4	147.4	182.1	217.4	241.9	261.6	301.4	326.0		375.2	404.0	480.6	538.8	570.8	576.8
15.a.	Balikpapan	49.7	49.0	47.8	51.4	87.5	113.3	121.2	134.9	140.8	153.0	177.5	210.5	244.9	284.5	346.0	349.6	347.0	362.9	393.3	486.8	504.3	547.5	589.5
b.	Samarinda	51.4	53.0	49.5	51.5	87.8	111.8	118.6	135.1	137.8	148.1	177.1	207.7	241.6	287.5	335.7	353.7	345.2	343.0	385.9	464.2	506.8	525.0	570.9
c.	Tarakan	46.1	51.1	63.3	50.4	87.8	115.1	122.2	136.1	140.8	150.7	181.2	204.2	240.2	302.9	346.9	369.2	375.0	376.5	407.4	508.1	545.8	572.9	613.3
16	Banjarmasin	41.7	43.1	37.4	48.3	79.0	97.3	93.9	123.8	128.5	132.6	170.3	201.9	216.7	244.7	302.6	334.8	331.1	333.0	343.7	471.5	468.8	496.6	522.8
17	Palangkaraya	46.7	45.5	43.1	50.5	102.0	108.6	99.5	133.3	131.0	139.1	167.4	193.7	239.1	253.0	317.6	336.2	325.0	344.3	387.1	468.9	480.1	523.8	540.3
18	Manado	45.4	48.5	49.0	52.9	91.4	118.6	120.5	137.0	139.6	148.7	173.0	200.1	234.5	268.7	306.3	351.2	327.8	342.6	395.4	492.4	501.8	540.9	571.1
19	Palu	44.2	46.5	48.0	48.5	82.0	107.6	104.0	125.1	135.4	143.8	168.3	187.3	206.0	248.6	286.9	318.3	330.2	330.4	390.2	472.9	455.1	500.3	553.8
20	Kendari	30.6	44.3	47.2	48.9	71.7	105.3	116.0	128.7	137.5	141.2	165.4	195.9	225.3	259.7	295.3	336.6	324.8	337.9	388.8	452.6	471.5	498.6	565.9
21	Ujung Pandang	31.3	40.0	41.2	47.4	65.2	87.1	96.1	118.4	116.4	124.8	154.1	183.6	202.3	232.7	274.2	285.5	277.3	299.7	345.0	417.4	435.1	461.6	517.8
22	Denpasar	31.9	42.9	41.4	40.8	61.6	68.8	100.6	122.5	118.3	127.5	151.8	179.6	206.6	224.9	267.5	290.5	292.4	325.0	370.9	425.2	440.4	473.3	532.3
23	Mataram	43.7	39.7	34.5	45.8	69.5	70.9	88.5	114.7	120.6	121.6	153.2	182.4	221.9	223.3	276.0	285.8	292.8	307.8	364.5	450.1	444.9	477.7	550.3
24	Kupang	46.1	47.6	50.0	53.7	78.4	110.8	114.9	133.1	135.0	142.5	169.1	194.2	235.1	274.4	321.1	299.5	338.0	350.2	392.1	462.0	531.0	541.8	561.5
25.a.	Ambon	46.1	50.0	50.0	50.0	85.0	119.9	125.6	136.9	140.0	152.5	175.9	208.0	247.4	272.5	323.4	361.0	370.0	369.4	396.7	474.1	537.1	550.8	588.8
b.	Ternate		49.9	48.5	50.3	81.5	117.5	125.5	136.9	138.8	146.2	173.4	205.5	238.4	280.8	320.5	359.3	300.0	369.4	393.9	476.0	537.1	550.0	585.0
26	Jayapura		2.0	29.1	40.4	38.1	40.0	47.2	96.4	98.6	120.8	163.5	190.7	215.4	308.7	349.5	409.3	404.7	412.4	430.0	479.4	556.3	604.7	613.2
27	Dilly												209.7	244.7	288.5	339.8	367.9	360.9	382.3	418.5	494.3	548.8	548.8	624.3
Rata-rata		42.6	45.0	45.3	49.4	83.5	99.6	107.8	128.5	132.6	140.5	170.2	198.8	226.7	254.8	304.7	328.2	320.4	346.1	387.6	469.2	500.9	523.7	562.3
Std. deviasi		5.6	8.4	5.7	3.4	14.0	18.8	15.0	9.0	9.6	9.3	7.8	9.2	13.2	23.0	23.3	31.6	33.2	26.9	23.4	23.7	39.5		

Source : Badan Urusan Logistik (ROGASAR), Jakarta.

Appendix D.

