Integrated Assessment of The Impacts of Trade Liberalization on The Rice Sector and The Environment

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1. Introduction

Since the rice sector does not stand alone in the Indonesian economy, therefore all policies to correct the economy will have influences on the rice sector and vice versa. Among the policies which are recognized to have strong influences are:

a. **Rice price policy**. The aim of rice price policy in Indonesia is mainly to meet a double objectives; to maintain a stable rice price in order to protect consumers from high and fluctuating rice prices and at the same time to give incentives to rice farmers by protecting them from a drop in their net incomes. So far rice prices have been kept low since the Indonesian independence in 1945, because rice has been the main staple food of the people and the largest portion of the Indonesians are still belong to the lower income group. High rice price together with high production will of course increase the farmers income, but depress the real incomes of the non rice producers and non agricultural workers.

b. **Trade policy**. Trade policies are distinguished into domestic trade and foreign trade policies. Formerly, rice trading was mainly under the control of State Trading Agency (BULOG). BULOG was assigned to maintain the stability of rice prices. A buffer stock policy was adopted by BULOG. During the great harvest, rice production increases and depresses the rice price. BULOG purchased rice produced by farmers through village cooperative unit (KUD) at a floor price level to protect the rice farmers. The floor price was determined by the government. On the other hand when rice price increased due to the low rice supply in the market, BULOG increased the supply of rice by taking the rice stock and sold to the market. The foreign trade policy is very much related to the GATT and WTO regulation. The GATT and WTO encourage the members to enlarge the members to engage in free trade policy by omitting the trade barriers and domestic subsidies which divert the production from efficiency.

c. **Agricultural inputs subsidy policy**. This is a policy commonly done in the developing countries. Agricultural technology in developing countries, as well as in Indonesia, is relatively less developed than that of developed countries. Farmers needs to be given extension services and encouragement to adopt modern technology such as high yielding varieties, fertilizers, pesticides, irrigation water, and even farm credits. These all actually are to compensate the negative rice price policy which keep the price of rice low. Otherwise, farmers will face double pressures namely a low rice price maintained by the government to protect the non-rice producers and non-farm workers, and high agricultural inputs prices which are the costs of production they have to pay. However, due to the trade liberalization as advocated by the WTO regulation, agricultural input subsidies have been reduced since 1995, besides the government has another objective that is to reduce the subsidy expenditures to correct the annual deficits of the government budgets. The reduction of government subsidy for agricultural inputs has caused the

agricultural inputs, mainly fertilizers and pesticides, to have higher prices, and in turn will affect the rice production.

d. **Macro economic policies**. Energy price policy which recently adopted by the Indonesian government with the objectives of reducing government subsidy to energy prices will also affect the rice sector. Formerly the prices of fossil fuels and electricity were kept low to facilitate the industrial sectors to grow, and also to allow reasonable electricity consumption for households that majority are low income farmers. However, the abolition of energy subsidies has caused the price of fuels to increase and pushed the general prices to rise especialy through the increases in transportation costs. In turn, all of those reduced the real income of the people, including the rice farmers. However, the change in rice price was always behind the changes in other prices, since the rice price was always under the control of the government through the system of floor and ceiling prices.

e. **Development policies**. These policies with the aim of increasing incomes and employement of the Indonesian people will have impacts on the rice sectors. The government often provides large budgets for irrigation development, transmigration of people from Java to outside Java, and also to increase export of non-fuel products. Such policies have caused structual adjustment and of course have impacts on the rice sectors. The growth of the industrial sector, real estates, and public facilities and infrastructures have caused high rates of agricultural land conversion to other uses. Since rice production is mainly found in Java, the land conversion in Java has hurt the rice production very heavily. Land conversion of wet lands (*sawah*) which is mostly appropriate for rice cultivation, was also pushed by the low rice price because the rice production does not give attractive returns to the farmers. In other words, the economic rent in rice production becomes much lower relative to those of other activities outside of agriculture.

2. Identification of the Relevant Time Period to be Studied

In studying the role of rice and the related policies, the time period should be divided into three different periods: a) 1990 – 1994 as a strong support or strong subsidy, b) 1995 - 1998 as a period of AoA, c) 1998 – 2002 period of radical liberalization.

a, **Strong support or strong subsidy**. Since the 1960 to 1994 actually the government of Indonesia had been focusing its effort to increase rice production to achieve food self sufficiency target. High expenditure budgets were spent to build dams, irrigation facilities, flood control system, and river rehabilitation. In fact between 1980 and 1985 Indonesia became a net rice exporter country. However, due to the failure in food diversity policy, where the Indonesian people turned to consume more rice and less diversed foods. The rice consumption per capita increased from 87 kg per kapita per year in 1990 to 130 kg per capita per year in 2001. During the period of 1990 to 1994 the government still encouraged farmers to produce more rice by giving high level of input subsidies, but at the same time farmers were not given price incentives to plant rice. Besides that, the government did not apply import tariff for rice imported instead of quota system, since the rice management was in the hand of the State Trading Entreprise (BULOG). BULOG was the only single agent acted as a monopolist in importing rice. As a result, rice production could not keep in pace with rice consumpiton, and Indonesia then changed its position from net rice exporting country to net rice importing country since 1995.

b. **The period of AoA.** The AoA covered 1994 to 2004 period. In 1995 Indonesia had begun to reduce subsidies for agricultural inputs. Subsidies for pesticides has been banned with a good accuse for it was following the AoA and at the same time the government attempted to economize its budget due to its difficulties in the government finance. At that time farmers had been familiar with the application of the modern farming, therefore eventhough the price of the agricultural inputs had incrased relative to the price of rice,

they still maintained the use of fertilizers and pesticides in order to maintain the same productivity level of rice. This means they sacrifice their net income in the rice production During the period of 1994 to1997, although input subsidies had been banned, the government still applied the quota system and this constrained the volume of rice import. Eventhough the AoA itself requires the country members to apply tarrif rather than the quota system.

c. **The radical liberalization**. In 1997 Indonesia together with some other countries, Thailand, Korea and even Japan, were hit by financial crisis In Indonesia it turned to become economic crisis and followed by political crisis as well. During the economic crisis the government of Indonesia invited IMF to help solve the problems of the economic crisis. The main advise was to liberalize the economy as to abolish and reduce the subsidy system together with opening the market system by changing the quota with tariffication system for rice. Earlier experiences were the falls of the goverment regimes which were always associated with the high prices of rice. To prevent the riot from demanding for the decrease in rice price, the government took the advice of the IMF to open the rice market by allowing all interested agencies to import rice. Import tariff was nil, and BULOG lost its function to a single rice iporter. The result was the volume of rice imported increased significantly to 5 million tons. Indonesia became the largest rice importing country in the world in 1998.. Domestic rice price decreased significantly due to the oversupply of rice, which hit the domestic rice farmers. Low rice price together with high input prices had caused them to feel that planting rice is not attractive for them anymore. This situtation still exist up to now.

