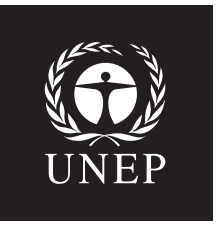
UNEP

Integrated Assessment of the Impact of Trade Liberalization

A Country Study on the Indonesian Rice Sector



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Foreword

Indonesia's food security and rural development are based on rice production, which provides the bulk of farm incomes and agricultural employment. When trade liberalization has a negative impact on rice farmers' net incomes it may cause a decline in rice production. This, in turn, has a number of environmental, social and economic consequences. Indeed, when the environmental multifunctionality of rice fields was taken into account, it was clear that a switch from rice to other crops, or the conversion of land to other non-agricultural uses generates far more costs than benefits. In addition, massive infrastructure developments were carried out specifically for rice cultivation making the land unsuitable for non-rice crops or forests. Also, if rice farmers abandon their farms to seek more lucrative work in cities, increased urbanisation can cause social as well as economic problems, particularly if urban infrastructures are unable to accommodate the influx of rural migrants. Finally, the national economy is also affected because the growing dependence on imported rice requires increased amounts of foreign exchange that could otherwise be used for development projects.

Indonesia could have met its food self-sufficiency target in 1984 and was in fact a net rice-exporting country from 1985 to 1987. Since 1988, domestic production has been unable to meet domestic demand and the country has become a net importer of rice. Indonesia started implementing the WTO AoA in 1998. Since trade liberalization, Indonesia's self-sufficiency ratio has decreased and its dependence on rice imports has increased. At the same time the price of rice has declined due to the low price of imported rice, resulting in a number of negative social, environmental and economic effects. Agriculture already contributes less to the gross domestic product (GDP) and employment than in 1975.

This study is an integrated assessment of the economic, social and environmental impacts of the WTO AoA and other trade-related policies on the rice sector, and it makes use of a variety of methodologies, including an Input-Output table to determine the backward and forward industry linkages, different valuations of environmental, social and economic costs and benefits, and so forth. Stakeholder participation was an important part of the process, and interviews with farmers provided the primary data used in this study.

An integrated assessment of the impacts of trade and trade-related policies was essential in view of the economic, social and environmental importance of Indonesia's rice sector. The main objectives of this study were to explore the trade-environment-development linkages and determine how the AoA and other trade-related policies have affected the environment, society and the economy. The end goal is to develop policy packages based on the findings of this study to mitigate the negative effects of trade liberalization and trade-related policies and promote the positive ones. It is also expected that the process will help build national capacity in (i) carrying out integrated assessments of trade-related policies; (ii) elaborating country and sector specific methodologies to assess impacts; (iii) understanding the implications of multilateral trade rules; (iv) negotiating on trade-related issues; (v) establishing long-term development policies and processes that address environmental as well as socio-economic concerns, including poverty reduction; and (vi) coordinating between national entities as well as the private sector.

Acknowledgements

A number of individuals and institutions have been involved in the development of this study. Jenderal Soedirman University conducted the study and organized the stakeholder meetings and seminars. Matius Suparmoko coordinated the project and worked in collaboration with the other team members: M. Husein Sawit (BULOG) and Maria Ratnaningsih (Wacana Mulia Institute for Research and Training in Environmental Economics). Special acknowledgement goes to Prof. Rubijanto Misman, Rector of Jenderal Soedirman University and to the team. It must also be recognized and acknowledged that this study has been enriched by the comments of the steering committee members, especially Dr. Dedi Masykur Riadi and his staff (BAPPENAS), throughout the process of this project. Thanks are also due to the stakeholders from civil society, different levels of Government, academics and the private sector, who provided valuable input and information, participated in national and local meetings, and engaged in active debate on different subjects analysed.

At UNEP, the project was initiated and led by Hussein Abaza. Sophie Forster Carbonnier and Mariko Hara coordinated and provided technical and logistical support to the project. The country teams prepared the full studies as well as the summaries included in the synthesis report (*Integrated Assessment of the Impact of Trade Liberalization, UNEP Country Projects Round III, A Synthesis Report*). Thanks are due to Jan Joost Kessler, Konrad von Moltke and Fulai Sheng for having provided critical reviews of draft reports. This appreciation is also extended to the members of the international working group on rice set up by UNEP to guide and implement the projects and provide comments. The members of this group, who attended the two international expert meetings on 19-20 February and 17-18 November 2003 in Geneva, and provided useful contributions and comments on these occasions, are: Tunji Akande, Nigerian Institute of Social and Economic Research; Claude Auroi, IUED (Institut Universitaire d'Etudes du Développement); Luisa Bernal, South Centre; Concepción Calpe, FAO; Céline Charveriat, Oxfam International; Martha Chouchena-Rojas, IUCN; Aliou Diagne, West Africa Rice Development Association; Salah El Serafy, Consultant, USA; Aimée Gonzales, WWF International; Dongmei Guo, State Environmental Protection Administration, China; Nestór Gutiérrez, Federación Nacional de Arroceros, Colombia; Mark Halle, IISD; Dimitris Kiakosavvas, OECD; Panos Konandreas, FAO; Doug Koplow, Earth Track, Inc.; Hans-Jörg Lehmann, Federal Office for Agriculture, Bern; Eric Peters, European Commission; Majda Petschen, WTO; Shishir Priyadarshi, South Centre; Sarah Richardson, Maeander Enterprises Ltd., Canada; Abdoulaye Sene, Institut des Sciences de l'Environnement, Dakar; Shefali Sharma, IATP; Miho Shirotori, UNCTAD; Matius Suparmoko, Jenderal Soedirman University, Indonesia; Robert Teh, WTO; Gerard van Dijk, UNEP Regional Office for Europe; Truong van Tuyen, Hue University of Agriculture and Forestry, Viet Nam; Scott Vaughan, OAS (ex-Carnegie Endowment); Rene Vossenaar, UNCTAD; Alex Werth, ICTSD.

Susan Broomfield edited the final study; however full responsibility for the content remains with the authors. Logistical support was provided by Desiree Leon and Rahila Mughal from UNEP.

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United Nations Environment Programme

The United Nations Environment Programme (UNEP) is the overall coordinating environmental organization of the United Nations system. Its mission is to provide leadership and encourage partnerships in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations. In accordance with its mandate, UNEP works to observe, monitor and assess the state of the global environment, improve the scientific understanding of how environmental change occurs, and in turn, how such change can be managed by action-oriented national policies and international agreements. UNEP's capacity building work thus centres on helping countries strengthen environmental management in diverse areas that include freshwater and land resource management, the conservation and sustainable use of biodiversity, marine and coastal ecosystem management, and cleaner industrial production and eco-efficiency, among many others.

UNEP, which is headquartered in Nairobi, Kenya, marked its first 30 years of service in 2002. During this time, in partnership with a global array of collaborating organizations, UNEP has achieved major advances in the development of international environmental policy and law, environmental monitoring and assessment, and the understanding of the science of global change. This work also supports the successful development and implementation of the world's major environmental conventions. In parallel, UNEP administers several multilateral environmental agreements (MEAs) including the Vienna Convention's Montreal Protocol on Substances that Deplete the Ozone Layer, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (SBC), the Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention, PIC) and the Cartagena Protocol on Biosafety to the Convention on Biological Diversity as well as the Stockholm Convention on Persistent Organic Pollutants (POPs).

Division of Technology, Industry and Economics

The mission of the Division of Technology, Industry and Economics (DTIE) is to encourage decision makers in government, local authorities and industry to develop and adopt policies, strategies and practices that are cleaner and safer, make efficient use of natural resources, ensure environmentally sound management of chemicals, and reduce pollution and risks for humans and the environment. In addition, it seeks to enable implementation of conventions and international agreements and encourage the internalisation of environmental costs. UNEP DTIE's strategy in carrying out these objectives is to influence decision-making through partnerships with other international organizations, governmental authorities, business and industry, and non-governmental organizations; facilitate knowledge management through networks; support implementation of conventions; and work closely with UNEP regional offices. The Division, with its Director and Division Office in Paris, consists of one centre and five branches located in Paris, Geneva and Osaka.

Economics and Trade Branch

The Economics and Trade Branch (ETB) is one of the five branches of DTIE. Its mission is to enhance the capacities of countries, especially of developing countries and countries with economies in transition, to integrate environmental considerations into development planning and macroeconomic policies, including trade policies. ETB helps countries to develop and use integrated assessment and incentive tools for sustainable development and poverty reduction. The Branch further works to improve the understanding of environmental, social and economic impacts of trade liberalization and the trade impacts of environmental policies, and to strengthen coherence between Multilateral Environmental Agreements and the World Trade Organization. Through its finance initiative, ETB helps enhance the role of the financial sector in moving towards sustainability.

In the field of environmental economics, ETB aims to promote the internalisation of environmental costs and enhance the use of economic instruments to contribute to sustainable development and poverty reduction, including in the specific context of Multilateral Environmental Agreements. The UNEP Working Group on Economic Instruments serves as an advisory body to UNEP-ETB's work programme on economics and has been instrumental in the preparation of UNEP publications on economic instruments.

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Executive Summary

A research team consisting of researchers from Jenderal Soedirman University (five economic faculty members and one agricultural faculty member), one researcher from the Food Logistic Agency (BULOG) and one researcher the Ministry of Agriculture conducted this study. The project was also supported by a group of 12 students from Jenderal Soedirman University who conducted interviews with farmers.

In April 2001 the United Nations Environment Programme (UNEP) invited participants from several rice producing countries to a meeting in Geneva to discuss potential studies to assess the economic, social and environmental impacts of the Agreement on Agriculture (AoA). Jenderal Soedirman University in Indonesia submitted a proposal that was accepted by UNEP and a MoU was signed between both institutions. The other six countries carrying out similar studies are China, Colombia, Côte d'Ivoire, Nigeria, Senegal and Viet Nam.

The study was launched with a meeting involving stakeholders from the rice sector on 22 November 2002. About 30 participants from different institutions and a senior member from UNEP attended the meeting. The participants included technical staff from the Ministry of Agriculture, Ministry of Industry and Trade, Ministry of Environment, the State Food Logistic Agency, the Jenderal Soedirman University, the Farmer Organization, the Indonesian Pesticides Analytical Network (PAN), the Land Research Institute, and the Research and Training Institute. Discussion focussed on the role of the World Trade Organization (WTO) AoA in relation to the Indonesian rice sector as well as on the methodology to approach the problems of the study, determine the sample villages and define the analytical methods to be adopted. Primary data was collected using rapid rural appraisals (RRA) involving 261 rice farmers in the selected villages in West and Central Java in late 2002 and early 2003.

An international meeting was held in Geneva on 19-20 February 2003 involving the seven countries taking part in these studies and other members of the international working group on rice set up by UNEP to guide and implement the projects and provide comments (members of this working group are listed in the Acknowledgements). This meeting helped shape the study and redirect project objectives, especially in relation to the methodology, and the participating countries learned from each other's methods.

In late February 2003 a steering committee was formed in Indonesia to discuss and improve the form and methodologies of the study. The steering committee consisted of the Deputy of the Ministry of Environment, the Deputy of the Ministry of Planning, the Director of the Mass Guidance and Rice Security Agency of the Department of Agriculture, the Director General of the Ministry of Foreign Affairs, the Expert Staff to the Minister of Trade and Industry, and the Rector of Jenderal Soedirman University. Members of the steering committee also provided comments on the draft final report that was presented at the second international meeting in Geneva on 18-20 November 2003, following which written comments were sent by UNEP to the respective study team leaders for incorporation as far as possible into the studies.

The Executive Summary of the report was also presented at a seminar on Natural Resource Accounting on 12-14 December 2003 in Indonesia and many comments and suggestions were received on that occasion.

Three distinct periods are covered in this study: 1990-1994 when the Government still provided strong support and subsidies; 1995-1997 when the Government of Indonesia (GOI) began implementing the AoA; and 1998-2001 as a period of radical trade liberalization. The study examines the economic, social and environmental impacts of trade liberalization on the rice sector. A summary of the findings is presented hereafter. It should be noted, however, that isolating the effects of trade liberalization from the effects of other policies has been difficult. Furthermore, the impacts of trade liberalization are different in Java compared to the outer islands in view of different social and environmental conditions that offer different opportunities and limitations. This study focuses on the impacts on rice farmers from West and Central Java, and the findings may not be applicable to other areas.

Indonesia's rice-growing area is ranked fourth highest in the world. About 56 per cent of Indonesia's rice is grown on Java where just over 50 per cent of the rice farmers cultivate landholdings of less than one quarter of a hectare each. Whilst in many areas traditional rice varieties are still being used, especially by the small-scale rice farmers, some larger-scale farmers are using new rice varieties to increase yields and production. Integrated Pest Management (IPM) has led to a reduction in the use of pesticides; however, in most cases chemical fertilizers are still being used instead of organic fertilizer, mainly because the latter is difficult to process and handle, is not available in sufficient quantities, and is perceived to be less efficient than chemical fertilizers.

Indonesia's food security and rural development are based on rice production, which provides the bulk of farm incomes and agricultural employment. In 2002, some 23 million families out of a total of 52 million in the country were involved in rice production. For many communities rice farming is a way of life that they wish to preserve, so rice production has a cultural or social value. Rice also plays an important role in the economic and political stability of the country and its price has acted as a barometer in the Indonesian economy, for example when the rate of inflation was especially high in the 1960's. This is because rice is by far the most important source of calories and protein for the Indonesian population, and its per capita consumption is high (about 130 kg/annum in 2002). About 21 per cent of household budgets are spent on staple foods, mainly rice, indicating that people are still living at subsistence level. Approximately three quarters of Indonesia's poor people lived in rural areas in 2001.

Indonesia could have reached its food self-sufficiency target in 1984, and was a net exporter of rice from 1985 to 1987 and in 1993. Indeed, prior to trade liberalization the Government encouraged significant rice production increases through the construction of dams and irrigation infrastructures and the provision of other agricultural services and subsidies. However, since 1988 production has mostly been unable to meet total demand and the country has gone from being a net exporter to a net importer of rice. Although per capita production, which fluctuated around 132 to 151 kg per year between 1983 and 2002, could theoretically cover per capita end-consumer demand, part of the seeds are saved for the next sowing season, some of the production is lost due to improper post-harvest handling and transportation, and some of the local production is used as an input by the rice milling industry (RMI).

Trade liberalization began in 1995 when Indonesia started implementing the AoA. This required Indonesia to reduce and abolish its subsidies on agricultural inputs such as pesticides and fertilizers. As a result rice production costs increased. Indonesia's rice trade liberalization was mainly guided by the International Monetary Fund (IMF)'s structural adjustment programme in response to the country's economic crisis. Initially, rice imports decreased from over three million tons in 1995 to 406,000 tons in 1997. However, in 1998 Indonesia's domestic rice production declined, and the economic crisis was accompanied by a major social conflict. The drop in domestic production can be attributed in part to the economic crisis, but also to the severe drought related to the "El-Nino" phenomena in Indonesia. It is estimated that the drought alone accounted for a 4-5 per cent reduction in domestic rice production. The shortage of rice caused prices to flare temporarily and, in view of the importance of rice in the Indonesian diet, the combined effect

engendered social panic and conflict. At the same time many people fell into the poor category, although prior to the economic crisis the poverty rate had been decreasing. The Government knew from previous experience that sufficient rice supplies could mitigate this panic so, in line with the IMF's advice, at the beginning of 1998 Indonesia liberalized rice imports and applied a zero tariff. Imports peaked to over six million tons in 1998 and over four million tons in 1999, averaging almost three and a half million tons per year between 1998 and 2002.

The increased supply of cheaper imported rice on the domestic market caused the price of domestically produced rice to fall. Combined with the increase in production costs due to the suppression of input subsidies, the decrease in the price of rice constricted farmers' net incomes even further. The Government subsequently reintroduced tariffs for imported rice in an effort to protect local production, but on the whole trade liberalization has increased Indonesia's import dependency on rice, decreased its self-sufficiency ratio and generally affected rice production in Java.

As of 1 January 2002 Indonesia has also been implementing the regional trade agreement among members of the ASEAN Free Trade Area (AFTA), which effectively involves applying a 0-5 per cent tariff for agricultural products by 1 January 2010. However, rice is included in the list of sensitive products that benefit from a longer period before the tariff has to be reduced to 0-5 per cent.

Whilst rice consumers have benefited from the lower price of rice, rice farmers have been the main losers since their net income from rice production has declined. Lower net revenues have acted as a disincentive to produce rice, and rice production has been stagnant in Java since 1999. On the other hand, the interviews revealed that a large majority of Javanese farmers continued to grow rice despite the lower revenues, and the few small-scale farmers who attempted to grow other crops mostly reverted to rice production. There are several reasons for this. First, rice is often grown as a subsistence crop and a large part of the harvest is used for the farmer's household consumption. Second, rice farming is a way of life for many communities, so these farmers will continue to grow rice irrespective of the price of rice. Third, there are difficulties and risks involved in the production, marketing and transport of other crops such as fruit and vegetables, and generally small-scale poor farmers have neither the technical knowledge nor the financial resources to tackle these problems. Finally, the small landholdings of less than half a hectare that are characteristic in Java make diversification problematic.

Examination of the economic impacts was carried out using an Input-Output table to visualize inter-industry relationships and backward and forward linkages. On the whole, rice production has largely contributed to pulling agro-chemical and other industries that supply inputs for rice production and pushing industries that use rice as a raw input. In turn, the RMI has contributed to pulling rice production and pushing other industries that use milled rice as an input. However, declining prices and increased production costs discourage farmers from adopting new technologies and maintaining rice crops. As a result, rice yields have been declining. Yet the strong forward and backward linkages of the rice sector mean that changes in rice production have impacts on other industries, particularly rice mills, rice trade, and livestock and poultry that are fed on rice bran, a side-product of the rice mills. Another economic impact of trade liberalization is that Indonesia's increased dependency on imports and dwindling rice production mean that it is becoming a high-risk country in terms of food security due to its lack of foreign exchange, its heavy debt and the instability of the domestic currency.

A study of the social impacts reveals that in 1998 there was a sharp increase in the number of persons living below the poverty line. Whilst this may be attributed in great part to the economic crisis, the decrease in the poverty rate after trade liberalization was much slower in rural areas than in urban areas. This may be due, at least in part, to the reduction in net revenues of rice farmers who, after all, represent a large proportion of the population in rural areas. Urbanisation and the lack of interest among the younger generation in rice farming seem to be related to the low wages of labourers in the rice farming and the

declining price of rice. The problem already existed prior to trade liberalization but appears to have been aggravated by the reduction in net revenues from rice farming after trade liberalization. Paradoxically, it is interesting to note that during the co-existence of trade liberalization and the economic crisis in Indonesia many displaced labourers, particularly from industrial and urban sectors, were absorbed by the agricultural economy. However, in the long term this would tend to increase rural poverty. Successful rural development should result in more equal income distribution, reduce poverty and prevent uncontrolled urbanisation, but it is evident that at present the low price of rice acts as an economic disincentive for rice farmers to produce rice and has a negative impact on poverty in rural areas.

Environmental impacts were computed based on the multifunctionality of rice fields in preventing floods, erosion and landslides, retaining water, improving water quality, recycling waste and maintaining air quality, but also in terms of the negative aspects of rice production, including pollution and health effects resulting from the use of agro-chemicals. One of the important findings of the study was that, when valuations were made of the various environmental impacts of rice farming, the benefits derived from the multifunctionality of rice fields far outweighed the costs resulting from the use of agro-chemicals. In monetary terms, the conversion of Javanese rice fields to other uses represents a net environmental loss of US$ 2,101.12 per hectare per year, or a total economic, social and environmental loss of about US$ 3,927 per hectare per year.