Table 8. World Price of Rice [Rice price in Bangkok, Thai 25 percent broken]

Year	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1974	224.8	550.0	560.0	575.0	565.0	470.0	470.0	475.0	455.0	410.0	395.0	360.0	459.2
1975	356.0	347.0	342.0	339.0	334.0	288.0	277.0	297.0	317.0	313.0	275.0	270.0	312.9
1976	231.0	229.0	221.0	221.0	221.0	217.0	216.0	210.0	220.0	235.0	227.0	222.0	222.5
1977	225.5	232.0	225.0	219.0	223.0	227.3	234.9	238.0	241.5	245.9	253.4	281.5	237.3
1978	312.6	334.4	362.4	375.6	377.0	375.0	253.0	327.6	330.1	324.9	282.5	268.7	327.0
1979	268.9	273.0	283.4	288.9	293.0	297.0	298.5	321.6	339.6	346.9	343.0	347.7	308.5
1980	366.7	366.2	380.1	383.8	392.2	408.0	408.0	404.7	403.0	400.9	410.8	417.3	395.1
1981	416.0	430.2	453.0	460.0	460.0	464.6	459.8	411.5	396.2	373.1	358.4	325.0	417.3
1982	294.8	273.8	272.5	258.5	251.5	245.8	237.5	239.4	241.5	236.8	228.4	230.6	250.9
1983	228.9	231.0	243.3	244.0	240.9	237.4	230.4	245.4	272.5	267.7	263.4	254.4	246.6
1984	240.0	230.9	229.6	232.0	234.6	237.4	251.6	257.8	241.8	238.9	219.1	209.1	235.2
1985	209.8	205.0	202.2	202.0	202.0	202.0	195.2	190.0	190.0	190.0	191.2	198.3	198.1
1986	190.0	177.5	174.7	158.8	170.5	170.0	170.0	178.7	172.1	170.0	167.9	165.0	172.1
1987	166.5	175.0	181.0	181.0	185.0	185.0	185.0	190.0	218.0	257.0	256.0	248.7	202.4
1988	275.0	298.7	293.8	290.0	280.4	280.0	289.2	281.2	280.0	280.0	280.0	270.4	283.2
1989	257.7	257.0	265.2	270.6	297.0	308.8	340.4	337.0	325.0	313.4	294.0	292.0	296.5
1990	293.5	287.0	277.0	277.0	266.8	255.5	242.0	237.6	238.2	221.7	226.9	224.8	254.0

Source : Badan Urusan Logistik (ROGASAR), Jakarta.
[Daily Market Quotation]

Appendix D.

Table 9. Floor Prices and Purchasing Prices of Unhusked and Milled Rice 1969-1990 (Rp/kg)

Year	Floor price unhusked	Purchased price				No. of INPRES (BIII)	Date of ISSUED (BIII)	Valid from
		Unhusked rice		Milled rice				
		KUD	NON-KUD	KUD	NON-KUD			
1969/70	20.90			37.00	37.00			
1970/71	20.90			37.00	37.00			
1971/72	20.90			37.00	37.00			
1972/73	20.90			37.00	37.00	6/1972		
1973/74 I	25.55			45.00	45.00	2/1973	14 Maret 1973	1 April 1973
1973/74 II	30.40			52.00	52.00			24 Mei 1973
1974/75	41.80	41.80	41.80	68.50	68.50	1/1974	February 1974	1 February 1974
1975/76	58.50	59.00	59.00	97.00	97.00	17/1974	November 1974	1 February 1975
1976/77	68.50	69.50	69.50	108.00	108.00	16/1975	28 October 1975	1 February 1976
1977/78	71.00	72.00	72.00	110.00	110.00	16/1976	18 December 1976	1 February 1977
1978/79	75.00	77.50	77.50	119.50	119.50	11/1977	16 December 1977	1 February 1978
1979/80 I	85.00	88.00	88.00	140.00	139.00	3/1979	27 January 1979	1 February 1979
1979/80 II	95.00	100.00	98.00	158.00	156.00	7/1979		3 Mei 1979
1980/81	105.00	111.00	108.00	175.00	172.00	22/1979	20 October 1979	1 February 1980
1981/82	120.00	128.00	123.50	195.00	191.00	15/1980	20 October 1980	1 February 1981
1982/83	135.00	146.00	139.50	214.00	210.00	13/1981	27 October 1981	1 February 1982
1983/84	145.00	156.00	152.00	238.00	233.00	14/1982	01 December 1982	1 February 1983
1984/85	165.00	177.70	172.70	270.00	264.00	16/1983	21 December 1983	1 February 1984
1985/86	175.00	187.70	182.70	285.00	279.00	12/1984	15 December 1984	1 February 1985
1986/87	175.00	187.70	182.70	285.00	279.00	11/1985	13 December 1985	1 February 1986
1987/88	190.00	202.70	197.70	313.00	307.00	4/1986	01 December 1986	1 February 1987
1988/89	210.00	222.70	217.70	344.00	338.00	6/1987	15 October 1987	1 February 1988
1989/90	250.00	262.70	257.70	405.00	399.00	4/1988	15 October 1988	1 January 1989
1990/91	270.00	282.70	277.70	436.00	430.00	7/1989	25 October 1989	1 January 1990

Source: BULOG (ROGASAR), Jakarta

Appendix D.