3. Main Economic, Social, Environmental Impacts of Trade Liberalization

This section will discuss the impact of changes in rice and agricultural inputs prices on the economic, social, and environment,

and will not assumed that the changes in rice, fertilizers and pesticides prices were specifically caused by the AoA of the WTO.

a. Economic impacts of a decrease in rice price

When the price of rice fell especially in 1998 and after, only very few farmers reduced the rice hectarage and the chemical fertilizers used. Most farmers in fact maintained the use of chemical fertilizers to keep the rice productivity remains at high level, although it means a reduction in the farmers' net incomes. This also happens when the price of chemical fertilizers and pesticides increased to a higher level due to the abolition and reduction of government subsidies; most farmers did not reduce the application of them to the rice crops in order to maintain the relatively high rice productivity. Again it means a decrease in the net income of the farmers. The farmers prefer to do that because they are subsistence farmers. The average size of land holding is less than 0.5 Ha, besides they do not have any ways to earn their alternative incomes. Shifting to other crops is considered very risky for the family's life because other crops such as vegetables and fruits are perishable products and require good handling and marketing systems of which farmers do not have any capability. See Table 1 and 2. From these two tables we can see that most farmers will operate the same areas and use the same level of agricultural inputs alhtough the price of rice rises and the costs of the agricultural inputs also rises. The reactions of farmer respondents to changes in fertilizers and pesticides prices are recorded in Table 1 where only 4% of the farmers respondents shifted to other crops, but 48 out of 251 respondents (18%) maintained the same size of lands for rice cultivation, although they reduced the application of the chemical fertilizers. However, from the total 261 farmer respondents, 204 farmers (78%) maintained both the same size of lands for rice crop and the same volume of chemical inputs as well. It means that about 78% of farmers will suffer from a decrese in net incomes derived from the rice production.

The most important thing is that farmers in Java tend to place food security as the first priority for the family. Whatever happens to them, they must have their food stock in the house. So during

the harvest they will sell a little portion of the harvest, and keep a bigger part for their own family. In addition, this rice stock is also very useful as a source of capital for the next planting season. This situation is quite true for the larger farmers with a size of operated land more than 1.0 Ha.

Tabel 1
Action Taken by Farmers When Price of Agricultural Input Increase In the Selected Villages in Java December 2002/ January 2003

Villages	Reduce Rice Area (person)	Same Areas but Reduce Agricultural Inputs	Same Areas and Agricultural Inputs	Change To other Crops	Total
Central Java					
Pucangan	0	26	40	2	68
Kebagoran	0	3	39	0	42
West Java					
Gegesik Wetan	0	5	94	2	101
Panggang Sari	0	14	31	5	50
Total (person)	0	48	204	9	261
(%)	0	(18%)	(78%)	(4%)	(100%)

Source : Primary data

On the other hand most small farmers because of their poverty, their economic lives actually depend on capital owners (creditors) who provide funds to them to operate the land. This fund is used to finance the tilling of the land, to pay the seeds, fertilizers and pesticides, and even to for the laborers' wages for the rice plantation. When the harvest time comes, farmers sell the harvest immediately to the creditor as payments for the debt and its interest. Of course the rice price is usually depressed to a low level and there is very little choice for the farmers. To support the life of the family, these small farmers and members of the family usually have other sources of incomes whether as farm laborers, or as workers in non agricultural sectors.

Some small farmers if they are lucky they may have other source of income as raising cattle, or plant vegetables in the

backyard of their house. The above patterns are supported by the condition that most of farmers have high number of dependents. See Table 3. From 261 farmer respondents, 44% of them have in average between 4 to 5 persons as dependents in their families, while only less than 3% of them have less than 3 respondents in the family. But still more than 13% of the respondents have more than 6 dependents in the family. These all indicate a heavy burden for farmers to support their family lives.

Tabel 2
Action Taken by Farmers When Rice Price Declines
In the Selected Villages in Java December 2002/ January 2003
(Person)

Villages	Reduce Rice Area	Same Areas but Reduce Agricultural Inputs	Same Areas and Agricultural Inputs	Change To other Crops	Total
Central Java					
Pucangan	1	5	55	7	68
Kebagoran	0	3	39	0	42
West Java					
Gegesik Wetan	1	3	96	1	101
Panggang Sari	0	3	46	1	50
Total	2	14	236	9	261
	(0,7%)	(5%)	(90%)	(3%)	(100%)

Source : Primary data

Tabel 3
Number of Dependence of Farmer in the Selected Village of Java, December 2002/January 2003

Villages	< 3 persons	4-5 persons	> 6 persons	Total (n) person
Central Java				
Pucangan	25	30	12	67
Kebagoran	21	17	4	42
West Java				
Gegesik Wetan	43	43	8	94
Panggang Sari	21	22	7	50
Total	110	112	31	253
	(43%)	(44%)	(13%)	100%

Source : Primary data

In some villages, the rise in agricultural inputs prices especially for chemical fertilizers has caused some farmers to reduce the application of them and supplement part of them with the organic fertilizers. With the application of organic agricultural inputs, the environmental quality is expected to be better off than before and of course will be good too for the health of the people. However, there is a negative point attached to the organic agricultural inputs since the application of organic fertilizer is not practical and in total is more costly compared to the chemical inputs. Also, the supply of organic fertilizer is too little relative to its demand because the number of cattle has been declining in the last decades. Furthermore, there is a competition between the demand for feeds for the existing cattle and for the raw materials of organic fertilizer. So, a new technology is needed to produce organic fertilizers to be similar in practice and comparable costs as chemical fertilizers.

b. Social impacts of a decrease in rice price

1. The local tradition as indigenous culture

In one of the studied village (Gegesik Wetan) rice farming seems to be a way of life of the people. Since most of the people are rice farmers due to a good technical irrigation system, they will never plant other crops except rice. And there is a custom that before they plant rice for a certain season, they conduct a ceremony with a big fiesta of puppet show (*wayangan*). No one has the courage to plant their land with rice before the *wayangan.* So this is a culture which the society is willing to maintain. By doing this, people maintain the social relation and could share the rural wealth.