The study found no product, technology or regulatory effects, since the imported rice had no environmental effect, trade liberalization did not have an effect on rice production technology, and the level of agro-chemical use remained more or less constant despite the suppression of subsidies. Reductions in pesticide use occurred prior to trade liberalization with the introduction of IPM techniques. However the study did identify structural and scale effects, such as the development of industries using rice as a raw material and changes in land use.

Declining net revenues due to lower prices and less Government incentives is already pushing farmers in Java to convert their agricultural land for the other purposes such as housing, manufacturing and roads. In some cases the topsoil is sold as input for brick and roof-tile industries. Between 1990 and 2000, the average annual rate of land conversion from rice fields to other uses was around 6.91 per cent. If this trend were to continue at the same rate it is estimated that in less than 20 years the whole of Java's agricultural land would be converted to non-agricultural uses, e.g. housing, offices, schools, shops and manufacturing plants. Although a Government regulation prohibits the conversion of fertile rice fields to other uses, this has not been effective in practice since the Government cannot guarantee that rice farmers will earn higher incomes if they do not convert their land to other uses. These land-use conversions will cause overall rice production to decrease, but will also result in the loss of the multifunctionality of rice fields. Furthermore, the conversions are permanent and irreversible.

Based on the findings of the study, the policy implications are that the Government should develop policies with a double function of helping poor urban consumers and protecting the livelihoods of farmers. The Government should make full use of subsidies allowed by the AoA to promote measures to increase domestic rice production and yield in order to protect food security, improve environmental quality and reduce poverty. It should also adopt a long-term strategy to finance the maintenance and development of irrigation infrastructures, increase farmers' capacity in IPM and develop environmentally friendly agriculture for sustainable development. The latter would include new technologies to increase rice production, reduce the cost and facilitate the handling of organic fertilizer, and improve the quality of the rice produced as well as the post-harvest technology and marketing systems.

It is recommended that the Government consider the environmental costs of land conversions – whether from forests to rice fields or from rice fields to other uses – when issuing permits for such conversions. Taxes should be used to discourage unsustainable land use, taking into account the multifunctional

benefits of rice fields compared to other land uses. The study recommends funding further research on the biodiversity value of both forests and rice fields, in view of the current gap in available data in this area.

The Government should develop a policy that encourages Indonesians to diversify their diet and thus reduce the per capita consumption of rice. This would help Indonesia reduce its increasing dependence on rice imports and save foreign exchange. Increasing production and productivity of food crops that have a comparative advantage may have a significant impact on food security and poverty reduction.

The study also highlights the need for wealthier countries to significantly reduce their support to their respective agricultural sectors. Meanwhile, the Indonesian Government has to maintain a certain tariff level to protect domestic rice producers, since allowing Indonesian rice prices to fall to the level of world markets undervalues the contribution of rice production to Indonesian social welfare, and a sustained period of low domestic rice prices can impair Indonesia's capacity to produce adequate quantities of rice in the future.

This project has benefited Indonesia in a number of ways. The methodology used to carry out the study was a new experience for Indonesia in that it involved stakeholders from all levels of the rice sector as well as individuals from a variety of institutions. Its capacity building function has benefited the in-country research teams who were provided with a methodology as well as technical and financial support from UNEP. Foreign researchers have carried out most previous research, and without UNEP's support the research team involved in this project would have had little opportunity to be exposed to an international forum. The international consultations provided the opportunity for the Indonesian researchers to discuss similar projects and exchange experiences, which was useful for disseminating information, knowledge and methods on conducting effective research. The substance of the study will be useful for the development of policy recommendations and will provide background material to support the arguments of Indonesian negotiators and delegates at WTO conferences related to the AoA.

Abbreviations and Acronyms

AFTA	ASEAN Free Trade Area
AoA	Agreement on Agriculture
ASEAN	Association South East Asia Nations
AV	Ad valorem
BAPPEDA	Badan Perencanaan Pembangunan Daerah (Regional Planning Board)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BPS	Badan Pusat Statistik
BULOG	Badan Urusan Logistik (Food Logistic Agency)
CEPT	Common Effective Preferential Tariff
CGE	Computable General Equilibrium
CVM	Contingent Valuation Method
DS	Domestic Support
ES	Export Subsidies
FAO	Food and Agriculture Organization of the United Nations
FOB	Free on Board
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GOI	Government of Indonesia
IDR	Import Dependency Ratio
IMF	International Monetary Fund
KIMPRASWIL	Permukiman dan Prasarana Wilayah (Department of Public Work)
KLBI	Kredit Likuiditas Bank Indonesia (Credit for Liquidity from The Central Bank /Bank Indonesia)
KUD	Koperasi Unit Desa (Village Cooperative Unit)
NAV	Non ad valorem
OECD	Organization for Economic Cooperation and Development
OPK	Operasi Pasar Khusus (Special Market Operation)
PAN	Pesticides Analytical Network
PI	Rice production industry
RCM	Replacement Cost Method
RMI	Rice milling industry
RRA	Rapid Rural Appraisal
STE	State Trading Enterprise
UNEP	United Nations Environment Programme
UR	Uruguay Round
WTO	World Trade Organization

1. Background to the project

1.1 Relevance of the rice sector to the national economy

Indonesia is an archipelago country with the largest population in the world after China, India and the United States of America. The rice-growing area is ranked fourth highest in the world. Food security and rural development are based on rice production, which provides the bulk of farm incomes and agricultural employment, so rice is a strategic commodity for Indonesia. In 2002, some 23 million families out of a total of 52 million in the country were involved in production. About half of these families cultivate less than one-quarter of a hectare of land each. Yet domestic rice production is not sufficient to feed the population and Indonesia has to import rice from other countries.

Rice is by far the most important source of calories and protein for the Indonesian population. In Indonesia rice consumption per capita is very high (about 130 kg/annum in 2002), which indicates that people are still living at subsistence level with a high percentage (21 per cent) of household budgets being spent on the staple food, namely rice.

Rice is of such paramount importance to farmers and consumers and has become a strategic commodity, so the Government's rice policy is to always attempt to reconcile the often-conflicting goals of guaranteeing as far as possible that consumers have access to ample supplies of rice at an affordable price while producers enjoy adequate production incentives. The price of rice also acted as a price barometer in the Indonesian economy when the rate of inflation was especially high (about 600 per cent/year in 1966). When the price of rice increased so did the prices of other commodities and services, not only because of the strength of supply of and demand for rice, but also as a result of the psychological impacts that caused consumers to panic-buy rice and other commodities out of fear of stock shortages of these commodities on the market. To curb the hyperinflation of the 1960s, in 1967 the GOI imported a large quantity of rice, which increased the supply of rice on the market and reduced consumer panic.

1.1.2 Pricing policies

Because rice is a strategic commodity and a staple food, and its price acts as a barometer for other prices, the GOI has, until now, maintained a reasonably low price for rice to guarantee that all segments of society have access to their basic staple food. However, this price policy does not encourage farmers to plant rice. The lower prices and higher production costs due to the abolition or reduction of subsidies on inputs such as agro-chemicals mean that farmers are unable to compete with cheap imported rice.

Prior to the reformation era in 1998, the price of rice was kept low and stable by applying buffer stock and negative rice price policies to gain momentum for economic development. Non-agricultural labourers, civilian workers, students and the army were all protected from high rice prices, while farmers had to accept low rice prices for the sake of development, although they were accorded agricultural input subsidies. During the harvest, BULOG purchased rice produced by farmers to build rice stocks and protect farmers from the declining rice prices. When rice production was low, BULOG sold the rice stock to the market to protect consumers from high rice prices. However, based on advice from the IMF, the Government opened the domestic rice market by abolishing BULOG's monopolistic right to import

rice, and BULOG became a Government enterprise that may be aiming to achieve profitability.

Over the last decade, the price of rice had been more or less constant but the cost of agricultural inputs has kept on rising so that the difference between the price of rice and the price of fertilizer has been closing up. In 1980-82 the price of urea fertilizer was around Rp 100 - 125/kg, while the price of dried husked rice was Rp 320/kg, i.e. 56 per cent higher than the price of urea fertilizer. Four years later (1986) the price of urea fertilizer had increased to Rp 250/kg and the price of rice increased to Rp 600/kg, i.e. 40 per cent higher than the price of urea fertilizer. The price of fertilizer increased further from 1995 to 1997 to Rp 1,100/kg, while the price of rice also increased, but at a lower rate, to Rp 1,200/kg for the same period, i.e. only 9 per cent higher than the price of urea fertilizer. The figures indicate a worsening terms of trade between rice and urea fertilizer compared to other commodities (see Table 1.1).

In 2003, the Government increased the floor price of rice, but the price of other commodities also increased due to inflation, producing no change in the terms of trade between agriculture and non-agricultural sectors. Recently, the Government determined the formal retail price of fertilizers at Rp 1,150/kg for urea fertilizer, Rp 1,000/kg for ZA, Rp 1,500/kg for SP36 and Rp 1,750/kg for NPK. With these prices, farmers are actually receiving price subsidies of Rp 250/kg for urea, Rp 146/kg for ZA, Rp 96/kg for SP36 and Rp 96/kg for NPK. Total Government expenditure for fertilizer subsidies in the 2003 budget was Rp 1,315 billion, of which Rp 1,068 billion for urea, Rp 96 billion for SP36, Rp 104 billion for ZA and Rp 28.3 billion for NPK.

1.1.3 Trade policies

Although Indonesia is the third largest rice producer after China and India, and could have reached food self-sufficiency in 1984, Indonesia's rice imports have been rising tremendously, especially since the reformation era following the economic crisis from 1997 to 1998. The average volume of rice imported from 1995 to 1997 was 1.503 million tons and increased to 3.268 million tons from 1998 to 2001. Rice imports peaked at over six million tons in 1998. With a small decline in rice production, rice imports also increased and raised the dependency ratio on rice imports from 5.3 per cent during the period 1975 - 1997 to 10.3 per cent during the period 1998 - 2002. For 2003 the CDS-Bogor Agricultural University estimates that rice imports will reach 2.3 million tons, while the USDA has predicted that Indonesia's rice imports will reach 3.25 tons, which is higher compared to other countries such as Nigeria (1.7 million tons); the Philippines (1.2 million tons); and Iraq (1.1 million tons).

The high volume of rice imports was mainly a result of the free trade policy for rice but also the real need to import rice. The GOI, following the advice of the IMF and World Bank, abolished import tariffs on rice in 1998. This was the beginning of the radical trade liberalization period. Formerly, rice imports were not controlled by tariffs but by a quota system. Only after the market liberalization and following the proposition of the WTO was a tariff system introduced. But in 2000, after realizing the impact of zero tariffs on a very high volume of rice imports, the Government imposed an import tariff for rice equivalent to 30 per cent of the FOB price. In 2002 the import tariff

Table 1.1: Comparison of rice and fertilizer prices, Indonesia: 1980 – 2003

Year (1)	Rice Price (Rp/Kg) (2)	Fertilizer Price (Rp/kg) (3)	Ratio (4 = 2 : 3)
1980-82	320	113	2.83
1986	600	250	2.40
1995 – 97	1,200	1,100	1.09
2003	2,750	1,150	2.39

Source: BULOG.

for rice was fixed at Rp 430/kg and is planned to be increased to Rp 510/kg this year (2003), although the Farmer Organization (HKTI) has proposed an even higher import tariff of Rp 900/kg in 2003 to protect domestic rice farmers from competition with rice imports.

1.2 Project objectives and hypothesis

1.2.1 Objectives of the project

The main objectives of this project are:

- to explore the linkages between trade, development and the environment;
- to develop policy packages promoting the beneficial effects of trade-related policies or trade agreements on the environment and development;
- to develop policy packages to mitigate any harmful effects of trade policies on the environment and on development.

The detailed objectives of the study are to:

- examine whether the AoA will truly have an effect on the reduction of the price of rice and cause farmers to convert from rice crops to other, more profitable crops;
- determine whether the AoA will incite farmers to convert land use from rice farming to non-agricultural activities;
- investigate whether the AoA incites farmers to reduce their use of inorganic chemical fertilizers and pesticides and increase their use of organic fertilizers;
- analyse whether as a result of the AoA, the quality of land, water and air has improved;
- explore whether as a result of the AoA, water supply for agriculture and non-agricultural activities has improved;
- measure the net benefits resulting from the application of the AoA.

1.2.2 Hypothesis

This study hypothesizes that the AoA will have the following impacts on the rice sector:

- the price of rice in general will be lower due to the implementation of the AoA;
- rice farmers will convert to other crops that are more profitable;
- in the long run, rice farmers will convert land-use to non-agricultural activities since land rent is higher for the latter;
- the supply of water to non-rice sectors will be higher as the demand for water from the rice sector declines;
- water quality will be improved due to a reduction in the use of chemical fertilizers and pesticides;
- air quality will be improved because of the reduction in pesticide use in the rice sector;
- land quality will improve because farmers will shift from chemical to organic fertilizers;
- people's health will improve as a result of less exposure to pesticides in agriculture and an increase in the availability of rice on the market at low prices;
- there will be a net benefit resulting from the adoption of the AoA.

1.3 The project benefits

This project will have the following benefits:

- enhance the country's understanding of the implications of multilateral trade rules and trade liberalization on national sustainable development and the environment and thus strengthen negotiating capacity;
- enhance the country's understanding of the environmental, social and economic implications of implementing the AoA;
- enhance and support national capacity in international trade policy research;
- assess the positive and negative environmental impacts of trade liberalization policies and multilateral trade rules, especially the AoA, taking into account social and economic impacts;
- elaborate country and sector specific methodologies to assess these impacts;
- enhance coordination between national entities and increase national expertise in the use of integrated assessment tools in order to identify

and quantify both negative and positive environmental, social and economic impacts of trade liberalization in the agricultural sector;

– establish a long-term policy development process in the rice sector to address future related environmental and socio-economic impacts of sectoral activity.

1.4 Process and in-country methodology

Seven countries are carrying out this type of study simultaneously. The UNEP office in Geneva is supporting the studies with funding, guidance, discussion and comments on the draft reports by experts, to ensure the study will be meaningful. As a result of the interactions between researchers and experts from various organizations in the world, it is hoped that the outcome of the studies will be useful not only for the countries involved, but also for other countries throughout the world. One of the objectives of the UNEP programme in supporting such studies is to build capacity among researchers and stakeholders, both during and after the study.

1.4.1 Process of the study

UNEP initiated the process by inviting participants from several rice producing countries to participate in a meeting held in Geneva in April 2001 to discuss potential studies to assess the economic, social and environmental impacts of the AoA. The participants were asked to submit a proposal. On acceptance of Indonesia's proposal, an MoU was signed between the Jenderal Soedirman University in Indonesia and UNEP.

1.4.1.1 Stakeholders meeting

The study was launched in Indonesia with a meeting involving stakeholders from the rice sector on 22 November 2002. Approximately 30 participants from different institutions and one senior staff member from UNEP attended the meeting. The participants included technical staff from the Ministry of Agriculture, Ministry of Industry and Trade, Ministry of Environment, the State Food Logistic Agency, the Jenderal Soedirman University, the Farmer Organization, the Indonesian PAN, the Land Research Institute, and the Research and Training Institute "WACANA MULIA". The discussion focused on the role of the WTO AoA in relation to the Indonesian rice sector as well as on the methodology to approach the problems of the study, determine the sample villages and define the analytical methods to be adopted.

1.4.1.2 International meetings in Geneva

The first international meeting held in Geneva on 19-20 February 2003 helped shape the study. Comments and suggestions were fruitful in redirecting project objectives, especially in relation to the methodology, as each country could learn from each other's methods. Based on the comments and suggestions during that international meeting, efforts were made to obtain more literature on methodology.

A second international meeting was convened in Geneva on 18-20 November 2003 to discuss the draft final reports of each country study. Most of the studies had improved in both form and quality, and further comments and suggestions were made to finalize the draft reports. Written comments were sent to the respective study team leaders, to be incorporated as far as possible in the final study reports.

1.4.1.3 Steering committee meetings and seminar

A steering committee was formed in February 2003, after the first consultative meeting in Geneva. The steering committee consisted of the Deputy of the Ministry of Environment, Deputy of the Ministry of Planning, the Director of the Mass Guidance and Rice Security Agency of the Department of Agriculture, Director General of the Ministry of Foreign Affairs, the Expert Staff to the Minister of Trade and Industry and the Rector of Jenderal Soedirman University. Discussions were held among the team leader and steering committee members to improve the form and methodology of the study.

Some members of the steering committee sent written comments before the draft final report was presented at the second meeting in Geneva in

November 2003. The executive summary of the report was also presented and discussed in a seminar on Natural Resource Accounting on 12-14 December 2003 in Baturraden, Purwokerto where Jenderal Soedirman University is located. Many comments and suggestions were obtained from the seminar and have been accommodated as far as possible.

1.4.2 Rationale of the study

Three different periods are covered by this study to analyse production and trade: 1990-1994 as a period of strong support/subsidy, 1995-1997 as a period of the AoA application and 1998-2001 as a period of radical liberalization.

The analysis is based on rice cultivation in Java where most rice is produced in Indonesia, i.e. 55 per cent in 1999 and 56 per cent in 2000. Most secondary food crops (corn, soybeans, peanuts, mung beans, cassava and sweet potatoes) and other agricultural products such as fruits and vegetables are also produced in Java. It was originally hypothesised that vegetable and fruit crops were the main substitutes for rice growing on the same rice land, since it was supposed that their economic value is higher than that of rice. However, after visiting the four selected villages in Central and West Java at the end of 2002 and in early 2003, it was found that most farmers who planted other crops in addition to rice had been practicing a mixed cropping system long before the decline of rice prices in 1998.

1.4.3 Interviewing farmers respondents with questionnaires

Primary data was collected from rice-growing villages by involving 261 farmer respondents in four villages (*desas*), in four different districts (*kecamatans*), in two regencies (*kabupatens*) in two provinces of Java. The *kabupatens* were chosen based on the suggestion made during the stakeholders meeting on the 22 November 2002; they were *kabupaten* Cirebon in West Java Province, and *kabupaten* Kebumen of Central Java Province. The *kabupatens* proposed in the MoU and initial study proposal (Karawang *kabupaten* in West Java Province, *kabupaten* Klaten in Central Java Province and Jember *kabupaten* in East Java Province) were dropped from the sampling because the three villages of the three *kabupatens* are well-irrigated villages.[1] The selection of the villages in each *kabupaten* was based on the results of the consultation meeting between the study team and the regional planning board *(BAPPEDA*) of each *kabupaten*. First, the team together with the BAPPEDA staff determined two sample districts; one district where mainly rice was produced and another district where other crops such as vegetables were produced in addition to rice. Secondly, together with the district head and his staff, the team determined the sample villages. In total four villages in four districts of two *kabupatens* of Java were selected for the study. Figure 1.1 indicates the sampling design for the primary data collection. See also Figure 1.2 showing the map of the study locations.

In view of the difficulties in finding farmers who combined other crops with rice production, only rice farmers were chosen as respondents in this study.

The interviews with the farmer respondents were undertaken by ten undergraduate students (six students from the Faculty of Economics and four from the Faculty of Agriculture of Jenderal Soedirman University), under the leadership of one holder of a Bachelor degree in economics, three teachers from the Faculty of Economics and one teacher from the Faculty of Agriculture. The field data was collected in December 2002 and January 2003.

[1] Farmers in the well-irrigated villages are certainly considered loyal to rice farming because the land is mostly suitable for rice and not for other crops, so any policy changes affecting rice prices will have a minor impact on rice production in these areas.