Table 10. Urea Production, Consumption, Trade, and Prices

Year	Production	Consumption	Imports	Exports	Reference Price
	------- Metric Tonnes -------				($/MT)
1	2	3	4	5	6
1963	15000	96000	0	0	72.0
1964	46000	78737	15180	0	91.0
1965	46000	83872	29770	0	96.0
1966	41000	109944	46700	0	89.0
1967	44000	105200	64200	0	79.0
1968	42100	198200	151800	0	66.0
1969	39300	105500	107600	0	56.0
1970	45267	201742	99025	0	48.0
1971	48185	196316	214672	0	46.0
1972	59856	347404	244907	0	59.0
1973	85200	350000	255000	0	95.0
1974	165900	345000	611000	0	316.0
1975	207500	341900	159000	0	198.0
1976	184200	351200	10300	0	112.0
1977	396100	465200	9879	184090	127.0
1978	694044	548998	17926	106013	145.0
1979	874826	620419	14356	137678	173.0
1980	958426	850931	124905	82516	222.0
1981	970566	997054	183620	17895	216.0
1982	940294	1082450	235153	43838	159.0
1983	1077189	1049077	72000	148524	135.0
1984	1402400	1285400	128000	104000	171.0
1985	1749100	1299000	8000	338000	136.0
1986	1971100	1359000	5000	969269	107.0
1987	1978900	1460300	8000	470706	117.0
1988	2033100	1585400	6640	434100	155.0
1989	2368700	1559400	5500	774500	132.0
1990		1559400	0	0	157.0

Note:
Source: 2, 3, 4 and 5, FAO Production Year Book.
Source: 6, World Bank Report No.814/92, October 1992

Appendix D.

Table 11. Prices of Fertilizers.

Year	Exch.rate (nominal)	FERTILIZERS								
		Reference Price (US$/MT)	Border Price (Rp/kg)	Trans cost (Rp/kg)	Urea price (Rp/kg)	TSP price (Rp/kg)	Unit Subsidy (Rp/kg)	Subsidy rate (Rp/kg)	Urea Cons (tonnes)	Subsidy cost (bill)
1	2	20	21	22	23	24	25	26	27	28
1970	379.00	48	21	9.0	30.0		-0.1	-0.3	342000	-0.0
1971	389.75	46	21	9.0	30.0		-0.4	-1.3	413000	-0.2
1972	413.58	59	28	9.0	30.0		7.1	19.1	485000	3.4
1973	414.17	95	45	12.0	40.0		17.2	30.1	669000	11.5
1974	415.75	316	151	12.0	40.0		123.1	75.5	604000	74.3
1975	415.67	198	95	18.0	60.0		52.6	46.7	676000	35.6
1976	415.00	112	53	24.0	80.0		-2.5	-3.3	686000	-1.7
1977	415.17	127	61	21.0	70.0		11.6	14.3	962000	11.2
1978	446.42	145	74	21.0	70.0		25.4	26.7	1080000	27.5
1979	630.78	173	125	21.0	70.0	70.0	76.5	52.2	1240000	94.9
1980	631.78	122	89	21.0	70.0	70.0	39.6	36.2	1680000	66.6
1981	636.58	216	158	21.0	70.0	70.0	109.1	60.9	2121000	231.5
1982	666.40	159	122	21.0	70.0	70.0	72.9	51.0	2181000	158.9
1983	894.29	135	139	27.0	90.0	90.0	75.8	45.7	2004154	152.0
1984	1030.08	171	203	27.0	90.0	90.0	139.6	60.8	2366167	330.2
1985	1114.83	136	174	30.0	100.0	100.0	104.4	51.1	2300007	240.0
1986	1282.85	107	158	30.0	100.0	100.0	87.9	46.8	2366199	207.9
1987	1649.55	117	222	37.5	125.0	125.0	134.4	51.8	2529968	340.1
1988	1692.20	155	302	40.5	135.0	135.0	207.1	60.5	2529293	523.9
1989	1772.14	132	269	49.5	165.0	170.0	153.5	48.2	2622934	402.6
1990	1980.00	157	357	55.5	185.0	210.0	228.0	55.2	2690896	613.5

Source: 1. BULOG (National Logistic Agency), Jakarta.
2. Ministry of Agriculture, Jakarta.
3. Central Bureau of Statistics, Jakarta.