This culture perhaps is related to the level of education of the farmers. Most farmers in the studied villages had only primary education (87% of respondents) and very few had high school (11%) and higher education (7%) as can be seen in Table 4. The education background very often influences a person in taking the risk.

Long before the economic crisis of 1997 and the radical trade liberalization in 1998, great number of young workers left the agricultural sector moved to the non-agricultural sectors mainly in the cities. Furthermore with the growth of modernization and improvement in the education level which has increased the number of the educated people, although mostly are still at elementary to junior high school levels of education, it is learnt that it is to be very difficult to find farm laborers in the villages nowadays. The youngest age of farmers now is 35 years old with an average age is about 45 years old. This data are found in the four sample villages for this study.

This condition is worsened by the pressures on the agricultural sector in the form of low incomes received in that sector because of the low price of rice. The younger age working groups (*less than 35 years old*) are preferred to work in the factories and to be motor vehicle drivers rather than in the agricultural sectors. This tendency in fact helps to increase the

costs of farm laborers in the rural areas. The labor scarcity has pushed the farm laborers to have even a bargaining power such as to determine the time schedule of the work and even the wage rates. However, since there is only low earning of the farmers derived from the rice sector, their wage rate although is considered high for the agricultural sector, but still relatively low compared to the non agricultural ones.[4]

Tabel 4
Education level of Respondents in the Selected Villages of Java December 2002/ January 2003

Villages	Elementary School (person)	Junior High School (person)	Senior High School (person)	Higher Education (person)	Total (person)
Central Java					
Pucangan	59	4	5	-	68
Kebagoran	34	5	3	-	42
West Java					
Gegesik Wetan	89	2	7	3	101
Panggang Sari	45	2	2	1	50
Total	227	13	17	4	261
	(87%)	(5%)	(6%)	(7%)	(100%)

Source : Primary data

Another consequence of the economic crisis of 1997, many families fell into the poor group. With the fall of rice price many rural families even became poorer. The government introduced a safety net program by giving subsidized low rice price to the poor group. The devise is to provide 20kg rice at the subsidized price (called *raskin*) to each poor household. The National Food Logistic Agency (BULOG) was assigned to conduct the

program. The floor price of BULOG is was actually Rp 2,800 per kg of rice in January 2003 and the *raskin* price was Rp. 1,000 per kg. Unfortunately this program did not work well in practice. The recipients of the *raskin* practically sold back the rice to the market to gain the price differences. So it was not an effective way to help the poor. In addition, the devise was modified in the field by village head so that the real poor household received only 5 kg of rice instead of 20 kg. This was because of the number of the poor turned to be larger since many families claimed to be poor families in order to receive the *raskin.*

2. Impacts of trade liberalization on poverty

Trade liberalization may have a wide impact on the Indonesian socio-economic factors. Among the socio-economic factors, poverty is the main issues to be studied. Poverty is a multidimensional aspect of human life phenomena. Trade is not the single factor that may affect the poverty, but trade may have a significant impact to the poverty as long as it related to the economic variables that affect both income, employment, and expenditure of the households.

Conceptually, poverty can be attributed to the institutional failures, including market and political failures, in allocating productive resources among the members of the society[5]. Previous study indicates that poverty in rural area is highly correlated to the lack of access to public infrastructures and services. It is imperative to say that rural poverties are situated in the remote or isolated villages. These poor villages mostly are having a little social and economic interaction with the center of development in the urban area. The poverty in that rural area is also characterized by subsistent farming activities.

Data on population under the poverty line is compiled by the Central Statistics Agency (BPS) based on the National Socio

Economic Survey, which is onducted every three years. It was defined that "a person who cannot afford to fulfill the basic minimum requirement is categorized as poor" (BPS-Statistics Indonesia, 2001)[6]. Data on the percentage of population below the poverty line in the period of 1976 – 2001 (Table 4 and Figure 1 – 2) show that percentage of both rural and urban poverties were declining in the period before national economic recession (1976 – 1993). In the period of economic recession (1996 - 1998), and in time when Indonesia implementing radical trade liberalization for rice and other basic food commodities, the percentage of poverty tended to be increasing.

In the economic recovery period (1998 – 2001), the percentage of population under poverty line in urban area tended to decrease from 21.9 percent to 9.8 percent. At the same period, the percentage of population under poverty line in rural area, however, tended to decrease insignificantly from 25.7 percent to 25.0 percent. This phenomenon implies that the population in rural area, under global economy, tended to recover from economic recession slower than the population in urban area.

Data in Table 5 and Figure 1- 2 show that the majority of poor people are situated in rural area. It is interesting to observe that the absolute number of poor people in rural area was declining significantly in the period of 1976 – 1996 (pre-crisis period). The economic development strategy during that time, therefore, can bee seen as the *pro-rural* economic development strategy. The data also indicates that absolute number of poor people in rural areas tended to increase after the economic recovery period 1999 – 2001, meanwhile the number of population under poverty line in urban areas tended to decrease in that period. This implies that the recovery program underwent during the liberalization era can be considered to be bias toward the *pro-urban* economic strategy.