Figure 1.1: Location of the sample *Kabupatens*, districts, and villages

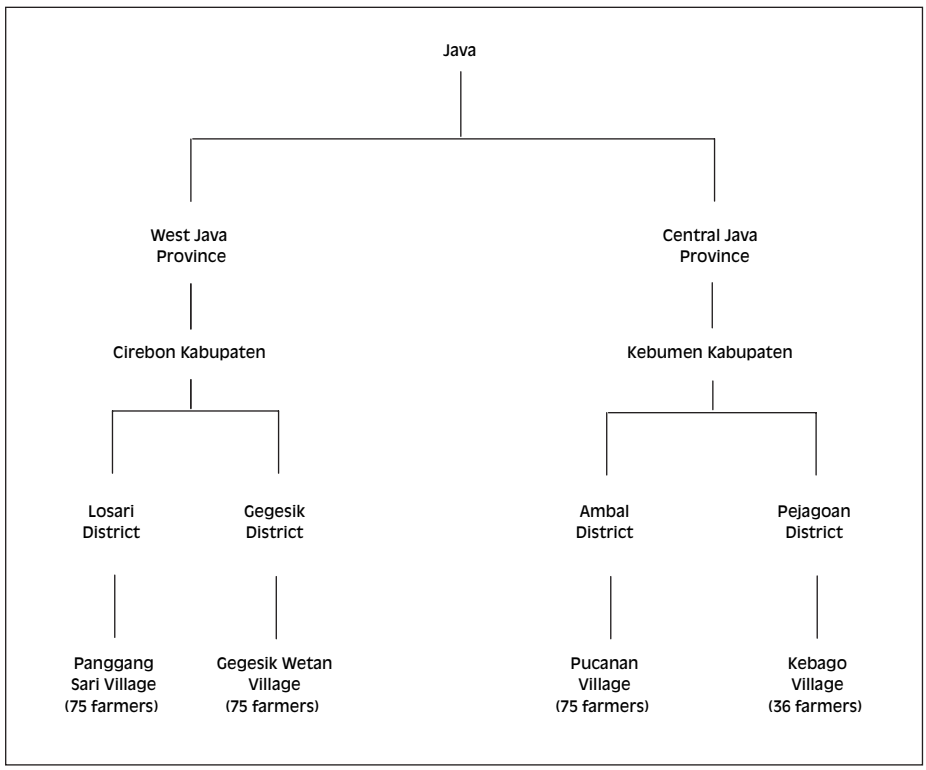
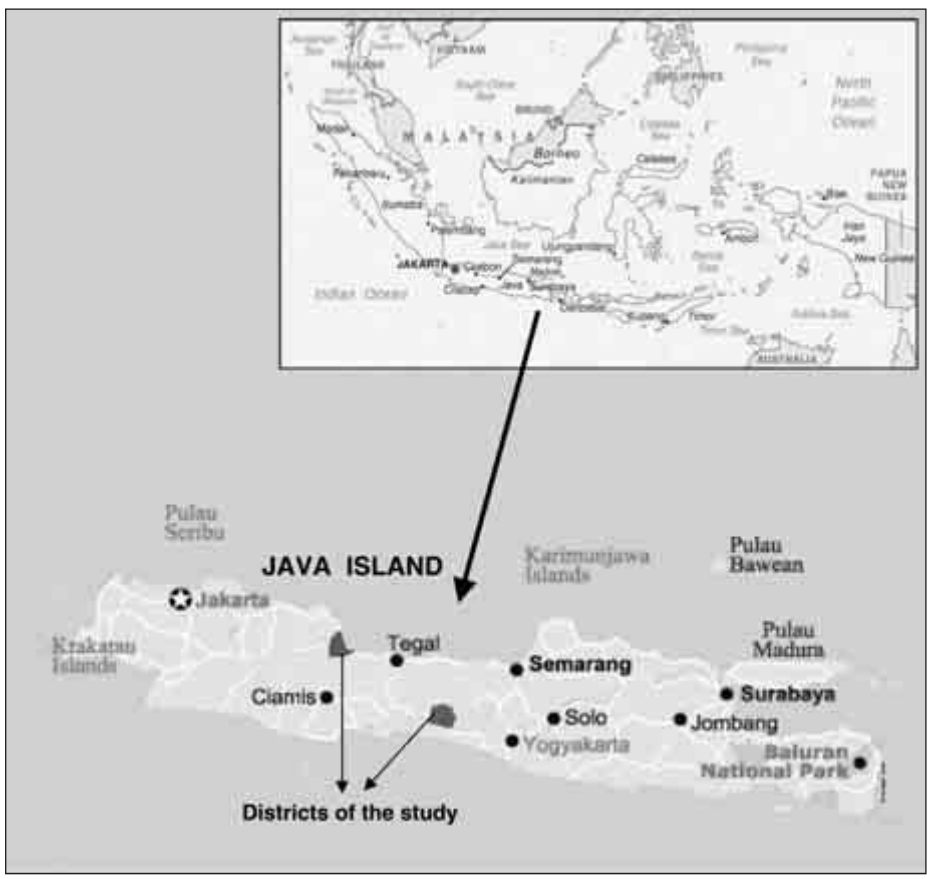


Figure 1.2: Map of the study locations



1.4.4 Secondary data

This study also makes use of secondary data gathered from different institutions, such as data on rice production, rice harvesting areas, farm labourers and the cost structure from 1990-2001, obtained from BPS and the Ministry of Agriculture. Data on farm gate and wholesale rice prices were obtained from BULOG. Data on the multifunctionality of rice farming are adopted from earlier studies in a similar field.[2]

1.4.5 Rapid rural appraisal (RRA)

To gather information on the rice economy, this study applied the RRA method in addition to conducting interviews with farmer respondents directly. The study team implemented the RRA with several groups of stakeholders: first with the BAPPEDA staff of Kebumen *Kabupaten* of Central Java, then with the staff of Pucangan village and separate groups of large and small scale farmers in Pucangan village. The same RRA was conducted with the staff of Kebagoran village, with a group of farmers and a group of agricultural input traders.

Similar RRAs were carried out in Cirebon *Kabupaten* in the West Java Province. First, local Government civil servants from different sectors at the BAPPEDA office (22 people) were interviewed. This was followed by separate interviews using the RRA method of the local Government civil servants of Gegesik District, staff from Gegesik Wetan village, large and small-scale farmers, as well as distributors of agricultural inputs. The same RRA was carried out with the village officials and farmers in Panggangsari village, Cirebon *Kabupaten* in West Java.

1.4.6 The analytical method

The main objective of this project was to determine the economic, social and environmental impacts of the AoA for the rice sector. To do so the following methodologies were used:

– Identification of the economic, social and environmental impacts of the AoA.
– For the economic impacts, the net value of the direct economic benefits of rice production were calculated based on the difference in total rice produced multiplied by the price of rice minus the production costs (including land rent, wages for the farm labourers, profit for the farmer as farm manager and agricultural inputs such as seeds, fertilizers, pesticides and water).
– An input-output table for 1998 with 6 x 6 sectors was employed to indicate the backward and forward linkages of rice production.
– The social impacts, especially changes in employment, urbanisation and the number of people living below the poverty line were examined by comparing the conditions before and after trade liberalization.
– The environmental impacts examined included changes in environmental functions and the costs thereof, which was done by studying the variables with and without rice production. These variables include:
  - the role of rice fields in preventing floods. Indicators include: (i) water carrying capacity of the rice field, (ii) water carrying capacity of flood prevention facilities, and (iii) investment plus operation and maintenance costs for flood prevention facilities;
  - the role of rice fields in preventing erosion. Indicators include: (i) capacity of the rice field in preventing soils from being carried away by flowing water, and (ii) investment plus operation and maintenance costs for erosion prevention;
  - the role of rice fields as water catchments. The indicators are: (i) the rice field's capacity in holding water, and (ii) investment and maintenance costs for holding water;
  - the role of rice fields in preventing land slides. The indicators are: (i) number of land slides in the rice lands and the non-rice lands, and (ii) the costs resulting from the landslides per event;
  - the role of rice fields in maintaining air quality, which includes the volume of gas emissions absorbed by the rice fields;

[2] Irawan *et al.,* 2002.

- the role of rice fields in absorbing agricultural wastes. The indicator is the volume of agricultural wastes absorbed by the rice field.

1.4.7 The methodology for economic valuation

This study principally examines the economic values of the economic, social and environmental impacts of the AoA on rice farming. Rice farming has direct and indirect functions (multifunctionality) although the indirect functions are not well recognized. The direct function is rice production. This is easier to evaluate because its market price is usually available. Indirect functions include flood and erosion prevention, water catchments, landslide control, air pollution control, agricultural waste processing, and preventing over-urbanisation. The economic valuation for these indirect functions involved using the replacement cost method (RCM) and the contingent valuation method (CVM).

The RCM considers the investment costs for building alternative facilities to prevent floods, erosion and landslides, control water and air pollution and process organic waste. The contingent valuation is used to evaluate impacts that do not have market prices. The sum total of these costs will represent the benefits foregone or costs resulting from the decline in the practice of rice farming due to trade liberalization.

When the price of rice decreased due to trade liberalization, the main changes included land use patterns and a reduction in the use of agricultural inputs such as fertilizers, pesticides and water. The reductions in the use of fertilizers, pesticides and water, compared to those used in rice farming, can be considered environmental benefits resulting from the AoA, while cheap rice represents a benefit of the AoA for net rice consumers. The difference between the benefits and the costs forms the net benefits or the net costs resulting from implementation of the AoA on the rice sector.

Data needed for the valuation include:

– rice production as direct output of rice farming that is physically measurable and marketable
– the direct benefits for which outputs are not physically measurable, including:
  - recreational function
  - rural cultural maintenance
  - urbanisation reduction
  - backward and forward linkage effects such as for rice mill industries and tractor manufacturing industries
– indirect ecological benefits and functions, including:
  - flood prevention
  - erosion prevention
  - maintaining water balance
  - air pollution control
  - recycling or processing agricultural and cattle wastes
– biodiversity conservation

The direct measurable function was measured by multiplying the total rice production by the market price.

The RCM is used to evaluate the environmental benefits of rice farming based on the investment, operation and maintenance costs of maintaining those environmental functions. The CVMs, which include the 'willingness to accept' or 'willingness to pay' method are used to measure the environmental costs and benefits that are difficult to measure physically, and measure the consumer's preference about the environmental functions.

The methods for valuating the functions of rice fields are explained below.

Flood prevention

During the heavy rains, land surface water usually flows down to the lower areas through rivers or canals, increasing the volume of water and causing flooding in the lower areas. To reduce the rate of flooding, a system to handle the overflow of water must be constructed. The total investment required to build flood prevention systems will be lower if rice fields can retain the total overflow of water. So the total value of rice fields in preventing floods can be estimated as follows:

$$Fl = A \times Wrt \times (Cd + Cm) \times Pw,$$

where:
- Fl = economic value of rice field for flood prevention (US$)
- A = total area of rice field (ha)
- Wrt = water retention capacity (m^3/ha)
- Cd = depreciation cost of the construction facilities (US$/$m^3$)
- Cm = maintenance cost of the construction facilities (US$/$m^3$)
- Pw = water price in terms of unit rent for water

Water retention

Rice fields catch water and retain it up to a certain extent. The value of rice fields in retaining water can be estimated as follows:

$$WCt = A \times (Cd + Cm) \times Rwct \times Pw,$$

where:
- WCt = economic value of rice field as water catchments (US$)
- A = total area of rice field (ha)
- Cd = depreciation cost of dam and irrigation construction facilities (US$/$m^3$)
- Cm = maintenance cost of dam and irrigation construction facilities
- Rwct = rate of water retention by rice field (m^3/ha)
- Pw = price of water in terms of unit rent for water

Erosion prevention

Run-off rainwater carries with it some of the most fertile layer of topsoil. The erosion rate depends on the slope gradient of the land, the amount of rainfall and the vegetation found in the area. To maintain soil fertility farmers have to add fertilizers.

Erosion also increases the probability of siltation of rivers, which may in turn cause floods in the lower regions of the river basin. Terraced rice fields can reduce the level of erosion. The costs of preventing erosion on the rice fields could be estimated as follows:

$$Epr = A \times (E_1 - E_2) \times S_{dr} (Cd + Cm)$$

where:
- E_{pr} = economic value of rice field in preventing erosion (US$/year)
- A = total area of rice field (ha)
- E_1 = estimated erosion of the non-rice field (m^3/ha/year)
- E_2 = estimated erosion of the rice field (m^3/ha/year)
- S_{dr} = sediment delivery rate (m^3/ha)
- Cd = depreciation cost of dam and irrigation construction facilities (US$/$m^3$)
- Cm = maintenance cost of dam and irrigation construction facilities (US$/$m^3$)

Landslide prevention

Rice fields are commonly flat and terraced and surrounded by small dikes that may prevent landslides. The economic value of preventing landslides is estimated as follows:

$$Ls = (A_1 - A_2) \times Cl\ s$$

where:
- Ls = economic value of rice field in preventing landslides (US$/ha/year)
- A_1 = number of landslides in non-rice growing areas
- A_2 = number of landslides in rice growing areas
- $Cl\ s$ = damage costs due to landslides (US$/ha)

Maintenance of air quality

Rice fields play a role in maintaining the quality of the air in view of their capacity to absorb the SO_2 and NO_2 produced by manufacturing industries and automobiles. Yoshida (1994, cited in Irawan *et al*., 2002) mentions that each hectare of rice field can absorb about 4.86 kg of SO_2 and 7.87 kg of NO_2. The valuation can be computed as follows:

$$A_q = [(A_r \times VSO_2)/4.86 + (A_r \times VNO_2)/7.87] \times P_{coal}$$

where:
- A_q = Value of air quality improvement
- A_r = Area of rice field
- VSO_2 = Volume of SO_2 produced by industries and automobiles
- VNO_2 = Volume of NO_2 produced by industries and automobiles
- P_{coal} = Price of coal

Waste recycling

Households, agriculture and markets generate organic wastes that can be recycled as organic fertilizer to reduce the rate of environmental pollution. The economic value of this function may be estimated as follows:

$$Wr = A \times V_{of} \times R_w$$

where:
- Wr = value of recycled wastes
- A = area of rice field where organic fertilizer is applied
- V_{of} = volume of organic fertilizer used in rice field
- R_w = unit rent of organic waste.

2. Trade liberalization policies in Indonesia

2.1 Introduction

2.1.1 Indonesia's trade policies for rice

Trade liberalization began in 1995 – 1997, when Indonesia implemented the AoA and reduced its subsidies on agricultural inputs (pesticides and fertilizers). During the 1996 – 1997 period, rice imports decreased from 3.1 million tons in 1995 to 1.09 million tons in 1996 and then to 0.406 tons in 1997. So from 1995 to 1997 annual rice imports averaged 1.5 million tons. At the beginning of 1998, rice imports were liberalized and peaked to 6.077 million tons in 1998 and 4.183 million tons in 1999, averaging 3.373 million tons per year between 1998 and 2002 (see Tables 2.1 and 2.2), causing Indonesia to become more dependent on rice imports. This increase in imports was due to a decline in Indonesian rice production. The latter was a result of the severe drought and a major social conflict linked to the economic crisis and the sharp increase in the price of rice because of rice shortages. Social panic also occurred in view of the prospect of insufficient rice supplies to meet demand. Even during the main harvest season, rice imports were high, although ironically a substantial portion of rice produced in Indonesia was also smuggled abroad. However, in 2000 and 2001 rice imports and supplies were low, so to maintain the total rice supply, rice imports were increased again in 2002 and 2003.

In fact, radical trade liberalization in Indonesia occurred just after the economic crisis. To recover from its economic crisis, Indonesia followed the IMF's and the World Bank's recommendations to liberalize the rice market since rice supply was considered important to abate social panic. Pressure from the IMF and the World Bank to open the Indonesian markets accelerated liberalization efforts that had already begun in 1994. The rice market was opened to free trade, especially from September 1998 to December 1999. The import tariff for rice was zero in 1998. The GOI signed a letter of intent with the IMF in September 1998 in which the former agreed to limit import tariffs on

Table 2.1: Rice production and imports, 1995 – 2001

Year	Production (1,000 tons)	Imports (1,000 tons)
1995	32,334	3,104
1996	33,216	1,090
1997	31,206	406
1998	31,118	6,077
1999	32,148	4,183
2000	32,040	1,512
2001	31,891	1,384
2002	32,130	3,707
Average:		
1995 -1997	**32,252**	**1,503**
1998 -2002	**31,865**	**3,373**

Sources: 1) Rice production from BPS, Jakarta.
2) Rice imports from The Rice Report.

all foodstuffs to no more than 5 per cent. The shift to free trade in rice was also a reaction to the doubling of domestic rice prices between April and August 1998 when domestic rice production was low, and there were soaring fiscal costs for rice subsidies. At that time there was a breakdown of commercial trade finance facilities.[3] However, the high price of rice on the domestic market in 1998 and 1999 was not a result of the economic crisis alone, but also of the production shortage due to the severe drought related to the "El-Nino" phenomena in Indonesia. It was estimated that this phenomena alone resulted in a 4-5 per cent reduction in domestic rice production.

Trade liberalization has increased Indonesia's import dependence on rice and affected its rice production. The impact is felt through the price of rice, which was much lower after rice trade liberalization, since the prices of imported rice (FOB and CIF prices) were much lower than those of the wholesale rice prices at the local level in Jakarta (see Table 2.3).

The increase in Indonesia's dependency on rice imports could create economic and political problems for the country. First of all, high import dependency may erode rice producers' incomes and discourage farmers as well as the Government from investing in measures aimed at improving rice production. Since rice has strong backward and forward linkages within the economy, increased import dependence will have adverse effects that extend beyond rice production, and will affect rural-based economic activities in the urban sectors of the economy.

Due to the considerable stockpiles of rice in rice-producing countries and the high cost of storing this stock, rice producing and exporting countries dumped their rice onto the world market. This resulted in low rice prices for importing countries, which was to the advantage of urban rice consumers and rural net rice consumers but to the disadvantage of domestic rice producers.

It thus appears that trade liberalization of Indonesia's rice sector may result in import dependence and a reduction in domestic production in a sector that provides livelihoods for a large proportion of Indonesia's poor farmers. Moreover, full reliance on rice imports would be particularly dangerous for food security and political stability in the country.

2.1.2 The role of the price of rice for farmers

Domestic rice producers suffered big losses as a result of low market prices and high production costs. Consequently, they were unable to meet their

Table 2.2: Rice imports by BULOG and private sector, January 1998 – September 1999 (in tons)

Month	1998			1999		
	BULOG	Private	Total	BULOG	Private	Total
Jan	399,800	0	399,800	445,100	232,800	677,900
Feb	427,200	0	427,200	301,900	207,300	509,200
Mar	663,900	0	663,900	221,500	231,300	452,800
Apr	843,500	0	843,500	97,400	94,900	192,300
May	725,000	0	725,000	132,600	98,800	231,400
Jun	323,800	0	323,800	156,800	275,800	432,600
Jul	252,600	0	252,600	218,600	418,800	637,400
Aug	293,600	0	293,600	20,500	n.a	n.a
Sep	362,200	228,600	590,800	108,600	n.a	n.a
Oct	375,600	216,400	592,000			
Nov	587,800	259,400	847,200			
Dec	528,100	613,300	1,141,400			
Total	**5,783,100**	**1,317,700**	**7,100,800**	**1,703,000**	**1,559,700**	**3,133,600***

Note: * Up to September 1999.
Source: BULOG and Ministry of Finance.

[3] Dillon *et al.,* 1999, p. 29.