Appendix D.

Table 12. Production, Consumption, Imports and Export of Nitrogen, Phosphate and Potash 1950-1990.

	NITROGEN					PHOSPHATE					TSP	DAP	POTASH		
Year	Production	Consumption	Imports	Exports	Price	Production	Consumption	Imports	Exports	Price	Price	Price	Consumption	Imports	Price
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1950	0	10290	10290	0		0	0	0	0				0	0	
1951	0	11445	11445	0		0	0	0	0				0	0	
1952	0	16902	16902	0		0	0	0	0				0	0	
1953	0	18932	18932	0		0	0	0	0				0	0	
1954	0	22274	22274	0		0	6835	6835	0				3678	3678	
1955	0	24599	24599	0		0	4789	4789	0				2732	2732	
1956	0	25000	25000	0		0	0	0	0				0	0	
1957	0	23589	23589	0		0	12903	12903	0				3753	3753	
1958	0	27749	27749	0		0	0	0	0				4858	4858	
1959	0	45512	45512	0		0	8732	8732	0				6165	6165	
1960	0	21097	21097	0		0	0	9945	0	13			10362	10362	29
1961	0	84752	84752	0		0	47110	47110	0	13			3960	3960	30
1962	0	98558	98558	0		0	46227	46227	0	12			4611	4611	30
1963	15000	96000	81000	0	72	0	30000	0	0	12			4000	0	30
1964	46000	78737	15180	0	91	0	14425	14425	0	13			3080	3080	33
1965	46000	83672	29770	0	96	0	8369	8369	0	14			2227	2227	30
1966	41000	109944	46700	0	89	0	28000	28000	0	13			4100	4100	28
1967	44000	105200	64200	0	79	0	13000	13000	0	12	47	69	5500	5500	26
1968	42100	196200	151800	0	66	0	65908	65908	0	12	38	61	7000	7000	24
1969	36900	105500	107800	0	56	0	62597	62597	0	11	39	56	8212	8212	22
1970	45267	201742	99025	0	48	0	28980	18000	0	11	43	54	6471	6884	32
1971	48185	196316	214672	0	46	0	23072	21604	0	11	43	62	4726	4725	33
1972	59856	347404	244907	0	59	0	66778	96046	0	12	68	91	29982	29982	34
1973	85200	350000	255000	0	95	0	85000	85000	0	14	100	119	40300	40300	43
1974	165900	345000	611000	0	316	0	121000	348900	0	55	304	333	33000	33200	61
1975	207500	341900	159000	0	198	0	87600	87600	0	67	203	243	25000	13400	81
1976	184200	351200	10300	0	112	0	12600	12600	0	36	91	120	30000	30000	55
1977	396100	465200	9879	184090	127	0	36000	36000	0	31	98	133	36400	40000	51
1978	694044	548998	17926	106013	145	0	137900	136836	0	29	98	140	78467	79398	56
1979	874826	620419	14356	137878	173	55206	151104	97000	0	33	142	193	84200	84201	77
1980	958426	850931	124905	82516	222	219757	230994	101698	0	47	180	222	91100	91100	118
1981	970566	997054	183620	17895	216	257209	320696	79201	0	50	161	195	136235	136235	113
1982	940294	1082450	235153	43838	159	270598	367726	218359	0	42	136	183	80463	121651	82
1983	1077189	1049077	72000	148524	135	367900	356700	17100	0	37	135	184	107847	151132	75
1984	1402400	1285400	128000	104000	171	461000	437700	3598	13692	36	131	189	151200	132600	84
1985	1749100	1299000	8000	338000	136	463300	494800	12800	10000	34	121	169	178000	180000	84
1986	1971100	1359000	5000	969269	107	513774	556800	7892	800	34	121	154	163000	134630	69
1987	1978900	1460300	8000	470706	117	554418	569161	5814	0	31	136	174	236100	301800	69
1988	2033100	1585400	6640	434100	155	551500	610400	30800	1104	36	158	197	286800	278000	88
1989	2366700	1559400	5500	774500	132	551100	660000	133100	1978	41	144	173	256300	266100	99
1990	0	1559400	0	0	157	0	0	0	0	41	132	171	0	0	98
1991	0	0	0	0	172	0	0	0	0	43	133	173	0	0	109
1992	0	0	0	0	143	0	0	0	0	43	121	145	0	0	112

Note :

Official figure up to Dec 1990

Unofficial estimates, indicates by an asterisk [*]

Source: 2-5, 7-10, 14 and 15, FAO Production Year Book

Source: 6, 11, 12 and 16, World Bank Report No.814/92 October 1992

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