Table 5
Percentage and Number of Population Below The Poverty Line (1976 – 2001)

Year	Percentage of Population Below the Poverty Line (%)			Number of Population Below the Poverty Line (Million people)		
	Urban	Rural	Urban +Rural	Urban	Rural	Urban +Rural
1976	38.8	40.4	40.1	10.0	44.2	54.2
1978	30.8	33.4	33.3	8.3	38.9	47.2
1980	29.0	28.4	28.6	9.5	32.8	42.3
1981	28.1	26.5	26.9	9.3	31.3	40.6
1984	23.1	21.2	21.6	9.3	25.7	35.0
1987	20.1	16.1	17.4	9.7	20.3	30.0
1990	16.8	14.3	15.1	9.4	17.8	27.2
1993	13.4	13.8	13.7	8.7	17.2	25.9
1996	13.6	19.9	17.7	9.6	24.9	34.5
1998	21.9	24.7	24.2	17.6	31.9	49.5
1999	15.1	20.2	18.2	12.4	25.1	37.5
2000	14.6	22.1	19.0	12.1	25.2	37.3
2001	9.8	25.0	18.4	8.5	28.6	37.1

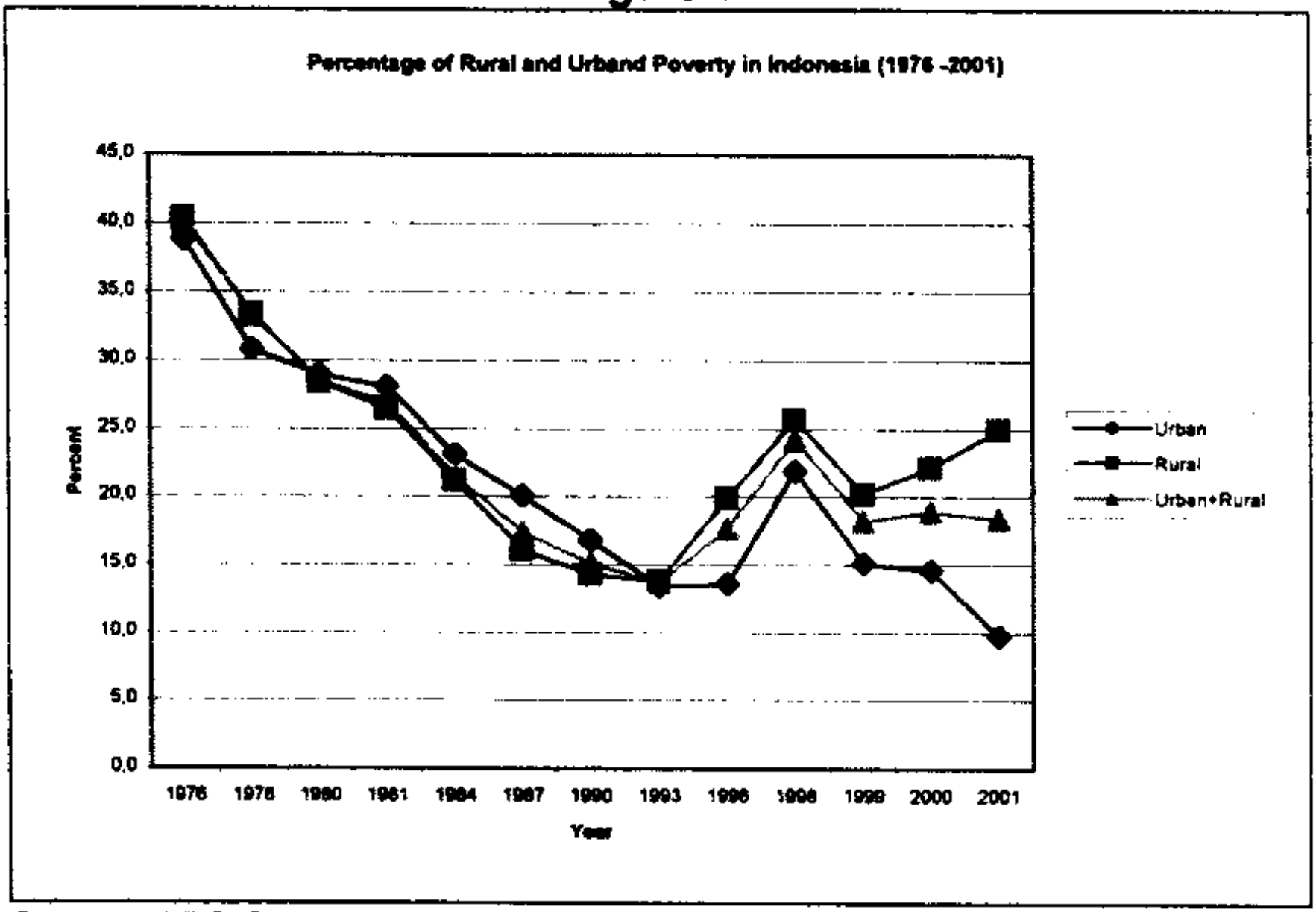
Source: *BPS-Statistics Indonesia. 2001.*

Using a CGE (computable general equilibrium) model for Indonesia, called WAYANG, Croser (2002) predicted the impact of trade liberalization to income distribution and poverty by using 1993 database. Croser indicated that complete removal of all tariffs and tariff-equivalent import licensees will reduce poverty and improves the welfare of households. However, wealthier households may benefit by more than poorer households, thus widening the income gap between households in each socio-economic group.

The Croser's prediction on the impact of trade liberalization was quite contradictory compared to the empirical evidence that the rural poverty in fact tended to increase during the trade liberalization era. One can argue that Croser's model did not incorporate the assumption that trade liberalization in Indonesia, especially in the rice economy, occurs in conjunction with the economic recession. One can argue also that the assumption of using international price as benchmarks of the economic

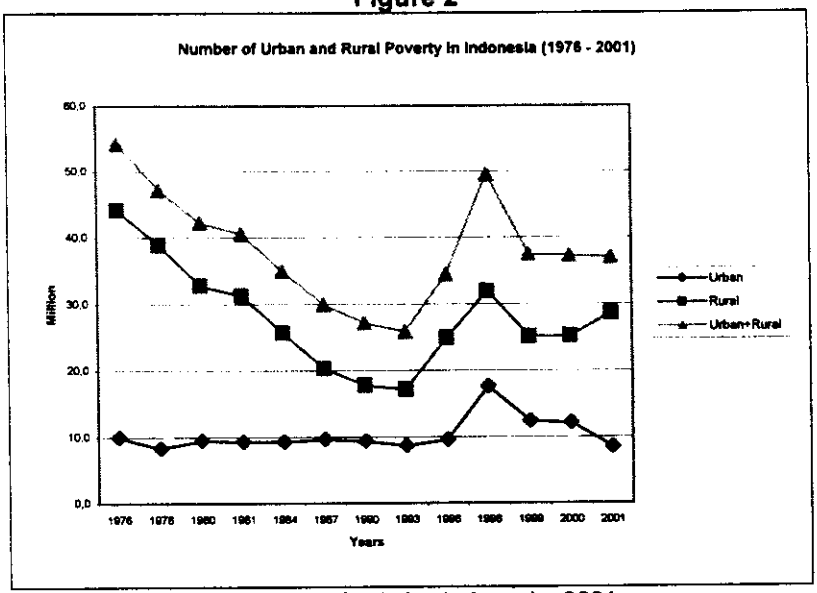
efficiency may not be the realistic assumption. These days some developed and rice exporting countries implement high export subsidies, as well as, domestic support policies. It is evident that at present, Indonesia is facing "artificially" low price of rice in the international market. This will cause the economic disincentive for Indonesian farmers to produce rice, and in turn will have negative impact for the poverty in rural area.