Table 2.3: Imported rice price and Jakarta's local market rice price, January 2000 – October 2001

Month	FOB Bangkok (US $/ton)	FOB Price (Rp/Kg)	CIF Price (Rp/Kg)	Local Market Jakarta (RP/Kg)
2000:				
Jan	202.50	1,502	1,651.88	2,250
Feb	202.00	1,516	1,667,61	2,229
Mar	187.50	1,423	1,565.44	1,929
Apr	179.75	1,428	1,570.93	1,864
May	171.00	1,474	1,621.42	1,906
Jun	166.50	1,454	1,599.82	2,010
Jul	167.00	1,504	1,653.82	2,000
Aug	164.50	1,364	1,500.08	1,977
Sept	161.00	1,414	1,554.94	1,863
Oct	161.00	1,513	1,663.85	1,800
Nov	162.00	1,544	1,698.25	1,800
Dec	158.25	1,518	1,670.25	1,800
2001:				
Jan	158.00	1,482	1,629.90	1,889
Feb	153.50	1,479	1,626.66	2,070
Mar	146.25	1,490	1,639.19	1,994
Apr	139.00	1,539	1,693.33	1,950
May	141.75	1,601	1,760.75	1,998
Jun	148.50	1,677	1,844.92	2,000
Jul	152.40	1,659	1,824.52	2,038
Aug	153.00	1,371	1,507.68	2,075
Sept	160.50	1,491	1,639.81	2,131
Oct	159.25	1,606	1,766.09	2,262

Source: BULOG.

household living costs. It is commonly believed by most developing countries, and Japan as a developed country, that current features of their food policies are absolutely essential to the continued security and stability of their economies. The relatively low price of imported rice indicates that the current Indonesian trade policy is not sufficiently protecting Indonesian farmers from the damaging effects of the global rice market. The artificially low price of imported rice seems to have a positive impact on alleviating the economic burden of low-income consumers in the short-run, but it will have a negative impact on national rice production if it acts as a disincentive for local farmers to produce more rice. This will in turn reduce the growth rate of national rice production, which will have a negative impact on Indonesia's rice-related industries, and will increase the rice import dependency ratio (IDR). It follows that protecting national rice farming from heavy competition from rice imports is important.

The belief is that the low rice prices will cause farmers and farming communities to suffer irreparable damage. The common objectives of protection are to increase incomes, ensure food security, maintain viable rural communities and achieve the stability of farm incomes. On the other hand the United States and some rice exporting countries have supported free trade with the opinion that subsidies and price interventions that have a significant effect on production, marketing and trade should be eliminated.[4]

2.2 The WTO AoA

Indonesia is one of the WTO member countries that have been reforming their trade and agriculture as stipulated under the AoA.

[4] Krueger, 1988, pp. 22-44.

Agriculture was under a soft discipline in the General Agreement on Tariffs and Trade (GATT) compared to industrial products. The AoA brings this sector under tighter discipline. The main elements of the Agreement are: a) Market access, i.e. discipline on import restraints, b) domestic support, i.e. government support to domestic producers, and c) export subsidies, i.e. government support for export.[5]

– **Market access:** An important step in market access is the "tariffication" i.e. conversion of non-tariff measures such as total import bans and quantitative restrictions on imports into tariff equivalents which, added to the ordinary tariff, make up the totality of the market restraints except the BOP measures and safeguard measures. After tariffication, all countries have to bind their tariffs on all agricultural products including rice. The level of tariffs starting from the initial bound levels in 1995 is gradually brought down to the final reduced levels at the end of the implementation period, i.e. 2004 for developing countries.

– **Domestic support:** The domestic subsidy for each WTO member country has been quantified, and each country has committed to limit its subsidy to a particular level in 1995. There are some exemptions for developing countries from the disciplines of domestic support, including investment subsidies and input subsidies generally available to low-income and resource-poor producers. Certain other types of measures are also exempt from the reduction commitment, e.g. general services such as research, pest and disease control, stock holding for food security, domestic food aid, relief against natural disasters and assistance for curtailing production in various ways. For developing countries, the purchase and sale of government stock at administered prices and also the provision of food for the poor at subsidized and reasonable prices are exempt from the reduction commitment. The subsidy involved in the purchase of government stock is to be included in the calculation of the level of annual subsidy, which in turn is subject to an annual ceiling.

– **Export subsidies:** these concern two items: (i) total budgetary outlays, and (ii) total quantity of exports covered by the export subsidy. Developing countries are exempted from the disciplines on two types of export subsidy, namely payments to reduce the cost of marketing including handling, upgrading, processing and institutional transport and freight. However, provision of transport and freight for export shipments is more favourable than for domestic shipments.

There are 1,341 agricultural products that were bound in GATT and written under the national schedules of commitments for Indonesia. Each tariff line was reduced to a minimal 10 per cent, and average tariff reductions were 37 per cent as set by the Modalities for the Establishment of a Specific Binding Commitment under the Reform Programme of GATT.

The average tariff line is bound at 48 per cent and the average (mode) per tariff line is 40 per cent for the period 1995 - 2005. All of the tariffs bound for agricultural commodities are *ad valorem* (AV); none of them fall under the category non *ad valorem* (NAV). Some commodities are bound at higher tariffs and have a special safeguard, namely 210 per cent for milk, 60 per cent for clove. The bound tariff levels for rice and sugar are 160 per cent and 95 per cent respectively. In the Schedules of Commitment, Indonesia has to open up minimal market access for rice (70,000 tons) and milk (414,700 tons). Within the rice quota (70,000 tons), the tariff level is 90 per cent. While, the tariff level of rice for the aforementioned quota could be applied up to 180 per cent, it had to be reduced to 160 per cent in 2004.[6]

Indonesia also committed to reduce export subsidies for rice. From 1986 to 1990 Indonesia was a net rice-exporting country, exporting 299,750 tons annually of subsidised rice with a subsidy value of US$ 28,000,000 per year. The export subsidy will be reduced to US$ 21,544,700 or 257,785 tons in 2004.

[5] Das, 1998, pp. 58-61.
[6] Pranolo, 2002.

BULOG, as a State Trading Enterprise (STE), previously had the main task of stabilising domestic food prices, particularly rice, wheat, soybean and sugar. Stabilisation - both economic and political - was the main policy adopted during the Suharto era (1966 - 1997). BULOG was granted the monopoly right to import these commodities. The GOI also provided many incentives to farmers through input and output price policies. The floor price was always adjusted by the cost of production and the international price of rice. To maintain the floor price, BULOG bought rice or paddy from the farmers. This rice went to the market operation pipeline stock. Part of it was supplied to the army and civil servants as income support and some was exported by BULOG as sole agency in the 1980s.

2.3 ASEAN Free Trade Area (AFTA)

As of 1 January 2002 Indonesia has had to implement the regional trade agreement among members of AFTA, which effectively involves applying 0 to 5 per cent tariff for agricultural products by 1 January 2010. All ASEAN countries are now moving towards the application of a zero tariff for all types of commodities. AFTA is regulated by the Common Effective Preferential Tariff (CEPT) concept. The agreed production sectors to be included in the CEPT are manufactured products, capital products and agricultural products.

The products proposed in the CEPT are grouped into: (i) inclusive list products, (ii) temporary exclusive list products, (iii) sensitive list products, and (iv) general exception list products. The inclusive list includes products that have been liberalized by reducing the tariff rate and abolishing quotas and other non-tariff trade barriers. The tariff for this group of commodities was 20 per cent maximum in 1998 and was reduced to a tariff between 0 and 5 per cent in 2003. The tariff has to be zero for all commodities by 2010 for the six original ASEAN countries and by 2015 for new ASEAN member countries.

Rice is one of the agricultural products included in the sensitive list. The other products are sugar, wheat flour, garlic and cloves. These products are allowed a longer period before they are included in the inclusive list. Indonesia proposed that rice and sugar be included as sensitive commodities in the AFTA so that it could maintain its current applicable tariff for rice imports until 2010 and up to 20 per cent maximum until 2020. For the other agricultural products a 0-5 per cent tariff will be applied as of 1 January 2010 for the ASEAN-6 and by 1 January 2018 for the ASEAN-4.

2.4 The IMF requirement

During Indonesia's financial and economic crisis the GOI requested financial support and technical assistance from the IMF to pull it out of the crisis and stabilise the Indonesian economy. The IMF recommended that the Indonesian Government adopt the free trade economic system by liberalizing all sectors in the economy namely the banking sector, the agricultural sector, the mining sector, etc. The GOI had to abolish all subsidies including the agricultural input subsidies, which were significant from 1990 to 1994.

The GOI signed Letters of Intent, and since then Indonesia has adopted the IMF and World Bank structural adjustment programme, which radically reformed its trade and agricultural systems. Indonesia became one of the developing countries to adopt trade liberalization of agricultural commodities, particularly food crops.[7]

2.5 The economic crisis and the rice policy change

Almost all types of subsidy and market price support have been abolished or significantly reduced since 1998. BULOG's import monopoly as the STE was abolished in September 1998, and private enterprises are now treated equally in relation to imports, whether of rice or other food commodities. BULOG's role was limited to the rice sector. Since 1988, Indonesia has been a net rice

[7] Magiera, 2002.

importer, except in 1993. From 1995 to 2002 rice imports averaged about 2.7 million tons per annum, although that figure has been far from constant. Indeed, imports decreased from over three million tons in 1995 to less than half a million tons in 1997 and then peaked to over six million tons in 1998 and over four million tons in 1999. The GOI also adopted trade and investment reforms in the retail and wholesale trade sectors, including domestic trade. The private sectors have been treated equally in terms of domestic distribution and imports of food commodities.

The GOI changed its policy from general subsidies and an overall price stabilization policy for rice to targeted food subsidies, particularly for rice. This change of policy, conducted under a special market operation, *Operasi Pasar Khusus* (OPK), was actually an emergency programme carried out from August 1998 to December 2001. In January 2002, the OPK was replaced by the Rice for the Poor Programme (RASKIN), a social protection programme for which the Government assigned implementation responsibility to BULOG.

Almost all food products such as soybean, maize, peanuts and wheat/wheat flour were imposed a set tariff set of 5 per cent, which was lower than the bound tariff in the commitment schedule. The import tariff for rice was set at 0 per cent AV during the period September 1998 to December 1999. The free trade policy for rice and sugar was then corrected by the GOI due to the low price of rice and sugar on the world market as well as the appreciation of the Rupiah (Rp). The new tariffs were then as follows:

– A specific tariff of Rp 430/kg of imported rice has been applied since January 2000. The level of tariff was equivalent to 25 per cent of the AV monthly average for the three-year period from January 2000 to December 2002.
– Since 2002 the GOI had been facing difficulties in managing rice imports because of rice import smuggling, under-reported imports etc. Smuggling occurred not only to avoid the payment of the import duties and gain higher profits, but also because of the rice import licensing system whereby the GOI allocated import licenses to selected private importers that met the criteria defined by the Ministry of Industry and Trade.
– The GOI is still applying the food price subsidy policy and market price support for the floor price of rice. Since 2001, this policy was changed to a procurement price, which is similar to the floor price policy. In fact, the Indonesian Government has adopted a floor price policy since 1970. The floor price system is a scheme that protects farmers from the decreases in the price of rice that usually occur during the big harvest season.

2.6 Domestic support for rice in developed countries

There are three pillars under the AoA, namely Market Access (MA), Domestic Support (DS) and Export Subsidies (ES). These three pillars are linked and should be treated equally. The MA, ES or DS policies adopted by one member country will impact the others in both international and domestic markets.

The WTO (2000) reported that countries that have reduced protection and agricultural subsidies have increased their support to agriculture through green box and other temporary support measures. While these measures were described as "non" or "minimally" trade distorting, Blandford (2001) concluded that all measures that either raised the rate of investment (or returns on investment) in agriculture – as the green and blue box measures do – will clearly have a highly restrictive effect on agricultural trade. In many OECD states trade-distorting policy support for agriculture has been reconfigured from easy-to-observe border measures to other more difficult-to-track forms of domestic agricultural support. In other words, these developed countries are using a loophole in the AoA to increase protection of their agricultural sectors, particularly the food production sub-sector.[8] With

[8] Blandford, 2001.

their vast numbers of small-scale farmers and incomplete registration systems, this is a loophole that few developing countries can possibly exploit.

The wide variation in the level of support and protection across commodities in OECD countries causes considerable distortions in global commodity markets. From 1998 to 2000 the average producer subsidy equivalent was less than 15 per cent for eggs, poultry and wool, between 40 and 50 per cent for wheat, coarse grains and mutton/lamb, and more than 50 per cent for rice, sugar and milk. Sugar and milk receive the highest levels of support in each country where they are produced. Japan, Korea and the US provide high levels of support for rice. From 1998 to 2000, the prices received by OECD producers and paid by consumers were, on average, over twice the level of world market prices for sugar and milk and about five times higher than the world market price for rice.[9]

Despite the Uruguay Round (UR) agreement and global movements to liberalize trade, many OECD countries have in fact increased their level of support to domestic rice producers in recent years. Several OECD Governments have attempted to maintain farm incomes in the wake of declining global rice prices through a variety of farm support initiatives. A good example of this is the United States.

Under the 1996 FAIR Act, US rice producers received approximately US$ 900 million in Production Flexibility Contract and emergency marketing support payments for the 2000/2001 crop year based on their 1996 producer contract area. In addition to income transfers, rice producers were provided with price assistance under a marketing loan programme that compensates farmers for the difference between a "world" price and the farm loan rate equivalent of US$ 143 per ton of paddy. Loan rate payments reached US$ 415 million in the year 2000 under this programme. In addition, rice farmers benefited from agricultural insurance reform subsidies that financed 80 to 90 per cent of the increase in premium. Export credit guarantees were provided for 225,000 tons of rice in the year 2000, and about 19 per cent of the US rice exports were shipped in 2000 under food aid or credit guarantees.[10]

The United States Department of Agriculture provides data on producer support over a relatively long period. In the early 1990s, US Government support accounted for just over one fifth of total rice producer revenues. These were gradually being reduced in line with UR commitments, but the trend was reversed in the mid to late 1990s. By 2000/2001, Government subsidies (largely through credit programmes) accounted for two thirds of total rice producer revenues. By dividing the total US farm subsidies for rice in 2000/2001 (US$ 1.4 billion) by the 2.6 million tons of rice that the US exported in 2001, it was found that the average farm subsidy of US rice exports was equal to approximately US$ 530 per ton. This illustrates the importance of US Government support to rice production (and trade) in one of the OECD's leading rice producers and exporters.

The Southeast Asian states have moved far more quickly to liberalize their agricultural markets than the more affluent, industrial economies.[11] Within the region, there has been growing recognition that excessive government interference in the agricultural commodity markets impedes private initiatives, contributes to rent-seeking behaviour and distorts the use of scarce rural resources. Pressures from the IMF and the World Bank to open markets had also contributed to liberalization efforts in several Southeast Asian countries. But the initial effects of agricultural trade liberalization in developing countries are mixed. A comprehensive study by the Food and Agriculture Organization of the United Nations (FAO)[12] of 14 developing countries concluded that the competitive pressures unleashed by liberalization contributed to the consolidation of farms and rising rural inequity. While trade liberalization has generally contributed to increased productivity and competitiveness, it

[9] OECD, 2001.
[10] FAO, 2001.
[11] Bâle, 1999.
[12] FAO, 2000.

has also led to the displacement and marginalization of farm labourers, small farmers and more marginal producers who often lacked food security and had limited access to formal safety nets. However, the impacts of US subsidies on the Indonesian economy were both direct and indirect in nature; a direct impact was that people in urban areas preferred the quality of imported rice to domestic rice, and an indirect impact was that farmers' incomes depreciated because of the restricted market for domestically produced rice.

2.7 Agricultural notification: Indonesia

Indonesia has notified the agricultural sector since 1995 and implemented DS under the green box (GB) as a public service that includes payments for natural disasters, support for research, domestic food aid and public food-stock holding. This type of support increased from US$ 191/ton in 1996 to US$ 373/ton in 2001 (see Table 2.4). Support under the GB under General Service reached Rp 950 billion in 2001, which is more than double the support provided prior to the economic crisis in 1996.

After the GOI modified its policy from food-price stabilization as a general subsidy to a targeted subsidy under the specific market operation programme (*OPK/Raskin)* in August 1998, this type of support reached up to 71 per cent of GB subsidies, i.e. Rp 2.7 trillion in 2001.[13]

Since 2000 the GOI has stopped providing credit subsidies (*Kredit Likuiditas Bank Indonesia* – KLBI) to BULOG as a food stock agency, and BULOG has thus been applying commercial credits for public stock holding. For this reason, the value of food stock holdings has been significantly reduced. For example, it was Rp 34 billion in 2001 compared to Rp 265 billion in 1998. In 2001, disaster payments also increased sharply compared to previous years due to the social conflict at the time of the economic crisis.

Table 2.5 shows the market price support for rice and *de minimis* since 1998. The total access market support is equal to the market price support in a situation of zero support under direct payment and other non product-specific support. The *de minimis* for rice was on average 6 per cent per annum from 1998 to 2002, which is below the 10 per cent allowed for developing countries. It is believed that this level of support is not significant enough to distort the market and trade.

2.8 The WTO positions

It is already known that the aim of the WTO policies is to promote fair and free world trade. The organization contends that free trade is the most

Table 2.4: Indonesia's domestic support under green box measures: 1995-2001

Type of measure	Monetary value/year (billion Rp)						
	1995	1996	1997	1998	1999	2000	2001
General service	366	407	557	622	826	1,056.5	950.2
Payment for natural disaster	2.7	4	4.8	11.8	14.8	12.7	143.7
Domestic food aid	0	0	0	411	425.6	305.5	2,698
Public food stock holding	32	38.3	55.5	264.5	346.5	57	33.8
Total (billion Rp)	400.7	449.3	617.3	1,309.3	1,612.9	1,431.7	3,825.7
Exchange rate (Rp/US$)	2,252.83	2,347.33	2,951.75	9,874.58	7,808.92	8,534.42	10,242.87
Green Box (US$ million)	178	191	209	133	207	168	373

Source: Indonesia's notification to the WTO on DS.

[13] Sawit *et al.,* 2003.

Table 2.5: Market price support and *de minimis* for rice, 1998-2002

Year	Applied Administered Price Rp/Kg	External Fixed Price (average 1996-98) Rp/kg	Eligible Production MT	Total AMS (Billion Rp)	Total Value of Production (Billion Rp)	*de minimis* (%)
1998	1,660	367.77	249,231	322	53,102	0.61
1999	2,310	367.77	2,448,752	4,756	68,172	6.98
2000	2,310	367.77	2,173,585	4,222	57,875	7.29
2001	2,470	367.77	2,010,792	4,227	66,567	6.35
2002	2,470	367.77	2,131,608	4,481	73,779	6.07
Average	2,311		1,802,794	3,602	63,899	5.46

Note: Exchange rate was US$1 = Rp 11,000 in 1998 and changed to US$1 = Rp 8,500 in 2000.
Source: Sawit *et al.,* 2003.

effective way to promote development and improve human welfare. With free trade, production and consumption should become more efficient, and since production should compensate for public stock holding, stock holding has been significantly reduced. Hence, free trade should be able to move factors of production into the most efficient system to obtain the highest price, while the output of the production activities should increase and reach the most efficient point with the lowest price for the consumers.

However, while trade has been understood as an engine of growth, this does not mean that free trade is devoid of problems, especially for developing countries. The problem is that many developing countries do not have sufficient capacity to fulfil the demands of world markets due to the lack of efficient technologies, skills, basic infrastructures, and financial resources. These factors result in high production costs that reduce their competitiveness in world markets. Consequently, a complete absence of trade barriers would hurt developing countries because of the high competition and lack of market access.