Figure 1



Source: *BPS-Statistics Indonesia. 2001.*

Figure 2



Sorce: BPS-Statistics Indonesia. 2001.

c. Environmental impacts of a decrease in rice price

Actually both the government and the people have responded positively to the challenges for good environmental quality. The real problem for the environmental concern is in fact how to alleviate the poverty level of the people. In the short run people are more concern with food and other basic necessities rather than the environmental quality, because the effect from lack of the basic necessities will quickly affect the quality of life of the people relatives to the effect of poor natural environment. It is common for the poor people that they will choose basic necessities to be fulfilled first before a good environmental quality. In other words, the poor people are willing to take the environmental risk more than those of the basic necessities.

1) Land resources

Land is the fundamental resource for agricultural activities. Indonesia is endowed with very abundant land resource with

various qualities. Many volcanoes are found in Java that made the land very fertile and is appropriate for rice farming. The distribution of agricultural land utilization in Java can be seen in Table 6 where from the total of 9,562,471 Ha of agricultural land 13,344,391 Ha or almost 35% is used for rice farming.

Table 6
Land Utilization in Java, 2000

No	Land users	Ha	%
1	House compound	1,774,093	18.55
2	Dry land for crop cultivation	3,112,370	32.55
3	Meadows	40,412	0.04
4	Dyke	132,365	1.38
5	Water pond	35,272	0.03
6	Fallow land	65,413	
7	Wood land	457,597	0.07
8	Agricultural estates	600,558	4.78
9	Wetland (rice field)	3,344,391	6.29
			34.97
Total		9,562,471	100.0

Source: Computed from Central Statistics Agency

However, the total wet land for rice farming has been decreasing due to the expansion of modern non-rice sector such as for industrial sites, businesses, office buildings, real estates, and roads. (See Table 7) The yearly average in 1991 – 1993 about 35,47 Ha or 33.33% of rice field in Indonesia and 18,257Ha or 31.51% of rice field in Java were converted to non-agricultural uses. The reasons for the conversion of the agricultural land was mainly that the agricultural sector is not attractive for it yields only a relatively low land rents compared to that of the non-agricultural sector. (Fachruddin Agus *et al* , 2001)

Table 4.7
Rice Wet Land Converted Non-agricultural Uses, 1991-93

No.	Wet Land Converted to:	Hectares		%	
		Java	Indonesia	Java	Indonesia
1	Housing	28,602	57,897	52.22	54.40
2	Industry	14,481	16,452	26.44	15.46
3	Offices	3,178	5,210	5.80	4.90
4	Others	8,509	26,774	15.52	25.16
5	Total	54,772	106,424	100.00	100.00
6	Yearly average	18,257	35,474	31.51	33.33

Source: *State Ministry for Environment*, 1999

a) Fertilizer used and its impacts

As has been found everywhere that the impacts of long continuous application of chemical fertilizers had been the decrease in soil fertility. The decreasing quality of land in terms of land fertility can be measured by the volume or the quantity of fertilizer used for the same land in order to keep the land fertility remains the same. During the 20 year period of 1982 to 1997. he use of fertilizer per hectare of rice production in Java had been at an increasing rate. Table 8 indicates the volume of fertilizers used by farmer respondents in the sample villages. Urea fertilizer was the most used by farmers, followed with SP36, KCL, TSP, ZA, and NPK was the least. In this study most farmers were small farmers with the land size of less than

one hectare, with the average size of land holding was about 0.62 hectares, although in one village (Kebagoran village) the average size of land holding was only 0.22 ha.

Tabel 8
Average Land Size and the Use of Fertilizer per Ha in the Selected Village of Java, December 2002/ January 2003

Villages	n	Total Land Size (Ha)	Ave-rage Land Size (Ha)	Urea (Kg/ Ha)	TSP (Kg/Ha)	NPK (Kg/ Ha)	SP36 (Kg/Ha)	ZA (Kg/ Ha)	KCL (Kg/ Ha)
Central Java									
Pucangan	68	19.6	0.29	227.45	47	1.28	37	20.28	4.1
Kebagoran	42	9.12	0.22	200	42.3	0	74	0.54	10.5
West Java									
Gegesik Wetan	101	97.29	0.96	239	30.48	4.63	140	4.32	37.5
Panggang Sari	50	34	0.68	231.6	1.5	8	243	94.85	32.35
Total	**261**	**160.01**	**0.62**	**233.8**	**26.97**	**4.67**	**58.45**	**25.3**	**30.78**

Source : Primary data

Converted to the costs of agricultural inputs, Table 9 presents the data collected from the sample villages. Labor costs to be the highest share of the costs of production inputs which is about 54.6% of the total costs of inputs. Then followed by the costs of chemical fertilizers which shares about 22.4% of the total costs of inputs, while farmers spent very little for organic fertilizer which is about less than 1% of the total input costs. Costs for seed also have a relatively high share of the costs of the production inputs which is about 4.8% of them. From the figures we could expect that the changes in fertilizer prices could still have some impacts on the agricultural practices. However, farmer respondents tend to maintain the use of the same amount of chemical fertilizers. In this case we should look at the more longer period in order to see the real impacts. It means that to examine the impacts of the changes in rice price and the agricultural input prices should be for a longer period than present

The Department of Agriculture has estimated the agricultural needs for fertilizers for the 2003 fiscal year to be 4,800,000 tons of urea, 900,000 tons of ZA, 400,000 tons NPK, and 1,400,000 tons SP36. At present, the application of chemical fertilizers is still considered important to prevent a drastic decrease in rice production. However, in the long run these all are very potential for worsening the land quality in particular and the environmental quality in general, the rice productivities in the short run.