3. Rice production in Indonesia

3.1 The share of agriculture in the Indonesian economy

Between 1975 and 2002 the Indonesian economy changed from an agrarian to an industrial type economy. In 1975 agriculture accounted for 30 per cent of the GDP, which was almost equal to other sectors' contributions, i.e. industry 34 per cent and services 36 per cent. Over the years the role of agriculture had been declining and in 1995 its contribution to the GDP was only 17.1 per cent while the industrial sector's contribution increased to 41.8 per cent and the service sector reached 41.1 per cent. After the economic crisis of 1998, agriculture's contribution to the GDP increased again slightly to 17.2 per cent in 2000 and 17.5 per cent in 2002. However, from an employment point of view, the role of agriculture declined from 62 per cent to 48 per cent between 1975 and 1995 and became relatively constant after the economic crisis of 1998 at about 44 per cent in 2000 and 2002 (see Table 3.1).

The transformation of the economy was in accordance with the long-term 25-year development plan. In the first five-year plan (1967 – 1972) the emphasis of development was on the agricultural sector. The second five-year development plan (1972 – 1977) focused on the development of light industries that processed the agricultural products. The third five-year development plan (1977 – 1982) focused on developing the industrial sector with a strong agricultural sector as the basis for development. During this period Indonesia was expecting its economy to take off and in fact in 1984 the food self-sufficiency target was realized. In the fourth five-year development plan (1982 – 1987), further development of the industrial sector was the target, and finally with the fifth five-year development plan (1987 – 1992), Indonesia was expected to become an industrialized country.

3.2 Production, hectarage and rice yields

Table 3.2 presents figures on rice production, hectarage and yield in Indonesia from 1990 to 2002. Rice production had been increasing at a low rate of 1.08 per cent per annum from an average of 50,074,233 tons per annum between 1995 and 2002 to an average of 50,615,678 tons per annum between 1998 and 2002, as a result of the 3.2 per cent per annum increase in the area harvested from an average of 11,383,022 Ha from 1975 to 1997 to

Table 3.1: Share of agriculture in Indonesia's GDP, 1975 – 2002

Year	1975	1985	1995	2000	2002
Sectoral share % GDP:					
Agriculture	30.2	23.2	17.1	17.2	17.5
Industry	33.5	35.8	41.8	40.0	44.5
Services	36.3	40.9	41.1	42.8	38.1
Share of total employment (%):					
Agriculture	62	56	48	44	44
Other Sectors	38	44	52	56	56

Source: BPS.

Table 3.2: Production, area harvested, and productivity, 1990 – 2002 (dried husk rice)

Year	Production (tons)	Area harvested (Ha)	Yield (tons/Ha)
1990	45,178,751	10,502,357	4.30
1995	49,744,140	11,438,764	4.35
1996	51,101,506	11,569,729	4.42
1997	49,377,054	11,140,574	4.43
1998	49,236,692	11,730,325	4.20
1999	50,866,387	11,963,204	4.25
2000	51,898,852	11,793,475	4.40
2001	50,460,782	11,499,997	4.39
2002	50,838,948	11,530,672	4.46
Average:	% change	% change	% change
1995-97	**50,074,233**	**11,383,002**	**4.40**
1998-02	**50,615,678**	**11,746,750**	**4.31**
	1.08	**3.20**	**(-) 2.05**

Source: BPS.

an average of 11,746,750 Ha from 1998 to 2002. However, this was accompanied by a decrease in rice yields of 2.05 per cent per annum, dropping from an average of 4.40 Kg/Ha of dried husked rice during the period 1975 to 1997 to an average of 4.31 Kg/Ha in 1998 to 2002.

More detailed figures after the 1998 recession show that the rice-growing area increased by 5.3 per cent from 11.14 million Ha in 1997 to 11.73 million Ha in 1998, while the production of unhusked rice decreased by 0.28 per cent from 49.38 tons to 49.24 million tons in the same period. In the following three years (1999 to 2001) the area cultivated with rice decreased to 11.96 million Ha, 11.79 million Ha, and 11.5 million Ha respectively, representing a total decrease of about 1.42 per cent within three years. The decrease in hectarage was followed by an increase in rice production from 51.87 million tons in 1999 to 51.90 million tons in 2000, a decrease to 50.6 million tons in 2001, and then an increase to 50.84 million tons in 2002 due to increases in both the area harvested and the yield.

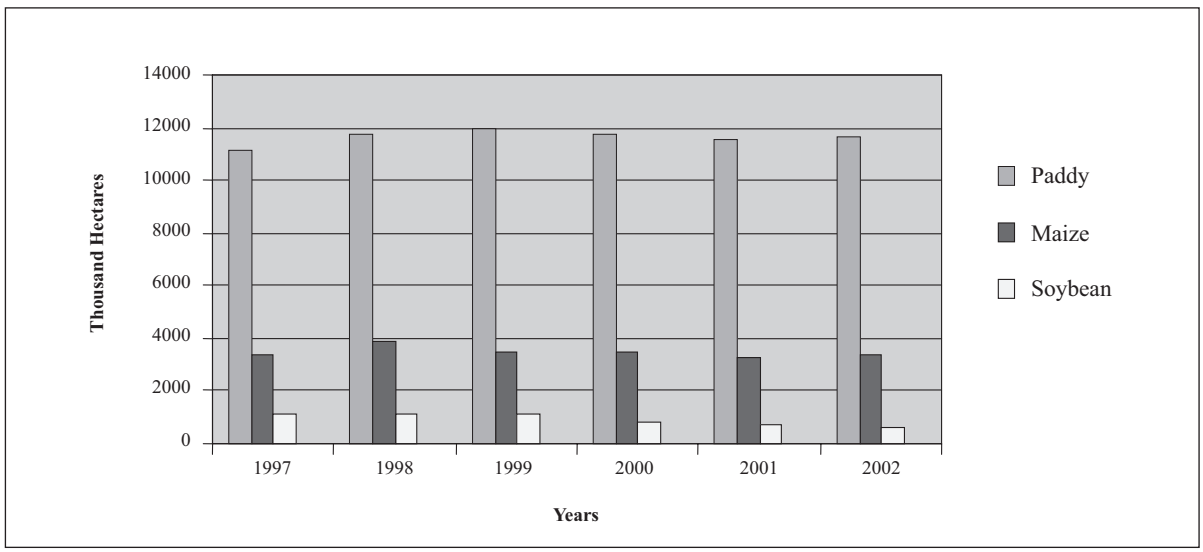
At the national level, BPS recorded data on the yearly harvested area of some major crops, including rice, corn and soybean. The statistics show that on the one hand the rice-growing area was increasing at a very moderate growth rate of 0.9 per cent per annum in the period 1997 to 2002. The growth rate of the harvested area of corn was also low at 0.2 per cent per annum for the same period. On the other hand, the growth of the harvested area of soybean decreased by 10.4 per cent per annum (Figure 3.1). These figures may imply that farmers received only marginal incentives and low incomes to plant rice and corn, and a negative incentive to plant more soybean.

The low prices that farmers obtain for these agricultural products may be partly the cause of their low income. In turn, the low prices of rice, corn and soybeans were the result of the heavy imports of these products following trade liberalization.

Farmers, however, have coping mechanisms to continue living off their farming activities. Firstly, farmers can continue planting rice and other food crops despite the low price of the output by reducing their utilisation of farm inputs. Secondly, farmers may continue their food crop production whilst engaging in crop diversification and other off-farm and non-farm activities to obtain additional income. Thirdly, farmers tend to lend their farmland to sharecroppers and farm labourers.

The remaining question is: why do the majority of farmers continue with their rice, corn and soybean farming? The main argument is that these crops provide food security so maximizing profit may not be the main goal for the majority of farmers

Figure 3.1: The development of rice, maize and soybean harvested area (1997-2002)



Source: Central Statistic Agency, Indonesia.

planting food crops. Based on their experiences, farmers have learned that planting rice, corn and soybean is safer than planting other crops such as vegetables and fruit. So it seems that farmers are averse to risk, and growing food crops represents a safety-first behaviour in the face of risk.

The hypothesis that trade liberalization, if not properly managed, can have negative impacts on domestic food crop producers can also be observed through agricultural land conversion. As previously mentioned, trade liberalization is not the only factor that spurs agriculture land conversion. Because of the price mechanism, trade can reduce

Table 3.3: Rice production and per capita production, 1983-2002

Year	Production (1,000 tons)	Population (1,000)	Per capita production (kg/capita)*)
1983	24,006	155,469	138.97
1984	25,932	158,531	147.22
1985	26,542	161,655	147.77
1986	27,014	164,839	147.49
1987	27,253	168,086	145.92
1988	28,340	171,398	148.81
1989	29,072	177,362	147.52
1990	29,366	179,829	146.97
1991	29,047	182,940	142.90
1992	31,356	186,043	151.69
1993	31,318	189,136	149.02
1994	30,317	192,217	141.95
1995	32,334	195,283	149.02
1996	33,216	198,343	150.72
1997	31,206	201,390	139.46
1998	31,118	204,393	137.02
1999	31,294	207,437	135.77
2000	32,130	207,937	138.68
2001	31,891	208,437	137.70
2002	32,130	211,064	139.07

Note: *) The volume of rice used for seed, feed and waste have been deducted from the production figure. Population 2000-2002, authors estimate.
Sources: BPS and BULOG.

Table 3.4: Indonesian rice production and imports, 1995 – 2002

Year	Production (1,000 tons)		Imports (1,000 tons)	
1995	32,334		3,104	
1996	33,216		1,090	
1997	31,206		406	
1998	31,118		6,077	
1999	32,148		4,183	
2000	32,040		1,512	
2001	31,891		1,404	
2002	32,614		3,703	
Average:	**%**	**change**	**%**	**change**
1995 -1997	32,252		1,503	
1998 -2001	31,661	1.83	3,289	118.83
1999 -2002	32,173	1.62	2,701	(-17.87)

Source: BPS.

the incentive to plant major food crops, and farmers may be driven to convert their farmlands to other commercial crops or sell their farmlands for non-agricultural purposes.

Rice production in Indonesia is actually sufficient to meet the country's demand, despite the fact that Indonesian per capita rice consumption is relatively high at about 130 kg/capita/year. Table 3.3 shows that the per capita rice production has been fluctuating around 135 to 151 kg per year, whereas the per capita rice consumption has been around 120 to 130 kg per year. However, Indonesia has been importing large amounts of rice during the last decade so the problem seems not to originate from low rice production, but rather from trade and management problems. In fact, the production figures show the total production recorded in the rice field, but part of the rice produced is saved for seeds for the following planting season and some is lost due to improper post-harvest handling and transportation. Furthermore, the per capita consumption figures for rice do not include rice consumption figures for the rice processing industries.

Table 3.5: Rice production, import, IDR, and self-sufficiency ratio 1995-2002

Year	Gross production (1,000 tons)	Net production (1,000 tons)	Imports (1,000 tons)	Import dependency ratio (%)	Self-sufficiency ratio (%)
1995	32,334	29,101	3,014	9.4	90.6
1996	33,216	29,894	1,379	4.4	95.6
1997	31,206	28,085	456	1.6	98.4
1998	31,118	28,006	6,077	17.8	82.2
1999	32,148	28,933	4,183	12.6	87.4
2000	32,040	28,836	1,512	5.0	95.0
2001	31,891	28,702	1,404	4.7	95.3
2002	32,614	29,352	3,703	11.2	88.8
Average:					
1995-1997	32,252		1,616	5.1	94.9
1998-2002	31,962		3,376	10.3	89.7

Note: Total export was zero for the whole period 1995 - 2003
Sources: 1) BPS for production, and preliminary data for 2003
2) BULOG for rice imports from 1995 to 1997
3) The Rice Trade for imports from 1998 to 2003.

Table 3.6: Size of land operated by farmers in selected villages in Java, December 2002 - January 2003

Villages	< 0.5 (Ha)	0.51 – 1.0 (Ha)	1.1 – 1.5 (Ha)	>1.6 (Ha)	Total (Ha)
Central Java province					
Pucangan	60	6	1	1	68
Kebagoran	40	-	1	1	42
West Java province					
Gegesik Wetan	20	57	12	12	101
Panggang Sari	28	19	1	2	50
Total	148 (57%)	82 (31%)	15 (6%)	16 (6%)	261 (100%)

Source: Primary data.

3.3 Rice production and imports

A comparison between rice production and imports is presented in Table 3.4. The average annual rice production has decreased by 1.83 per cent per annum from an average of 32,252,000 tons/year between the years of 1995 and 1997 to 31,661,000 tons/year between 1998 and 2001. But if we consider the average rice production during the normal (non-crisis) years of 1999 to 2002, average annual rice production was 32,173,000 tons, which is 1.62 per cent higher than the overall average annual rice production of 31,661,000 tons including the economic crisis period (1998 - 2001). Rice production was in fact lowest during the crises years 1997 and 1998, i.e. 31,118,000 tons and 32,148,000 tons respectively.

The statistics in Table 3.4 show that the average quantity of rice imported by Indonesia increased at a high rate of 118.83 per cent per annum from 1,503,000 tons during the period 1995-1997 to 3,289,000 tons during the period 1998-2001, but decreased by 17.87 per cent to 2,701,000 tons/year during the period 1999-2002, which is the normal period compared to the crisis period of 1998 to 2001.

The role of rice production in the economy can be measured by the self-sufficiency and import-dependency ratios. The self-sufficiency ratio is the ratio between net rice production and the total of net rice production minus exports plus imports. The import-dependency ratio is the ratio between total imports and total net production minus exports plus imports. Table 3.5 shows the rice

Table 3.7: Types of irrigation of agricultural land in the selected villages of Java, December 2002 - January 2003

	(Number of respondents)			
Villages	Technical (persons)	Semi Technical (persons)	Rain fed (persons)	Total (persons)
Central Java province				
Pucangan	2	9	57	68
Kebagoran	-	24	18	42
West Java province				
Gegesik Wetan	-	86	15	101
Panggang Sari	2	39	11	50
Total (persons)	4 (1%)	158 (61%)	101 (38%)	261 (100%)

Source: Primary data.

Table 3.8: Experience of farmers in paddy farming in selected villages of Java, December 2002 - January 2003

Villages	≤ 3 years	4-5 years	≥ 6 years	Total
Central Java province				
Pucangan	1	16	51	68
Kebagoran	-	11	31	32
West Java province				
Gegesik Wetan	9	20	72	101
Panggang Sari	5	5	40	50
Total	15 (6%)	52 (20%)	194 (74%)	251 (100%)

Source: Primary data.

import-dependency and self-sufficiency ratios in Indonesia from 1995 to 2002. It appears that the import-dependency ratio increased from 5.1 per cent between 1995-1997 to 10.3 per cent between 1998 and 2002, while the self-sufficiency ratio decreased from 94.9 per cent between 1995 and 1997 to 89.7 per cent between 1998 and 2002.

3.4 Characteristics of the rice farmer

As can be seen from Table 3.6, 57 per cent of the 261 farmer respondents in Java farm lands of less than 0.5 Ha, 31 per cent farm between 0.5 to 1.0 Ha of land, and the remaining 12 per cent or so, farm 1.1 Ha or more of land. Because of the relatively small size of rice farms, the production policy is very much connected with household food security, since rice production *per se* will not be sufficient to fulfil the farmer's family needs and living costs. This is one of the reasons why most farmers have jobs outside rice production. Based on the discussions with farmer respondents 1.5 hectares of rice field is sufficient to support a family at subsistence level, but for smaller land holdings other sources of income are necessary.

Table 3.7 shows that most farmer respondents earn a low level of income from rice production if their rice field is not well irrigated. Only 1 per cent of the farmer respondents operated land with a technical irrigation system, while 61 per cent had semi-technical irrigation systems and the remaining 38 per cent depended on rainfall. Those dependent on rainfall cannot grow two rice crops a year, but commonly plant non-rice food crops in the dry season after planting rice during the wet season. Only those rice fields with a good technical irrigation system can plant two rice crops followed by one non-rice food crop such as cassava, sweet potatoes, soybeans, mungo beans etc. in a single year. However, some farmers in the technically irrigated area still complained that sometimes the water from the irrigation canal did not reach their plots because the water supply in the upper region was not well managed.

If the current agricultural and development policies remain the same, the future of Indonesia's rice-farming in particular and agricultural sector in general will be bleak. There are already very few young farmers, and the younger generation is increasingly reluctant to work in the agricultural sector. Table 3.8 shows the number of years farmers have spent in rice farming. Among the 261 farmers, only 15 (6 per cent) of them have worked for less than three years in rice farming, while 20 per cent have worked between four and five years and 74 per cent for more than six years in rice farming.

It should also be noted that currently the lowest age of farmers is 35 years old. Again, this does not bode well for the future of Indonesian agriculture. Unless the Government pays more attention to this sector, Indonesia will always be a net importer of all kinds of foods, including fruits and vegetables. Unfortunately, the Indonesian Government does not dispose of sufficient financial resources to

sustain long-term support for agriculture. Therefore, the Government's policy is to encourage the growth of industrial, services and commercial sector activities within rural areas, as these are needed to absorb the growing rural workforce.

3.5 Costs of rice production

The typical cost structure of rice production in Indonesia is shown in Table 3.9. The figures indicate that the gross return from operating one hectare of rice field at the end of 2002 was Rp 6.7 million (equivalent to US$ 753 at an exchange rate of Rp 8,850/US$), which then increased to Rp 7.5 million (US$ 853) in 2003. The production costs per hectare amounted to 79 per cent of the gross returns in 2002, but it was estimated that this would increase to 86 per cent in 2003 due to the rise in fuel prices in early 2003. The farmers' net incomes were already low in 2002 and will be even lower in 2003, i.e. about 21 per cent and 14 per cent of total gross returns respectively (see Table 3.9).

Looking at the cost components of rice production, labour accounts for 42 – 46 per cent of the total production costs, followed by rental costs (23 – 28 per cent) and capital interest (7 – 11 per cent). This means that the other agricultural inputs (seeds, fertilizers and pesticides) together account for just 16 per cent of the total costs of producing rice. The proportion for labour costs (family and non-family labourers) is reasonable compared to that of other sectors, because most farmers are small-scale farmers operating on lands averaging approximately half a hectare or less, and generally make more use of family labourers than non-family ones. This situation has been exacerbated by the fact that the supply of agricultural labourers had been declining for the last decades due to modernization and improvements in education in rural areas.

The high percentage of land rent (23-28 per cent) relative to the total rice production costs was probably a result of the scarcity of agricultural land in relation to the total population of Java. In 2002 Java occupied only 7 per cent of the total land area of Indonesia but was densely populated with 54 per cent of the total Indonesian population of approximately 210 million. Capital costs were also relatively high, because farmers usually had no access to rural banks and were facilitated by private creditors who charge high interest rates (about 20 per cent per season or approximately four months).

The rental system is a sort of guaranteed income for landowners without any risk of not receiving income from rice farming activities. For the tenants, land rent is part of the production costs, which in turn requires them to obtain higher prices for their rice. This is one of the reasons why Indonesian rice cannot compete with imported rice, although it is known that rice productivity in Java

Table 3.9: The structure of farm budgets before and after the rise in oil prices on 2 January 2003 (Rp/Ha)

No.	Items	Before oil price rises (2002)		After oil price rises (2003)	
		Rp 000	%	Rp 000	%
1	Gross Returns	6,663	100	7,551	100
2	Expenditures	5,292	79	6,476	86
	– Seeds	207	4	207	3
	– Urea fertilizer	259	5	259	4
	– SP-36 fertilizer	131	3	132	2
	– KCL fertilizer	65	1	65	1
	– Pesticides	160	3	210	3
	– Farm labourers	2,220	42	2,960	46
	– Tractors	281	5	350	5
	– Land rents	1,450	28	1,450	23
	– Taxes, water fees, etc.	150	3	150	2
	– Interests for farm credits	369	7	694	11
3	Net income	1,371	21	1,075	14

Source: HKTI cited in Kompas, Saturday, 18 January, 2003, p. 23.

(over 4 tons per hectare) is one of the highest among Asian rice producers. Land rental costs have also increased as a result of population growth and demand for land for other non-agricultural land uses.

The costs of agricultural inputs only contributed to around 12-16 per cent of the total costs of rice production. The abolition of Government subsidies for pesticides and fertilizers drove up the prices of these inputs and should contribute to a reduction in their use, which was previously above the recommended doses in any case. The use of chemical fertilizers was relatively constant. Farmers attempted to maintain a constant fertilizer dose in order to avoid decreases in rice production. Although fertilizers and pesticides only represent around 13-16 per cent of the total costs, farmers always considered them as the main production cost determining total rice productivity. Farmers very seldom counted the labour costs, which mainly consisted of family labourers. Consequently, the discussions with the respondents revealed that the farmers always demanded a ratio of 2:1 for the price of rice compared to the price of fertilizers.

Despite the low price of rice and high price of agricultural inputs, the Department of Agriculture estimated that the demand for fertilizers for the 2003 fiscal year was quite high, i.e. 4,800,000 tons of urea, 900,000 tons of ZA, 400,000 tons of NPK and 1,400,000 tons of SP36.

3.6 Rice and its linkages in Indonesia

Rice and rice milling industries have strong sectoral linkages in the economy, mainly in rural areas. The rice industry uses inputs from other industries, e.g. fertilizers, pesticides, agricultural equipment, trade and labour, while the RMI depends on the supply of inputs such as rice, capital and labour. Most of the rice produced goes directly to end consumers, but some is used as an input for the manufacture of rice flour, rice noodles, etc. These industries have, in turn, pushed the development of other industries such as water, fishpond and livestock industries, most of which are found in rural areas and absorb a significant amount of the labour force there. The rice industry is Indonesia's most labour-intensive industry.

Industries that provide inputs for the production of rice are referred to as backward linkages and industries that depend on rice as an input are referred to as forward linkages. These linkages, which are based on input demand and output supply, generate growth impulses that are transmitted from one industry to another. Syafaat (2002) studied the role of rice and rice milling industries in Indonesia using the latest 6 x 6 I/O table for Indonesia for 1998. Data from his study are summarized in Table 3.10.

3.7 Level of industrial linkages and key industries

Based on the data in Table 3.10, the total coefficient of direct and indirect backward linkages (Z) is 1.17173. This means that if the final demand on rice rises by Rp 1 billion, this will pull other industries to increase their total production by Rp 1.17 billion. The four main industries that would be affected in this case are rice and other crops, fertilizer, pesticide and the financial sector, their total share being about 94.4 per cent.

Similarly, the total coefficient of direct and indirect forward linkages (Y) is 1.9629, so an increase in end demand of Rp 1 billion will induce a rise in rice production of Rp 1.96 billion. The total relative indices (direct and indirect) for the rice production industry (PI) and RMI are 1.14 and 1.24 respectively, and the direct linkages for those industries are 2.04 and 1.88. All of the total relative indices are above one. These are the key industries for economic development, most of which are located in rural areas, so the development of rice farming has a positive impact on rural welfare and employment.

Development of the rice industry has pulled other industries, with a total contribution of PI and RMI of 97 and 96 per cent respectively. These figures are relatively high. The PI has pulled other industries, mainly the rice sector (87 per cent), fertilizer and pesticide industry (3 per cent), financial institutions (2 per cent), other crops (2 per cent), livestock (1 per cent) and trade (1 per cent). The RMI has contributed to pulling the rice sector (38 per cent), rice milling (52 per cent),

fertilizer and pesticide (1 per cent), financial institutions (2 per cent), trade (1 per cent), and livestock and poultry (1.47 per cent).

Together, the PI and RMI have contributed to pushing other industries with high contributions of 97 and 93 per cent respectively. For RMI these include the rice sector (85 per cent), restaurant and hotel (3 per cent), other food industries (3 per cent) and livestock (3 per cent).

These inter-industry linkages highlight the importance of the PI and RMI in terms of (i) increasing production and value added and (ii) generating employment. The PI has made a relatively small contribution compared to the RMI in increasing production, namely Rp 2.5 billion versus Rp 101.9 trillion respectively. The share of RMI towards increasing production is 6 per cent and is thus one of the 12 largest industries in the country, while the share of PI is only 1 per cent. Hence, rice as a commodity has significant impacts in terms of increasing production as well as value added. The PI and RMI have together absorbed a workforce of almost 12 million people.

It should be noted, however, that the development of the PI depends heavily on the demand for rice from the RMI, while the RMI depends significantly on the demand for domestic rice. So rice plays an important role in economic development, particularly in rural areas. In particular, the PI and RMI are key industries for rural economic development since they provide considerable employment opportunities

Table 3.10: Role of PI and RMI in the Indonesian economy, 1998

Indicators	PI	RMI
A. Level of linkages		
1. Coefficient direct linkages:		
– Backward (U)	0.13787	0.86482
– Forward (W)	0.99995	0.17925
– Total relative index	2.04	1.88
2. Total linkages coefficient:		
– Backward (Z): sensitivity of dispersion	1.17173	2.10256
– Forward (Y): power of dispersion	1.96293	1.29917
– Total relative index	1.14	1.24
B. Contribution to pull other industries:	**96.82**	**95.82**
– Rice (%)	87	37.76
– Fertilizer and pesticide (%)	3.05	1.33
– Financial (%)	2.26	1.73
– Other crops (%)	2.04	0.89
– Livestock (%)	1.47	0.64
– Trade (%)	1	1.2
– Rice milling (%)	-	52.27
C. Contribution to push other industries:	**96.72**	**93.31**
– Rice (%)	51.93	-
– Rice milling (%)	40.44	84.56
– Restaurants and hotel (%)	1.52	3.18
– Other food industries (%)	1.22	2.54
– Livestock (%)	1.61	3.03
D. Role in the economy		
1. Increasing production		
– Value (Rp)	2,568	101,877,238
– Contribution to total (%)	0.01	5,72
2. Value added		
– Value (Rp)	2,113	46,219,615
– Contribution to total (%)	0.0021	4.49
3. Employment		
– Total (person)	601,000	11,141,991
– Contribution to total (%)	0.01	12.77

Source: Syafaat, 2002.

in rural areas. Consequently, they help prevent a high rate of urbanisation and provide a bumper strategy for social unrest in urban areas. It follows, therefore, that rice imports, which tend to lower rice prices, might have a negative impact on economic development in general and on rural employment in particular.

3.8 Environmental aspects of rice production

3.8.1 The multifunctionality of rice production

Nurmanaf, *et al.* (2001) studied and valued the multifunctionality of rice fields. In addition to rice production, rice fields provide other functions such as flood mitigation, conservation of water resources, reducing erosion, rural amenity, food security, organic waste disposal, income and employment generation. Land conversion of rice fields, particularly from agricultural uses to industrial and other development purposes, has incurred environmental degradation not only within the area under conversion, but also to the surrounding areas due to externalities.[14]

3.8.2 The soil resources

Rice fields have two main functions: as a source of nutrients and a provider of environmental services where the plant can grow, and where ground water is stored. When the soil becomes damaged, due for example to the loss of nutrients and other organic matter, the presence of compound or toxic matter in the root area, saturation, water logging or erosion, it can no longer support the growing of plants.

Indonesia has a tropical climate and an average rainfall of over 1,500 mm per year. Under this type of climate, the process of soil damage due to organic changes, mineral decay and nutrient wash can occur quickly. Besides, repetitive planting of rice in the same fields without proper management, combined with the custom of burning the plant residues in the harvesting area also accelerates the washing process of the nutrients.

In Indonesia, rice is a one-season, mono-cultural crop that requires high nutrient input and the application of macro-fertilizers such as urea, SP-36, and KCl to obtain optimum yields. The use of inorganic fertilizer has increased at times, while the use of organic fertilizer as a source of complex nutrients (including micronutrients) has been decreasing and is sometimes inexistent since it is inadequate for obtaining maximum yields and is very bulky. In wet rice fields the number of organisms that can change the organic matter is small, so the providing rate of nutrients and organic matter is also low. In well-irrigated areas the intensity of rice planting is high. Exploitation of the land becomes more intensive, but again the application of organic fertilizer is very limited. The addition of micronutrients to increase production is rare. As a result, the land becomes saturated due to the lack of micronutrients such as Zn, Mo, Cu, etc. The application of SP-36 where the source of P mostly originates from natural resources that contain metals such as Pb or Cd will accumulate in the soil. In the flooded soil, Pb and Cd will not be harmful to the plant, but in the dry field, for example where land-use has been converted from rice growing to the cultivation of other non-rice food crops, the metal will be absorbed by and contaminate the crop. A study carried out by the Soil and Agro Climate Research Institute shows that in wetlands that have been used for growing rice for more than 100 years, the contamination with Pb, Cd and pesticides is insignificant, while in the recently occupied dry land for farming the contamination with Cd is above standard.

3.8.3 Land conversion

The fact that imported rice is cheaper than domestically produced rice plus the fact that the Government is providing less incentives for farmers to plant rice will increasingly become a burden to farmers who continue to produce rice. This situation has already pushed farmers, especially the wealthier ones, to convert their agricultural land for other purposes, such as housing, manufacturing and roads. In some cases part of the soil has been

[14] Agus *et al.,* 2002.

Table 3.11: Conversion pattern and land use after conversion, 1989-1996 (%)

Rice field	Non-agriculture					Agriculture	Total
	Housing	Industry	Road	Others	Total	Non-rice	Conversion
West Java							
Technical	46.00	48.20	2.16	1.48	97.84	2.16	100
Semi-technical	56.02	18.25	2.14	5.61	82.02	17.98	100
Simple	3.13	26.70	6.56	0.02	36.41	63.59	100
Rain fed	49.11	27.44	0.08	1.50	78.13	21.87	100
East Java							
Technical	22.83	34.60	25.53	14.67	97.63	2.37	100
Semi-technical	33.16	55.05	6.71	4.08	99.00	1.00	100
Simple	4.66	0.50	0.20	0.30	5.66	94.34	100
Rain fed	47.83	37.13	1.00	12.03	97.98	2.02	100
Average	32.84	31.67	5.55	3.59	74.33	25.67	100

Source: Sumaryanto *et al.,* 2001.

sold as input for brick and roof-tile industries. Table 3.11 presents the pattern of land conversions and shows that, out of the total rice fields converted to other uses, 74 per cent have been converted for non-agricultural uses and about 26 per cent for non-rice farming. Among the non-agricultural uses, housing and industry share the largest proportion, namely 32.84 per cent and 31.67 per cent respectively. Observations have shown that some rice fields are now being planted with mango trees as the latter are considered the most appropriate replacement of rice crops in Java.

The Government regulation on the development and management of land-conversion, as stated in the Presidential Decree No. 33, year 1990 on *Land Use for Industrial Estate Development,* prohibits the conversion of fertile rice fields to other uses. Also, the Letter of the State Minister of National Development Planning or Head of the National Development Planning Agency (BAPPENAS) No. 5334/MK/9/1994 on the *Changes in Rice Field with Technical Irrigation to Non-agricultural Purposes* has not worked effectively, since the Government cannot guarantee that rice farmers will earn higher incomes if they do not convert the rice fields. The conversion of rice fields will cause overall rice production to decrease, but will also result in the loss of the multiple functions of rice fields as water ponds, in restraining water and controlling floods, as water reservoirs, in preventing erosion and in heat control. Furthermore, rice field conversion is permanent; once the rice field has been converted to non-agricultural usage, the process is irreversible.[15]

From the 1970s to the 1990s, the irrigated area was expanded by 108,000 to 114,000 hectares per year.[16] After achieving food self-sufficiency in 1984, the Government attempted to speed up economic

Table 3.12: Estimated rice fields converted to other uses in Java, 1987 -1993

Province	Years	Total (ha)	Average (Ha/year)
West Java	1987-1991	37,033	7,046
Central Java	1981-1986	40,327	6,721
Yogyakarta	1986-1990	2,910	224
East Java	1987-1993	57,996	8,285
Total			22,276

Source: Sumaryanto *et al.,* 2001.

15 Sumaryanto *et al.,* 2001.
16 Hardjoamidjojo, 1994.

Table 3.13: Area of wetland (rice field) by type of irrigation in Java and Indonesia, 2000 (in Ha)

Province/Island	Technical	Semi-technical	Non-technical	Total
DKI Jakarta				
West Java	860	655	1,000	2,515
Central Java	397,106	113,886	275,931	786,923
Yogyakarta	380,985	133,420	203,149	717,554
East Java	18,336	23,664	8,193	50,193
Banten	671,468	113,919	124,662	910,049
	58,114	14,827	43,393	116,334
Total Java	1,526,869	400,371	656,328	2,583,568
	(59.10%)	(15.50%)	(25.40%)	(100%)
Total Indonesia	2,212,853	976,515	1,682,892	4,872,260
	(45,42%)	(20,04%)	(34,54%)	(100%)

Source: Agricultural Survey, Land Area by Utilisation in Indonesia, BPS, Jakarta, 2000.

growth through industrial development. As a result, its commitment to develop the agricultural sector decreased.

Table 3.12 presents the annual average rice growing area converted to other uses in different provinces in Java. The absolute figures indicate that between 1987 and 1993, the largest annual average area of rice land converted to other uses (8,285 ha/year) occurred in East Java, followed by West Java (7,046 Ha/year) between 1987 and 1991, then Central Java and finally Yogyakarta. However, it would be more informative if the figures were stated in percentage terms.

From Table 3.13 it can be seen that in 2000 the total amount of irrigated land in Java was about 53.02 per cent (about 2,583,568 Ha) of the total irrigated land of Indonesia (4,872,260 Ha). Out of the total irrigated land in Java, 59.1 per cent was technically irrigated, 15.50 per cent was semi-technically irrigated, and 34.54 per cent was non-technically irrigated. In comparison, in the same year, for Indonesia as a whole, the total irrigated rice field consisted of 45.42 per cent of technically irrigated rice field, 20.04 per cent of semi-technically irrigated and 34.54 per cent of non-technically irrigated rice fields.

The total rice land converted to other uses can be estimated by comparing the figures in Tables 3.12 and 3.13. The percentage rate of rice field conversion is presented in Table 3.14. The figures were extrapolated where it is assumed that the absolute conversion of rice fields to other uses was constant during the period 1990 to 2000.

From Table 3.14 we can see that the average land conversion in Java ranges from 224 Ha/year in the smallest province in Java, Yogyakarta, to 8,285 Ha/year in East Java, the largest province. The total land conversion during the decade 1990 – 2000 could be estimated at 22,276 Ha/year. In percentage terms, the average rate of land conversion ranges between 4.3 per cent per year in Yogyakarta to 10.8 per cent per year in Central Java. In total, the rate of land conversion in Java reached around

Table 3.14: Rate of land conversion to other uses in Java, 1990 - 2000

Province	Average (Ha/year)	Annual rate of conversion %
West Java (1997 – 2000)	7,046	6.65
Central Java (1987 – 2000)	6,721	10.80
Yogyakarta (1990 – 2000)	224	4.30
East Java (1993 – 2000)	8,285	5.90
Total average for Java	22,276	6.91

Source: Table 3.12 and 3.13.

Table 3.15: Total erosion in some of type of land utilisation in the river basin sheet

Location	Soil erosion (tons/ha/year)			
	Rice field	Agric non-rice field	Forest	Housing
Kali Garang River Basin (Central Java)	9.53	57.21	11.20	0.70
Citarik Sub-River Basin (West Java)	1.40	176.53	4.50	-
Average	5.46	116.87	7.85	-

6.91 per cent per year between 1990 and 2000 and, if this trend continues at the same rate, it is quite probable that in less than 20 years the whole agricultural land of Java will be converted to non-agricultural uses, mainly for housing, offices, schools, shopping centres and manufacturing plants.

3.8.4 Erosion

When soil erosion occurs, nutrients and organic matters needed by plants are carried away and the ability of land to restrain water is reduced. The farmers' activities in the field can potentially cause the highest erosion during the mudding stage, but most farmers have anticipated this by reducing the flow of water to and from the rice field, which may reduce the rate of soil erosion, and the water that covers the surface of the rice field may protect the soil from damage caused by rainfall. The rate of soil erosion on rice fields (5.46 tons/Ha/year) is lower than the rate of soil erosion for other farming activities (116.87 tons/Ha/year), including for the forest area (7.85 tons/Ha/year) (see Table 3.15).

Based on the above data it can be seen that land used for rice farming contributes the least to soil erosion compared to other land uses, such as non-rice farming, forestry and housing. Therefore, the increasing land conversion will also increase the volume of soil erosion.

It is clear that forests contribute more to biodiversity than rice fields. But the issue is not about converting rice fields into forests since this is not possible. On the contrary, the conversion of forestland to agriculture, including rice production, is much easier in all cases, although this type of land conversion is the worst. The conversion of rice fields to non-rice agricultural and non-agricultural uses is more likely.

3.8.5 Irrigation

One aspect that is often overlooked when rice fields are converted to other uses is the multifunctionality of the irrigation system. Massive Government investments for irrigation during the last

Table 3.16: Government fertilizer and irrigation subsidies for rice production, 1968 – 1988 (billion Rupiah)

Period	Fertilizer	Irrigation
1st five-year plan	412	1,704
2nd five-year plan	2,426	2,426
3rd five-year plan	2,898	4,100
4th five-year plan	3,972	4,100
Total	9,708	13,056

Note: First five-year Development Plan: 1967/68 – 1971/72
Second five-year Development Plan: 1972/73 – 1976/77
Third five-year Development Plan: 1977/78 – 1981/82
Fourth five-year Development Plan: 1982/83 – 1987/88

Source: Varley, 1995.

Table 3.17: The average content of nitrate, ammonium and sulphate in the shallow well of rice fields and forest areas (mg/L)

Location	Nitrate	Ammonium	Sulphate
Citarik Sub River Basin			
Shallow Well in Rice Field Area	6.87	6.08	26.53
Shallow Well in Forest Area	1.12	0.31	1.64
Kaligarang River Basin			
Shallow Well in Rice Field Area	1.82	0.71	16.43
Shallow Well in Forest Area	0.92	0.00	1.28

Source: Nursyamsi *et al.,* 2001.

decades become worthless when irrigated land is converted to other uses, especially when the conversion is to non-agricultural uses. Government investments, including subsidies, in the agricultural sector are presented in Table 3.16. During the period between the first and fourth five-year Plans, subsidies for fertilizers and irrigation services increased annually and were always higher for irrigation than for fertilizers. The Government developed the irrigation facilities and provided water to farmers free of charge.

The conversion of technically irrigated lands incurs very high economic costs since the opportunity to produce rice in the highly productive irrigated lands has gone. Yet these lands can commonly be used to grow two rice crops and one non-rice crop in a single year.

Dams serve the purpose of adjusting the volume of water that reaches irrigated lands, while the volume of water for rain-fed land obviously depends on the rainfall. During the dry season, rain-fed land becomes very dry, while the irrigated land can still be utilised for farming. However, wetlands are still commonly planted with rice during the rainy season.

The amount of water retained in the rice field depends on the capacity of the bund and the rate of water percolation-infiltration into the soil. In the early stages of rice field preparation, the soil is continuously processed so that the upper soil layer remains muddy and the lowest layer becomes solid as this reduces the rate of percolation-infiltration and allows the land to be flooded for planting rice. The capacity to retain the surface water will reduce the rate of runoff into the river. Gatot *et al* (2001) found that the rice fields of the Kali Garang River Basin could reduce the water discharged by 5 to 11 per cent.

Urea, SP-36, KCl and pesticides are necessary to support rice production. The water that lies on the surface contains agro-chemical residues such as pesticides, fertilizers and heavy metals. Nursyamsi *et al.* (2001) found that water of a shallow well in the rice field area contains more ammonium, nitrate or sulphate compared to wells in forest areas (see Table 3.17). If fertilizers or other agro-chemicals dissolve through percolation flow, they are filtered by the deep soft soil particles so the water that seeps through to aquifers remains clean. Permanent flooding of the rice field would provide a continuous supply of clean water, albeit at a low capacity.