Tabel 9
Average Cost of Agricultural Inputs in 4 Selected Village of Java
December 2002/ January 2003
(Rp 1000/Ha)

Villages	n	Total Land Size (Ha)	Average Land Size (Ha)	Seed	Fertilizer		Pesticides	Labor	Trac-tor	Total
					Chemical	Organic				
Central Java										
Pucangan	68	19.6	0.29	122	416	82	37	944	144	1,745
Kebagoran	42	9.1	0.22	191	363	22.4	74	1,333	236	2,337
West Java										
Gegesik	101	97.3	0.96	91	501	0	140	1,154	217	2,104
Pg. Sari	50	34	0.68	117	576	0	243	1,520	350	2,456
Total	**261**	**160.0**	**0.62**	**106**	**499**	**18**	**145**	**1,216**	**240**	**2,224**

Source : Primary data

The impact of fertilizer use on the quality of water occurs during the fertilization of the plant when water flow includes in it some fertilizers that are not absorbed by the soil. In some place it may accumulate and causes the growth of water plants (*gulma*) and at the same time may cause the quality of water decreases due to some fertilizer contaminations. In the case of water we may say when the quality of water decreases meaning that the quantity of it for certain purposes also decreases for certain purposes, although the quantity as a whole is not affected.

Most farmers understand the decreasing soil fertility from the prolonged use of chemical fertilizer as appear in Table 10. From the table, 54% of the 261 farmer respondents understand that the soil quality of the rice field decreases due to the continues use of the chemical fertilizers, while32% of the total respondents said that the quality of the soil remains the same, and about 14 of the total respondents did not have any ideas about the changes in soil fertility.

b) Pesticide used and its impacts

It is also understood that a long and continuous application of chemical pesticides has resulted in poor health of people directly and indirectly. The direct impact of chemical pesticides is mainly suffered by farm laborers or farmers who are directly exposed to the pesticides while they are working in the farms, whereas the indirect impact accrues to those who consumes raw foods and drinks surface water contaminated by the pesticides and the fertilizers. In addition, the air quality may also worsen because of the contamination due to the spread of the pesticides used in the rice farming. Budi P. Resosudarmo and Erick Thorbecke quoting Achmadi said that in 1988 there were approximately 3,000 cases of acute poisoning were associated with the use of pesticides in agricultural sectors. They noted also that each year approximately 35% of farmers who used pesticides contracted chronic pesticide related-illness.

Tabel 10
Changes in Soil Quality due to Fertilizer used in the Selected Village in Java, December 2002/ January 2003

Villages	Constant (person)	Decrease (person)	No Idea (person)	Total (person)
Central Java				
Pucangan	22	36	10	68
Kebagoran	11	21	10	42
West Java				
Gegesik Wetan	36	53	12	101
Panggang Sari	14	30	6	50
Total	**83**	**140**	**38**	**261**
	(32%)	**(54%)**	**(14%)**	**(100%)**

Source : Primary data

The Central Statistics Agency provided figures that in 1990, approximately 40 million people worked in agricultural sectors and around 28 million of them were farmers and agricultural workers who utilized pesticides. Thus the estimate of chronic pesticides related illness cases for 1990 approximately 35% x 28 million people equals to 9,8 million people.[7] These illness include headaches, weakness, insomnia, difficulties in concentration, nausea, excessive sweating and salivation, and chest tightness. Based on several interviews with medical doctors working in public hospitals and public health centers in Jakarta, an estimate of total health costs associated with acute

and chronic pesticide poisoning cases was Rp 0.67 billion and Rp 8.33 billion, respectively.

Primary data collected from the 4 sample villages indicate the farmers response about the medical costs spent for medication of the impacts of pesticides used. (Table 4.11). Before the trade liberalization it seemed that 148 farmer respondents (57%) not spend money at all for curing the impacts of pesticides use. This number in fact increased insignificantly after the 1998 trade liberalization to be 163 farmers or 62% of the farmer respondents. This indicates a less use of pesticides by the farmers resulted from the IPM program together with the increase in pesticides prices. The number of farmers who suffered from the impacts of pesticides use was higher after the trade rehabilitation period only for the group who spent between Rp 20,000 to Rp 50,000 or about US$ 2 to US$ 5 per case. But the number of farmers who spent less than Rp 20,000 or US$ 2 became much smaller after the 1998 trade liberalization. These data show that there was a quite minor impact of pesticide use in the rice farming in the studied villages.

Table 11
Medical Cost to Cure the Pesticide Impacts before 1998
In the Four Selected Villages of Java

Villages	< Rp 20,000		Rp 20.000-50.000		None		Total (n)
	Before	After	Before	After	Before	After	
Central Java	13	10	3	5	52	53	68
Pucangan	4	2	-	-	38	40	42
Kebagoran							
West Java	57	16	14	40	30	45	101
Gegesik	17	12	5	13	28	25	50
Wetan							
Panggang							
Sari							
Total	**91**	**40**	**22**	**58**	**148**	**163**	**261**
	(35%)	(15%)	(8%)	(22%)	(57%)	(62%)	(100%)

Source : Primary data

2) Water resources

Water resource is a key factor for agricultural production. Indonesia is endowed with huge volume of water resources. Table 12 indicates the availability of water and its uses according to sectors and islands in Indonesia. From the table we learn that Java has the least water supply but it uses the most of it. Among the sectors, agriculture compared to other sectors is the largest user of water. Figures on distribution of water use in Java is presented in Table 13, where about 82% of water is consumed by the agricultural sector namely for irrigation purposes. Other sectors, the spraying of water for cleaning the city and for drinking and industrial uses together consume about 8.6% and 7.1% respectively.

Table 12
Availability and Utilization of Water By Island
1995 (in million m^3/year)

Island	Water availability	Irigation	Drink Water Industry	Spraying Water	Water Poud	Poulty
Sumatera	426,642	28,358	1,684	1,974	1,517	89
Java	122,697	52,486	4,524	5,445	721	140
Nusa Tenggara	43,702	5,657	7,267	195	38	48
Kalimantan	518,382	3,409	224	327	735	14
Sulawesi	139,584	14,007	313	444	330	65
Maluku & Papua	496,423	167	86	115	0	5
Indonesia	1,747,430	104,083	14,097	8,499	3,341	367

Source : Cetral Statistics Agency, 1996.