On the basis that rice fields can increase the supply of clean water and improve the quality of water aquifers, the conversion of rice fields to non-rice crop uses decreases the function of the land as rainwater catchments and filters. In addition, the flooded water on the surface functions as *mulsa* and can prevent the kinetic energy of rainwater from striking directly on the land surface and thus lessens the risk of soil erosion.

3.8.6 Air quality

Rice plants are needle-shaped and relatively short, i.e. less than one meter, so the evapo-transpiration rate is relatively low. The water of the inundated land surface can absorb the heat of the sunlight, thus reducing the heat of the air in the surrounding area. The humidity rate is relatively high, which

may also, in turn, reduce the evapo-transpiration rate. However, permanent inundation may result in an imperfect rate of decomposition of organic matter in the soil. In certain conditions this may cause the release of methane gas (CH4) into the air, although this is relatively low if the water level is not too high, i.e. around five centimetres.

3.8.7 Biodiversity

The monoculture aspect of rice growing reduces biodiversity since fewer species can survive in the rice field ecosystem and the use of chemical inorganic fertilizers does not encourage the development of flora, fauna or soil micro-organisms. The loss of certain species in the ecosystem can result in the development of other highly adaptable species of pest that attack rice crops. The number of pests always increases as a result of farmers' actions to protect rice crops. To prevent pests, farmers spray pesticides on the rice field, but other organisms with similar behaviour will be destroyed too, so the number of non-targeted organisms that may have a predator function on targeted organisms will also decrease, allowing unwanted pests to develop. If the rice field is then converted for other purposes new problems will arise as a result of a change in the ecosystem that could harm the stability of ecosystems in the surrounding area. In Table 3.18 Darmawan and Yusdja (1993) show that the total area of rice field pest invasion has increased from 1986 to 1990.

In 1986 pests and diseases invaded 340,616 Ha of land in total and by 1990 this had increased to 553,903 Ha, representing an average increase of about 15.65 per cent per year.

Table 3.18: The total invasion of rice field in Indonesia, 1986 – 1990 (Ha)

	1986	1987	1988	1989	1990
Pest	308,125	300,798	463,994	405,232	479,401
Disease	32,491	40,719	78,527	71,674	74,502
Total Pest & Disease	340,616	341,517	542,521	476,906	553,903

Source: Darmawan and Yusdja, 1993.

4. Integrated assessment of the impacts of trade liberalization on the rice sector

4.1 Introduction

Rice is not the only sector in the Indonesian economy and all policies aimed at restructuring the economy will have influences on all sectors. This section describes the policies recognized as having strong influences.

4.1.1 Rice price policy

The Indonesian rice price policy has two main purposes: (i) maintaining the price of rice stable to protect consumers from high and fluctuating rice prices and (ii) providing incentives to rice farmers by protecting them from a drop in their net incomes resulting from a decrease in rice prices. The price of rice has been kept low since the beginning of Indonesian independence in 1945 because rice has been the main staple food of the people and the majority of Indonesians still belong to the lower income group. A high rice price and high production will of course increase the farmers' incomes, but on the other hand the high price of rice depresses the real incomes of the non-rice producers and non-agricultural workers. At present the Government is implementing a procurement price policy, rather than adopting a floor policy.

4.1.2 Trade policy

Trade policies are divided into domestic and foreign trade policies. Formerly, BULOG controlled all rice trading in its role as the STE and was assigned the task of maintaining the stability of rice prices. BULOG adopted a buffer stock policy, which consisted in increasing or decreasing the quantity of rice on the market as necessary. To protect the rice farmers, BULOG purchased rice through village cooperative units (KUD) at a floor price level determined by the Government. When the price of rice increased due to low supplies in the market, BULOG sold the rice stock back to the market.

Since late 1998, the foreign trade policy has been very much related to the GATT and WTO regulations, and private enterprises other than BULOG have been allowed to import rice.

Indonesia's trade liberalization of the rice sector was mainly guided by the IMF's structural adjustment programme as stated in the Letter of Intent signed in 1998 at the beginning of the economic crisis. The economic crisis was accompanied by social panic due to a lack of rice supplies. The Government had already learned from previous experience in 1966 that sufficient rice supplies could mitigate this panic. Therefore, in line with the IMF's advice, the GOI agreed to increase rice imports, applying a zero tariff. In addition it granted private traders the permission to import rice in addition to BULOG. This resulted in a significant increase in rice imports and a decrease in the local price of rice. But the Government subsequently reviewed its policy by imposing a 30 per cent tariff equivalent for imported rice, which represented a specific tariff rate of Rp 430/kg in the year 2000.

Trade liberalization was in fact in line with the regional trade agreement on rice according to the CEPT of the AFTA. Rice is included in the sensitive list for Indonesia, so rice imports can still be imposed a 20 per cent tariff until the year 2018, after which the tariff must be abolished.

The IMF has emphasized the removal of tariffs and subsidies for all sectors, including banking, oil, gas and agriculture. For the latter this also includes eliminating subsidies for agricultural inputs (pesticides and fertilizers).

4.1.3 Agricultural inputs subsidy policy

This policy is common in developing countries. Agricultural technology in developing countries, such as in Indonesia, is less advanced than in developed countries. Farmers need extension services and encouragement to adopt modern technology such as high-yielding varieties, fertilizers, pesticides, irrigation water and farm credits, all of which compensate for the negative rice price policy that keeps the price of rice stable but low. Without these extension services farmers face double pressure in terms of a low price of rice maintained by the Government to protect the non-rice producers and non-farm workers as well as high agricultural input prices. Farmers are very much dependent on chemical pesticides to protect rice crops and on chemical fertilizers to increase productivity. Yet, as already mentioned, the heavy use of pesticides also eliminates non-targeted predators, and the increased resistance of pests to the pesticides results in frequent pest outbreaks. Similarly, the continuous use of chemical pesticides also has adverse effects on the agricultural environment; it was found, for instance, that the plants absorbed only 1 per cent of the inputs while the rest remained in the environment as poisonous waste.

In view of these problems, and as a result of trade liberalization efforts as advocated by the WTO regulations and the IMF, subsidies for these agricultural inputs have been reduced since 1995. Subsidies for chemical pesticides were already waived in 1989. This change in policy gained support from the IMF because it was in line with the Government's objective to reduce its annual budget deficits. The reduction of Government subsidies for agricultural inputs has resulted in higher prices for agricultural inputs, mainly fertilizers and pesticides, which in turn affected rice production. However, the abolition of pesticide subsidies was accompanied by the introduction of Integrated Pest Management (IPM), which led to a reduction in the use of pesticides and an increase in rice production and income. The IPM programme thus contributed to financial benefits for the farmers and was environmentally beneficial because less poisonous wastes entered the environment. This phenomenon has been noticed over the last ten years since the declining tendency of farmers in the province of Yogyakarta in Java to use pesticides.[17]

4.1.4 Macro-economic policy

Energy price policies recently adopted by the Indonesian Government with the objective of reducing Government subsidies for energy will also affect the rice sector. Formerly the prices of fossil fuels and electricity were kept low to facilitate the growth of industrial sectors and allow reasonable electricity consumption for households most of which are low-income. However, the abolition of energy subsidies has obviously resulted in higher fuel prices. This has caused an overall increase in prices, especially for transportation, which reduces the real disposable income of the population, including rice farmers. However, the change in rice prices was always behind the changes in other prices, since the price of rice was always under the control of the Government through the system of floor and ceiling prices.

4.1.5 Development policy

The aim of development policies is to increase the incomes and employment rate of the Indonesian people. Such policies can have impacts on the rice sector. The Government often provides large

[17] Irham *et al.,* 2003.

budgets for irrigation development, for the transmigration of people from Java to outside Java, and to increase the export of non-fuel products. Such policies have resulted in structural adjustments and, of course, had impacts on the rice sector. The growth of industry, real estate, public facilities and infrastructures has stimulated a high rate of conversion from agricultural to other uses. Since most of Indonesia's rice production is in Java, the land conversion in Java has hurt Indonesian rice production very heavily.

4.2 Identification of the relevant time period to be studied

In studying the role of rice and rice-related policies, three main periods can be distinguished: (i) 1990 – 1994 as a period of strong support or strong subsidization, (ii) 1995 - 1997 as a period of trade liberalization under the AoA, and (iii) 1998 – 2002 as a period of radical trade liberalization.

4.2.1 Strong support or strong subsidization (1990-1994)

From the 1960s up to 1994 the GOI focused its efforts on increasing rice production to achieve its food self-sufficiency target. Considerable funds were spent on building dams, irrigation facilities, flood control systems and rehabilitating rivers. In fact, between 1980 and 1985 Indonesia became a net rice-exporting country. However, the food diversity policy failed and Indonesians consumed more rice and less diverse foods, so the per capita rice consumption increased from 87 kg per year in 1990 to 130 kg per year in 2001. During the period 1990 to 1994 the Government still encouraged farmers to produce more rice by heavily subsidizing inputs, but at the same time the price of rice did not act as an incentive for farmers to plant rice. In fact, the application of pesticides in the 1970s and 1980s had reached a very high level as a result of the green revolution movement in Asia in the early 1970s. It is recorded that Government subsidies for agricultural inputs reached US$ 725 million during that period. About 40 per cent of these subsidies were allocated to chemical pesticides.[18] Besides, the Government applied a quota system rather than import tariffs for rice. Domestic rice production was unable to keep pace with rice consumption, and Indonesia went from being a net rice-exporting country from 1985 to 1987, to being a net rice-importing country from 1988 onwards (see Table 4.1). Rice imports reached over 6 million tons in 1998 and then declined again.

4.2.2 The period of the AoA (1995-1997)

In 1995 Indonesia began to reduce subsidies for agricultural inputs, although subsidies for pesticides were banned earlier (in 1989) on account of the implementation of the AoA and reductions in Government spending due to financial difficulties. But by then farmers had become familiar with the application of modern farming technology so, even though the price of agricultural inputs increased relative to the price of rice, farmers continued using fertilizers and pesticides in order to maintain the same level of productivity, thus sacrificing their net income from rice production. During the period 1994 to 1997, despite the ban on input subsidies, the Government continued to apply the quota system, thus constraining the volume of rice imports, even though the AoA requires its member countries to apply the tariff rather than the quota system.

4.2.3 Radical trade liberalization (1998-2002)

In 1997 Indonesia and other countries (Thailand, Korea, Japan) experienced a financial crisis. In Indonesia, the economic crisis was followed by a political crisis. When consulted by the GOI to help solve the economic crisis, the IMF's main advice was to liberalize the economy, abolish and reduce subsidies and open the market system by applying tariffs rather than quotas for rice imports. In the past, the fall of government regimes had always been associated with high rice prices so, to prevent

[18] Irham *et al.,* 2003.

riots demanding that the price of rice be decreased, the Government took the IMF's advice to open up the rice market and allowed all interested agencies to import rice, so BULOG no longer had monopolistic rights for rice imports. The import tariff was nil and the volume of rice imports increased significantly to about 6 million tons. In 1998, Indonesia became the largest rice importing country in the world. Domestic rice prices decreased significantly due to the oversupply of rice, which hit the domestic rice farmers because the low prices of rice combined with high input prices no longer made rice growing attractive. This situation persists today.

4.3 Main economic, social and environmental impacts of trade liberalization

This section will discuss the economic, social and environmental impacts of changes in the prices of rice and agricultural inputs, and will not assume that the changes in rice, fertilizer and pesticide prices were specifically caused by the WTO AoA.

4.3.1 Economic impacts of a decrease in the price of rice

This study is based on the hypotheses that decreases in the price of rice will affect the agricultural economy, mainly in terms of rice production. However, looking at the long-term trend in column 1 of Table 4.2 it appears that from 1986 to 1999 rice prices stated in current prices were not declining, but rather increasing. When the rice prices are stated in real prices by deflating the producer prices (column 1) with the consumer price index (column 2), the results (column 3) still show that the trend in the price of rice is on the increase, albeit with occasional decreases in the 'real' price of rice in 1991, 1993 and 1995.

Even during the radical trade liberalization years (1998-1999), the price of rice was increasing. Therefore, it seems the hypothesis that trade liberalization has caused the price of rice to decline is only true in the short–run, i.e. only during the first half of 1998.[19] However, Table 4.2.a shows that the nominal prices increased during the whole period of 1992 to 2002, but the real prices

Table 4.1: Rice supply and demand in Indonesia, 1966-1999

Year	Domestic production of milled rice ('000 tons)	Net imports ('000 tons)	Rice consumption per capita (kg/year)	Rice production per capita (kg/year)
1983	24,006	1,169	126.09	138.97
1984	25,932	403	126.77	147.22
1985	26,542	-371	127.18	147.77
1986	27,014	-213	127.18	147.49
1987	27,253	-64	127.97	145.92
1988	28,340	13	128.89	148.81
1989	29,072	325	129.86	147.52
1990	29,366	32	130.78	146.97
1991	29,047	179	130.94	142.90
1992	31,356	561	130.74	151.69
1993	31,318	-540	130.64	149.02
1994	30,317	643	130.64	141.95
1995	32,334	3,104	130.48	149.02
1996	33,216	1,090	131.34	150.72
1997	31,206	406	131.56	139.46
1998	31,118	6,077	131.65	137.02
1999	31,294	4,183	131.44	135.77
2000	32,130	1,512	n.a.	136.79
2001	31,891	1,404	n.a.	133.50
2002	32,130	3,703	n.a.	132.25

Source: Masyhuri and Fukui, 2003, Table III-2-1; BPS and The Rice Report.

[19] The local price of rice at local market Jakarta for IR III quality decreased from Rp 1350 in January 1998 to Rp 1300 in February 1998, Rp 1200 in March and April 1998 and increased again to Rp 1350 in May 1998 and then increased continuously after that month.

Table 4.2: Rice producer price and consumer price index, and real price of rice, 1980-1999

Year	Producer price (Rp/kg)	Consumer price index	Real price (1995 =100)
1980	125.3	28.60	438.11
1981	134.1	32.20	416.45
1982	149.7	35.20	425.28
1983	171.5	39.40	435.28
1984	183.3	43.50	421.38
1985	189.7	45.50	416.92
1986	186.1	48.20	386.09
1987	224.1	52.60	426.05
1988	270.2	56.90	474.87
1989	270.2	60.50	446.61
1990	308.5	65.30	472.43
1991	354.2	71.40	496.08
1992	382.3	76.80	497.79
1993	356.6	84.20	423.51
1994	413.2	91.40	452.09
1995	495.2	100.00	495.20
1996	500.0	108.00	462.96
1997	588.0	115.20	510.42
1998	1136.0	181.70	625.21
1999	1455.9	218.90	665.09
2000	n.a	227.00	n.a

Sources: Statistik BULOG (several publications)
Economic Indicator, BPS (several publications).

increased only during the period 1992 to 1999 and then decreased by an average of 6.1 per cent per year from Rp 1,316 in 1999 to Rp 996 in 2003. The real retail price was computed using consumer price indices with 1996 as the base year.

As already mentioned, when the price of rice fell, especially in 1998, only very few farmers reduced the amount of land on which they grew rice and the quantity of chemical fertilizers used. In fact, most farmers continued using chemical fertilizers to maintain high productivity, even though this meant a reduction in their net incomes. This was also the case when the price of chemical fertilizers and pesticides increased following the reduction and abolition of Government subsidies, the main reason being that they were subsistence farmers and continued to grow rice for their household needs. The average land holding size of Indonesian farmers is less than half a hectare and the farmers do not have alternative income opportunities.

Table 4.2.a: Current prices, consumer price index and real prices 1996 = 100, Jakarta retail market, 1992 - 2003

Year	Current price (Rp/kg)	Consumer price index	Real price (1996 =100)
1992	603.68	71.11	848.94
1993	592.25	77.96	759.68
1994	660.37	84.63	780.30
1995	776.38	92.59	838.51
1996	880.00	100.00	880.00
1997	1,063.80	106.67	997.28
1998	2,099.03	168.32	1,247.05
1999	2,665.58	202.63	1,315.49
2000	2,424.22	210.27	1,152.91
2001	2,537.09	234.46	1,082.10
2002	2,826.06	262.31	1,077.37
2003	2,785.85	279.59	996.41

Sources : – Nominal Retail Price from BULOG.
– Consumer Price Index from BPS.

Switching to other crops is considered risky because other crops such as vegetables and fruits are perishable and require appropriate handling and marketing systems for which the farmers lack capability at present. From Tables 4.3 and 4.4 we can see that most farmers continued farming the same amount of land and used the same level of agricultural inputs despite rises in the cost of inputs and decreases in the price of rice. Table 4.3 shows that, out of the 261 farmer respondents, only 4 per cent shifted to other crops, while 18 per cent continued cultivating rice on the same amount of land but reduced the application of chemical fertilizers, and 78 per cent continued growing rice on the same amount of land and used the same volume of chemical inputs. This means that about 78 per cent of farmers suffered from a decrease in net incomes derived from rice production.

The most important thing to note is that farmers in Java tended to consider their household food security as the first priority, so they would only sell a small proportion of their harvest and keep the bulk for their own family. In addition, this rice stock was also a useful source of capital for the next planting season. This was especially the case for the larger scale farmers operating land holdings of more than one hectare. Small-scale farmers commonly do not have the possibility of holding back their rice stock since they need to sell the harvested rice immediately after the harvest to pay back their loans and credits.

From the figures in Table 4.4, we learn that the impact of a decrease in the price of rice is similar to the impact of an increase in agricultural input prices. Indeed, 90 per cent of farmer respondents continued growing rice on the same amount of land and using the same quantity of inputs, and 5 per cent continued growing rice on the same amount of land but reduced the use of farm inputs. Only 3 per cent changed from growing rice to other crops as the price of rice decreased.

From the above two tables it appears to be difficult for Indonesian rice farmers to adjust to changing market conditions. Because of their poverty, most small farmers are economically dependent on the capital owners (creditors) who provided them with the funds to operate the land, including tilling of the land and paying for seeds, fertilizers, pesticides and labour. Immediately after the harvest, the small farmers sold the rice to the creditors as payment for the debt and its interest and used the remainder of their harvest as their food security. At harvest time the price of rice is usually very low, but the farmers had very little choice.

To support their families, during the non-harvest season these small farmers and their family members usually earned income from other sources, for example as farm labourers or as workers in non-agricultural sectors (construction, trade, transportation). The more fortunate of them may have other sources of income such as raising cattle, or growing vegetables in the backyard of their houses.

Table 4.3: Action taken by farmers when the price of agricultural inputs increased in the selected villages in Java, December 2002 – January 2003

Villages	Reduced rice-growing area (persons)	Same amount of land but reduced agricultural inputs (persons)	Same amount of land and agricultural inputs (persons)	Changed to other crops (persons)	Total (persons)
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.

Table 4.4: Action taken by farmers when the price of rice declined in the selected villages in Java, December 2002 – January 2003 (Persons)

Villages	Reduced rice-growing area	Same area but reduced farm inputs	Same area and same farm 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.

In addition, most farmers have a high number of dependents (see Table 4.5). Out of the 261 farmer respondents, 44 per cent had on average four or five dependent family members, over 13 per cent had more than six dependents, and less than 3 per cent had less than three dependents. These figures indicate that farmers carry a heavy burden in terms of supporting their families.

In some villages, the rise in agricultural input prices, especially for chemical fertilizers, has caused some farmers to reduce the application of chemical fertilizers and supplement them with organic fertilizers, which is expected to have environmental and health benefits.