Table 13
Total Water Use in Java, by Sectors1995

Sector	Volume (million m^3)	%
Irigation	52,486	82.9
Drinking/ Industry	4,524	7.1
Spraying	5,445	8.6
Brac kish water Poud	721	1.2
Poulty	140	0.2
Total	63,316	100

Source : Central Statistics Agency, 1996

Table 14 presents the availability of water in total and in per capita basis. Again it appears that Java is the most critical compared to other islands, since the per capita water availability is the lowest (1,013 m3/person) while the highest is found in Maluku and Papua with 118,224 m3/person.) and the average availability of water is about 8,489 m3/person for Indonesia.

Table 14
Water Supply, Number of Population, and Water Supply per Capitaby Islands

Islands	Water supply		Number of population		Water supply per capita m^3/capita
	Billion m^3	%	Person (000)	%	
Sumatera	426,642	24.42	43,227	21.00	9,869
Java	122,697	7.02	121,097	58.83	1,013
Nusa	43,702	2.50	11,095	5.39	3,930
Tenggara	518,382	29.67	11,301	5.49	45,871
Kalimantan	139,584	7.98	14,924	7.25	9,353
Sulawesi	496,423	28.41	4,199	2.04	118,224
Maluku & Papua	1,747,430	100.00	205,843	100.00	8,489
Total Indonesia					

Source: Cetral Statistics Agency, 1996.

However, it does not mean that water is not a problem, because the oversupply of water and if not well managed may cause flood and erosion. This occurs mainly during the wet rainy season. During the dry season water may become scarce since it is not caught properly by vegetation especially at the upper areas due to poor forest and other crops management. In order to maintain adequate supply of water, watershed area has to be covered with good forest and well maintained. A good condition of watershed may guarantee a sufficient supply of water for the agricultural sector, including the rice farming. Besides that, a good condition of forest cover in the watershed area will also facilitate the habitat of the biodiversities which in turn will provide good stock of natural medicine for the health of the people. Due to unavailability of data on biodiversity in forest and rice field, this aspect will not be measured and valued, although it is understood as a very important aspect to be examined.

Concerning water resources, Randy Stringer et.al. has projected that in the future up to 2020, the demand for water in agriculture will decline as result of significantly improved efficiencies anticipated in irrigation delivery systems as well as the changing in the economic structure. The water withdrawals fall by 4% in 2010 and by 36% by 2020. (*Anna Strutt and Kym Anderson, in Stringer, et.al., pp.77-81*). In addition they also projected that water quality will be affected by higher emission of pollutants from major industries, and declined.

3) The environmental impacts of decreases in rice price due to trade liberalization

The environmental impacts caused by trade liberalization can be distinguished into product effect, technology effect, scale effect, structural effect, and regulatory effect. Table 15 helps us to understand the different effects of trade liberalization in the rice sector.

a. Product effect. This type of effect is associated with goods or inputs that can improve or deteriorate the environment. In the case of rice, trade liberalization has increased rice import and this does not have any direct impacts on the environment.

Table.15
Checklist of Impacts of Trade Liberalization on the Economy and the Environment in Indonesia: Rice Sector

Economic effect	Related economic/environment factor	Air quality	Water supply	Water quality	Land quality	Erosion	Biodiversity
Product effect	Rice import	(0)	(0)	(0)	(0)	(0)	(0)
Technological effect	Fertilizer use	(0)	(0)	(0)	(0)	(0)	(0)
Scale effect	More available rice raises more activities in other sectors	(-)	(-)	(-)	(-)	(-)	(-)
Structural effect	Shift in land use for non agricultural land	(-)	(-)	(-)	(-)	(-)	(-)
Regulatory effect	Reducing input subsidies Floor price	(+) (+)	(0) (+)	(+) (-)	(+) (-)	(0) (+)	(+) (-)

Notes: (+) means having positive impacts
(-) means has negative impacts
(0) means has neutral effects

b. Technology effects. These effects are in the form of changes of production techniques brought by the trade reforms. An indication was found in the studied villages that the technology effect occurred in the form of changes but insignificantly in the use of chemical fertilizer to organic fertilizer. Most farmers maintained the use of chemical fertilizers and very insignificantly supplementing them with the organic fertilizers. The reasons for not changes in the practice of fertilizer usage was because farmers considered the organic fertilizer as very bulky and gave slow response of the soil, and finally it turned to be more expensive

c. Scale effects. These effects are seen as a higher rate of use of natural and environmental resources due to a higher level of economic activities resulted from trade liberalization. It is very difficult to measure because although the domestic rice production dwindled,

the domestic market was flooded by the rice import, and the net result is rice is more available in the market. Even worst, the domestically produced rice price has dropped very drastically due to very low quality besides the competition of the rice import. Rice processing industries such as rice mills may close down because lacks of rice inputs, while those industries which process rice as their production inputs may develop faster due to the more rice availability and cheap rice price in the market. The scale effect of a decrease in rice price is one of the effects that felt significantly because farmers may search for other source of earnings such as from sand digging and quarrying. The decreased in rice production may decrease the local government revenues derived from land taxes, because the net incomes of farmers decline due to low rice price and poor quality of rice produced. As a result, the local government will be more intent in searching for local natural resources as the main source of local government incomes by relaxing the issuance of permits. (See the analysis on the impact of trade liberalization and decentralization system).

d. Structural effects. These effects are in the form of changes in the economic structure as it specializes in the production of goods and services where it has competitive advantages. Trade liberalization tends to encourage farmers to sell their land for non-agricultural uses rather than to shift to other non-rice crops. In connection with the decrease in rice price it was found that only 2 respondents or 0.7% of total farmer respondents replied that they reduced the size of land for rice crop, 5% of respondents maintained the same rice area and most of the respondents (90%) maintained the same size of rice area and the same volumes of inputs as well. Only very small number of farmer respondents shifted to other crops, but then they returned to rice again. (See again Table 1 and Table 2).

Refering to Table 16 we learn that among the 261 farmer respondents, 159 farmers or 61% of the total number of farmer respondents did never plant other crops except rice, whereas 17% of the total farmer respondents had ever changed crops for less than one year, 20% between one or two years, and the rest 2% for more than two years. This information may lead to a wrong conclusion

because the change to other crops were not permanently, but only temporary, and finally many of them mixed their planting, some areas for rice and mostly some others for non-rice crops.

From the RRA held in Pucangan village of Kebumen Kabupaten of Central Java, it is understood that in 1980's when the price of rice declined to a very low level, one of the larger farmer respondent converted 0.50 Ha of the rice crop into orange crop. After harvesting for three times of the orange plantation, the crops were attacked by virus and caused damage to the crop. Then he turned back to rice cropping. However, when the rice price dropped again in 1998, he attempted to plant orange crops again, but after it was harvested for two times, the crops were also attacked by virus and caused a damage. As a result he made up his mind that whatever the price of rice will be, he will never turn from the rice crop, mainly for the safety reason. Rice is easier to store and lasts longer, while fruit products need better technology since these are perishable products and more vulnarable to desease, and thus do not last long.

Tabel 16
Ever Planted other Crops in the Selected Villages in Java December 2002/January 2003

Villages	Never	Yes for < 1 year	Year for 2 years	Yes for > 2 years	Total
Central Java					
Pucangan	39	22	7	0	68
Kebagoran	23	17	2	0	42
West Java					
Gegesik Wetan	55	3	43	0	101
Panggang Sari	42	2	1	5	50
Total	**159**	**44**	**53**	**5**	**261**
	(61%)	(17%)	(20%)	(2%)	(100%)

Source : Primary data

Another practice of shifting in land function is also found in one of the studied villages. In the village of Kebagoran, Kebumen Kabupaten,

Central Java, farmers dig their rice land for sale to the roof-tile factories. Although it has been practiced earlier bfore the trade liberalization, the decrease in the price of rice has futrther encouraged farmers in the Kebagoran village to stop planting their lands with rice and sell the soil to the roof-tile factories. The soil is dug for one metre deep and then the top 0.25 metre is left and ploughed back to the rice field, while the other 0.75 metre is taken away as the raw material for roof-tile production. The soil digging operation takes approximately six months for one hectare of land and gives income as the rental cost of Rp 15 million per Ha, which is about 6 times higher than the net income when it were planted with rice. The farmers could not plant the rice field for six months that is during the soil digging operation, but then they could plant the field back in the following seasons although at a lower yield of rice. When they sell soil this way, it is locally termed as *rental* (*sewa*) system. When there is a land sold and dug for that purpose, the neighboring rice fields or lands would follow to be sold, otherwise the land may slide down. As a comparison, the price of a permanent sale of land for change in title was Rp 65 million per Ha in early 2003 which is only about 4 times of the rental price.

The next linkage of the development of roof-tile industry which is supported by the sale of soil from the rice field, is the growing activities in the fire wood industry. The fire wood industry involves the cutting of trees at the upper region and may have negative impacts on soil fertility, high rate of erosion and high level of sedimentation in rivers and dams. Although the cutting of trees as the sources of firewood for the roof-tile industries occurred in other villages of other Kabupatens, the negative impacts still remain. The growth of the roof tile industry is in line with the growth of housing sector, and it may demand more fire woods that in turns may result in the rate of erosion and sedimentation in the canals resulted from the high level of wood cutting at the upper areas. Very recently many places in Java suffered from land sliding which caused many kills and monetary losses. This means that the management of the upper region and forests has been very poor too.

e. ***Flora and fauna.*** To close this chapter an indicator for the betterment of the environment can be seen from the farmers response about the flora and fauna found in the fields. Table 17 presents the farmers, opinion about flora and fauna in the four studied villages.

Table 17
Changes in Flora and Fauna to be Better off in the latest five years 1998 -2003

Villages	Yes	No	No idea	Total
Central Java				
Pucangan	51	8	9	68
Kebagoran	33	9	-	42
West Java				
Gegesik Wetan	96	3	2	101
Panggang Sari	2	48	-	50
Total	**182**	**68**	**11**	**261**
	(70%)	**(26)%**	**(4%)**	**(100%)**

Source : Primary data

From 261 farmer respondents 182 farmers or 70% of the total respondents answers that there are more flora and fauna compared to the situation before 1998. Now they can see again more birds, fire flies, frogs, snakes and snails and eals in the rice fields. More plants mostly grass also grow better. But still 26% of the respondents said that the quality of the environment still poor looking at the qualiy of water and air.

4. The impact of decentralization system on resource management

Since the introduction of the decentralization system of the Indonesian government on the first of January 2001, the role of natural resources as the main source of revenues for many local governments becomes very important, because the central government has given a bigger share of the revenues derived from the natural resources to the local governments. Local governments whose lands contained natural resources such as oil, gas, coal, forest and even fish, have proved to gain much higher income share from the central government. For instance, for fossil fuel, the share given to the local government is 15% and the rest 85% is still for the central government. Whereas for forest resources and coal mining, the local government earned 80% share and the central government earned 20%. (Law No. 25, year 1999 on Intergovernmental Finance in Indonesia).

It seems the decentralization system has encouraged many local governments to find new sources of local income and tends to deplete more their natural resources in order to meet the need of local budget. In fact the central government has reduced the subsidies to the local governments and pushed the local government to find their own financial sources. So far the forest resources have suffered from a big harvest and very slow replantation; therefore it caused the water sources to suffer from shortages, especially during the dry season and floods during the rainy season. In 2002, Java was experiencing a very long drought. Many rice fields especially the rainfed rice fields could not be supplied with enough water. The water level in most dams in Java declined and was short to water the irrigated rice fields. As a result of poor management of forest, it threats the survival of the rice farming, because the rice crop demands a lot of water, especially for the high yielding rice varieties. In other words, the existence of rice farming is in a more difficult situation nowadays. In turns farmers will seek other sources of income such as from forests and quarrying and other non-agricultural sectors. Hence, the villagers and local governments may deplete the available natural resources.

5. Conclusions

From the above discussion it is understood that there is a linkage between trade and economic, social and the environment. The Agreement on Agriculture (AoA) has a strong influence on the economic and social aspects. Through the impact on the price of rice, rice farming is becoming unatractive for the farmers. Alhtough on one side there is an improvement on the quality of the environment due less use of chemical fertilizer, but since rice has multifunctions in the economy, the total loss might be larger than the benefits. The government has to also provides support to the poor to counter the negative impacts of the trade liberalization. This is another costs of the trade liberalization. The benefits of the trade liberalization is mainly in the form of reasonably low price of rice and more rice is available to the economy.

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