However, the negative aspect of organic agricultural inputs is that they are not practical (bulky and dirty), since these inputs consist mainly of cow dung and rice stalk. Another problem with regard to the production of such organic fertilizer is the declining number of cattle over the last decades and shortage of rice stalk. So, new technologies are needed to produce organic fertilizers that are similar in use and comparable in cost to chemical fertilizers.

4.3.2 Social impacts of a decrease in rice price

4.3.2.1 Local traditions and indigenous culture

In one of the studied village (Gegesik Wetan) rice farming seems to be a way of life. Most of the people are rice farmers due to efficient technical irrigation so they will never plant crops other than rice. None of the farmers will plant rice until after the *wayangan* ceremony (big fête and puppet show). The society

Table 4.5: Number of dependents per farmer in the selected villages 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.

wishes to preserve this culture, and by doing so people perpetuate the social relations and can share the rural wealth. This culture is perhaps related to the level of education of the farmers. Most farmers (87 per cent of respondents) in the studied villages only underwent primary education, very few (11 per cent) attended high school and even fewer (7 per cent) attended higher education establishments (see Table 4.6). Educational background very often influences how a person reacts in the face of risks.

4.3.2.2 Urbanisation

Long before the beginning of the economic crisis in 1997 and radical trade liberalization in 1998, a great number of young workers moved from the agricultural sector to non-agricultural sectors, mainly in the cities. Furthermore, modernization and improvements in the level of education has led to an increase in the number of educated people in villages, although most are still at elementary or junior high school levels. This factor has contributed to the scarcity of farm labourers in the villages. From the field survey in early 2003, it was found that the youngest age of the farmer respondents was 35 years old, with an average age of about 45 years old. This phenomenon appeared in the four sample villages for this study.

Low wages aggravate the scarcity of farm labourers in the sector. The younger workers (less than 35 years old) prefer to work in factories or as taxi drivers rather than in the agricultural sector. The scarcity of farm labourers gives the latter bargaining power to determine their work schedule and wage rates, which in turn has increased the overall cost of farm labour for farmers. This is a significant factor in the reduced net incomes of farmers. Labour accounted for a higher proportion of the production costs than agro-chemicals, but because the earnings of farmers in the rice sector are low, the wages of farm labourers, although considered high for the agricultural sector, are still relatively low compared to wages in non-agricultural sectors.[20]

4.3.2.3 Poverty level

Another consequence of the economic crisis is that many families fell into the poor category. The Government introduced a safety net programme by providing subsidized low-priced rice for the poor. This programme (called RASKIN) consisted in providing 20 kg of rice at the subsidized price to each poor household. BULOG, which was assigned the task of conducting the programme, instituted a floor price of Rp 2,800 per kg of rice in January 2003 while the RASKIN price was Rp. 1,000 per kg. Unfortunately this programme did not work

Table 4.6: Education level of respondents in the selected villages of Java, December 2002 – January 2003

Villages	Elementary School (persons)	Junior High School (persons)	Senior High School (persons)	Higher Education (persons)	Total (persons)
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 (87%)**	**13 (5%)**	**17 (6%)**	**4 (7%)**	**261 (100%)**

Source: Primary data.

[20] As a comparison, in January 2003 the wage for tilling the land was Rp. 18,000/day including meals, while the wage of a bricklayer was Rp. 25,000/day including meals.

Table 4.7: Percentage and number of people living below the poverty line, 1976 – 2001

	Percentage of people living below the poverty line (%)			Number of people living below the poverty line (Million people)		
Year	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.

well in practice, because the beneficiaries sold the rice back to the market to gain the price difference. In addition, the programme was modified in the field by village heads so that the real poor households received only 5 kg of rice instead of 20 kg. This was because of the number of the poor turned out to be larger since many families claimed to be poor in order to benefit from the RASKIN programme.

Poverty is a multidimensional phenomenon, and trade is not the only factor that may affect poverty. However, trade may have a significant impact if it is related to the economic variables that affect income, employment and household expenditures.

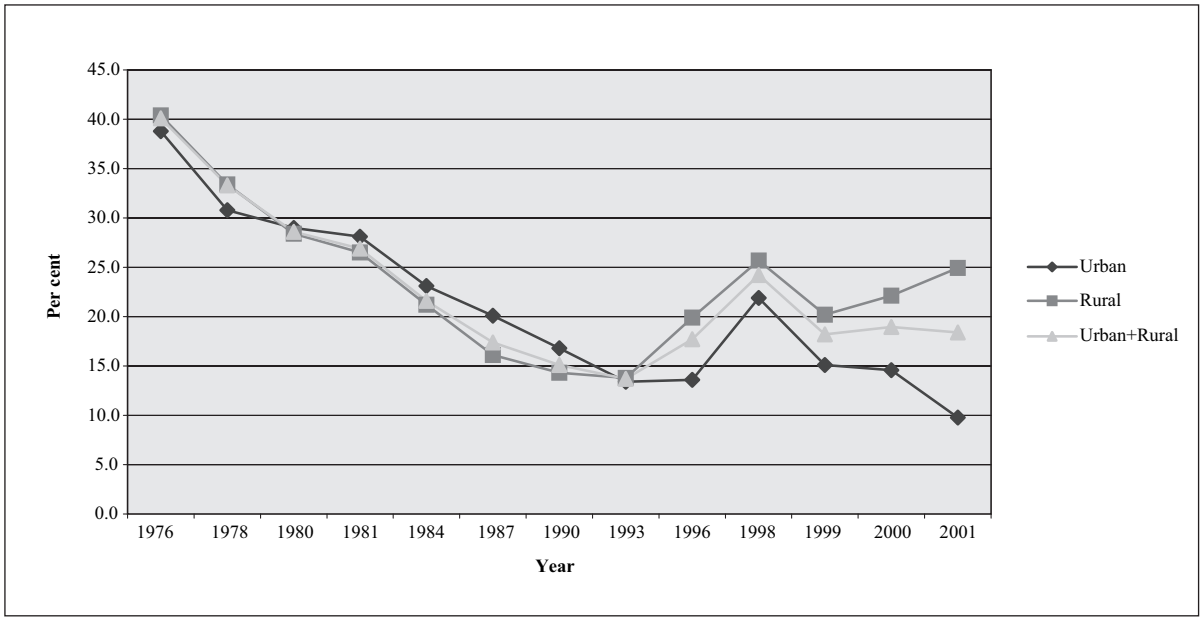
Conceptually, poverty can be attributed to institutional failures, including market and political failures, in allocating productive resources among the members of society (Pakpahan *et al*., 1995). A previous study indicates that poverty in rural areas is highly correlated to the lack of access to public infrastructures and services, especially in the remote or isolated villages. For the most part, these poor villages have little social and economic interaction with urban development centres and poverty in those areas is characterised by subsistence farming activities.

BPS compiles data on the population living below the poverty line based on the National Socio-Economic Survey that is conducted every three years. It was defined that "a person who cannot afford to fulfil their basic minimum requirements is categorised as poor". For period 1976 – 2001, the percentage of both rural and urban population living in poverty was declining in the period before the national economic recession (1976-1993). During the economic recession (1997-1998), and when Indonesia began implementing radical trade liberalization for rice and other basic food commodities (1998), the percentage of people living in poverty was tending to increase (see Table 4.7 and Figures 4.1 and 4.2).

During the economic recovery period (1998-2001), the percentage of people living below the poverty line in urban areas decreased from 21.9 per cent to 9.8 per cent but in rural areas it only decreased insignificantly from 25.7 per cent to 25 per cent. This implies that under the global economy the rural population recovered more slowly from the economic recession than the urban population.

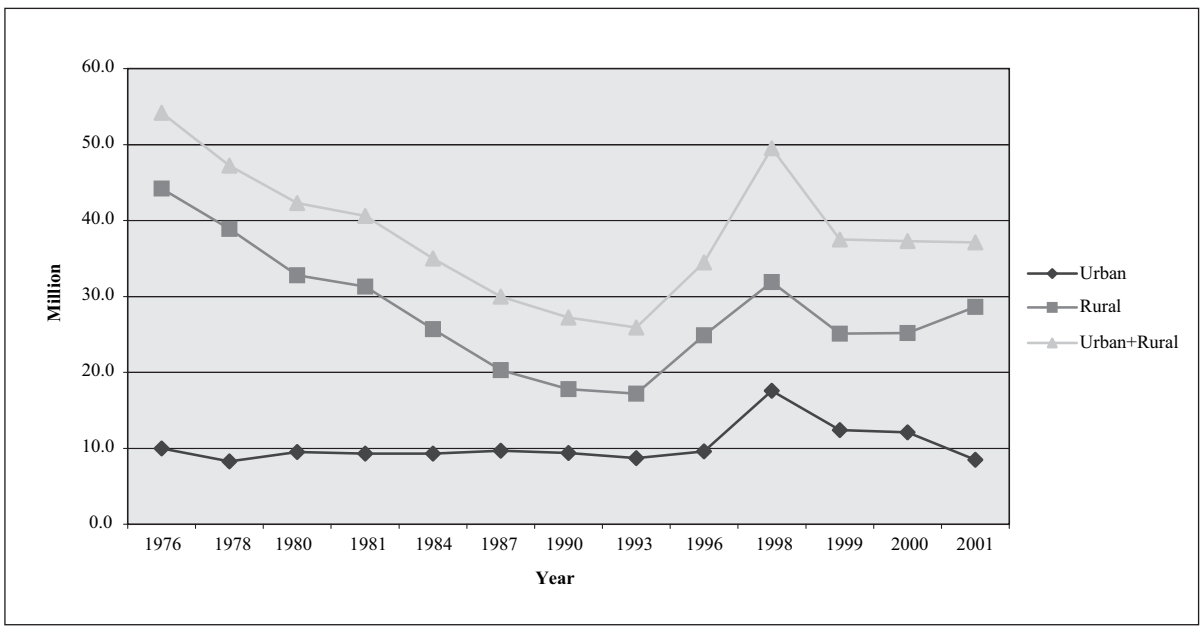
Table 4.8 and Figures 4.1 and 4.2 show that the majority of poor people live in rural areas. It is interesting to observe that the absolute number of poor people in rural areas was declining significantly in the period 1976-1996 (pre-crisis period). The economic development strategy during that time, therefore, can be seen as a pro-rural economic

Figure 4.1: Percentage of rural and urban poverty in Indonesia, 1976 - 2001



Source: BPS-Statistics Indonesia, 2001.

Figure 4.2: Number of urban and rural poor in Indonesia, 1976 - 2001



Source: BPS-Statistics Indonesia, 2001.

development strategy. The data also indicate that after the economic recovery period, i.e. after 1999, the absolute number of poor people living in rural areas tended to increase while in urban areas it tended to decrease. This implies that the recovery programme undergone during the liberalization era can essentially be considered a pro-urban economic strategy.

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

However, Croser's prediction on the impact of trade liberalization contradicted the empirical evidence that showed that rural poverty tended to increase during the trade liberalization era. One can argue that Croser's model did not incorporate the assumptions that trade liberalization in Indonesia, especially in the rice sector, occurred in conjunction with the economic recession, and that using international prices as benchmarks of economic efficiency may not be realistic. These days some developed and rice exporting countries implement high export subsidies as well as DS policies. It is evident that at present, Indonesia is faced with an artificially low price of rice on the international market, which acts as an economic disincentive for Indonesian farmers to produce rice, and in turn will have a negative impact on the poor in rural areas.

4.3.2.4 Impacts of trade liberalization on employment

Employment is an important socio-economic variable that indicates the extent to which economic development can absorb the workforce. The more employment opportunities that are created as a result of economic growth, the more people will benefit from that growth. Accordingly, the employment rate can be regarded as a variable that indicates the distributional function of the economic instrument.

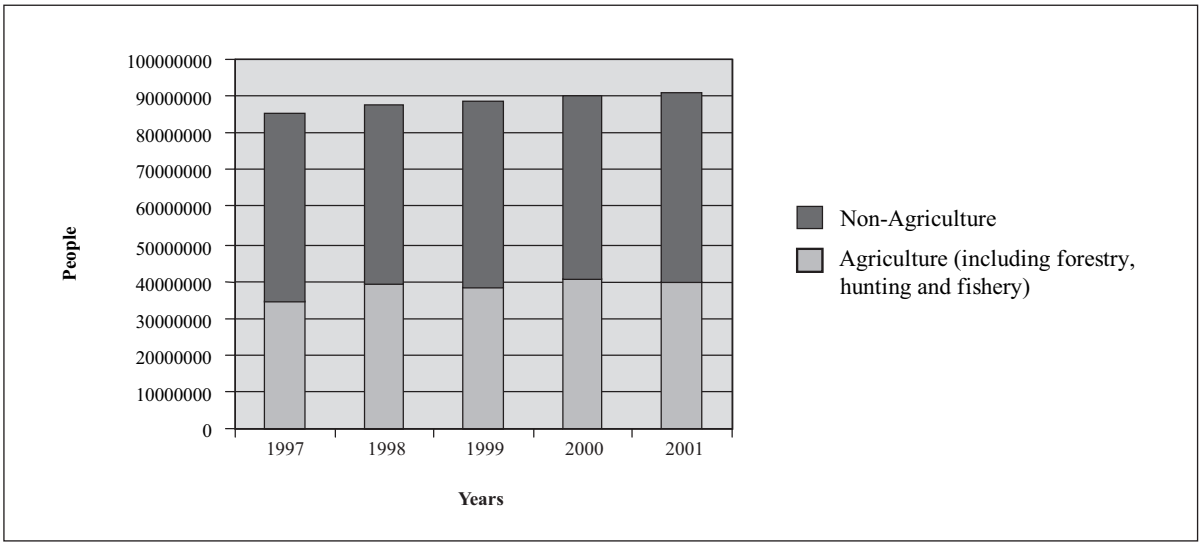
At the national level, the BPS records data on the yearly employment rate according to the major professional occupations. As can be seen in Table 4.8 and Figure 4.3, from 1997 to 2001 the total employment rate in Indonesia varied between 84.5 and 90.8 million people, with an annual growth rate of 1.5 per cent. During that period, the agricultural sector absorbed 48.3 to 51.1 million people, with an annual growth rate of 3.6 per cent. The proportion of labour absorbed by the agricultural sector varied between 40.7 and 45.2 per cent of the total employment rate. Meanwhile, the unemployment rate during the period 1997 to 2001 varied between 4.7 and 8.1 per cent of the total workforce, with a growth rate of 18.5 per cent per year, so the level of unemployment was increasing during the co-existence of trade liberalization and economic crisis in Indonesia.

The relatively high growth rate of employment in agriculture implies that during the crisis and recovery periods agriculture generated most employment for the economy. The agricultural sector can thus be viewed as a social safety net for

Table 4.8: Employment, unemployment and labour force in Indonesia, 1997 – 2001

Employment, unemployment and labour force:	1997	1998	1999	2000	2001
Agriculture (including forestry, hunting and fishery)	34,789,927	39,414,765	38,378,133	40,676,713	39,743,908
Non-agriculture	50,615,602	48,257,684	50,438,726	49,161,017	51,063,509
Total employment	85,405,529	87,672,449	88,816,859	89,837,730	90,807,417
Total labour force	89,602,835	92,734,932	94,847,178	95,650,961	98,812,448
Total unemployment	4,197,306	5,062,483	6,030,319	5,813,231	80,05,031
Employment rate in agriculture (%)	40.73	44.96	43.21	45.28	43.77
Unemployment rate (%)	4.68	5.46	6.36	6.08	8.10

Figure 4.3: The development of agriculture and non-agriculture employment in Indonesia, 1997 – 2001



the economy in times of crises. This could be due to the fact that, because of its nature, job entry requirements are relatively flexible in agriculture so many displaced workers from the industrial and urban sectors can be easily enrolled in agricultural activities. However, agricultural sector growth is relatively low compared to the growth of other economic sectors, especially during economic crises. The agricultural growth rate from 1988 to 2002 was estimated to be 1.7 per cent per year. Because of the high rate of labour absorption compared to the low growth rate of the agricultural sector, labour productivity in agriculture is decreasing and it can therefore be expected that rural poverty will tend to increase during periods of economic crisis.

The absorption of displaced workers by the agricultural sector can be viewed as temporary relief. In the long-term, however, the high rate of labour absorption by the agricultural sector will generate more poverty in rural areas.

4.3.3 Environmental impacts of a decrease in rice price

Both the Government and the people have responded positively to the challenge of improving the quality of the environment. However the real

Table 4.9: Land utilisation 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	0.07
7	Wood land	457,597	4.78
8	Agricultural estates	600,558	6.29
9	Wetland (rice field)	3,344,391	34.97
	Total	**9,562,471**	**100.0**

Source: Computed from BPS.

Table 4.10: Rice wetland converted to non-agricultural uses from 1991 to 1993

		Hectares		%	
No.	Wetland converted to:	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.

environmental concern is in terms of reducing poverty. In the short-term, people are more concerned with obtaining food and other basic necessities than with environmental quality, because the lack of basic necessities will affect their quality of life more quickly than a poor natural environment. In other words, poor people are more willing to risk environmental degradation than the non-fulfilment of their basic necessities.

4.3.3.1 Land resources

Land is the fundamental resource for agricultural activities and Indonesia is endowed with abundant land resources with various qualities. The numerous volcanoes have provided Java with very fertile land that is appropriate for rice farming. The distribution and utilisation of agricultural land in Java is shown in Table 4.9. From a total of 9,562,471 Ha of agricultural land, 3,344,391 Ha (about one third) is used for rice farming.

However, the total amount of wetland used for rice farming has been decreasing due to the expansion of non-rice sector constructions such as industrial plants, businesses, office buildings, real estate, schools and roads (see Table 4.10). The amount of land converted each year from rice fields to non-agricultural uses between 1991 and 1993 was about 35,47 Ha (33.33 per cent) in Indonesia and 18,25 Ha (31.51 per cent) in Java. The main reason for these conversions is that agriculture is less financially attractive than non-agricultural activities.

4.3.3.2 Chemical fertilizer and its impacts

The continuous application of chemical fertilizers over a long period of time causes a decrease in soil fertility that can be measured by the volume of fertilizer required to maintain the same level of soil fertility on the same plot of land.

Table 4.11 indicates the volume of fertilizer used by farmer respondents in the sample villages. The

Table 4.11: Average land size and the use of fertilizer per Ha in the selected villages of Java, December 2002 – January 2003

Villages	n	Total land size (Ha)	Average 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	19.60	0.29	227.45	47.00	1.28	37	20.28	4.10
Kebagoran	42	9.12	0.22	200.00	42.30	0.00	74	0.54	10.50
West Java									
Gegesik Wetan	101	97.29	0.96	239.00	30.48	4.63	140	4.32	37.50
Panggang Sari	50	34.00	0.68	231.60	1.50	8.00	243	94.85	32.35
Total/average	**261**	**160.01**	**0.62**	**233.80**	**26.97**	**4.67**	**58.45**	**25.30**	**30.78**

Source: Primary data.

Table 4.12: Average cost of agricultural inputs in four selected villages of Java, December 2002 – January 2003

				Cost of Agricultural Inputs (Rp 1,000/Ha)					
Villages	**N**	**Total Land Size (Ha)**	**Average Land Size (Ha)**	**Seed**	**Fertilizer**		**Pesticides**	**Labour**	**Tractor**	**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.

most commonly used fertilizer is urea (approximately 233.8 Kg/Ha), followed by SP36 (58.45 Kg/Ha), KCL (30.78 Kg/Ha), TSP (26.9 Kg/Ha), ZA (25.3 Kg/Ha) and NPK (4.67 Kg/Ha). Most of the farmers participating in this study operated land holdings averaging 0.62 hectares, although in one village (Kebagoran village) the average land holding size was only about 0.22 Ha.

Table 4.12 presents the cost of the various agricultural inputs based on the sample villages. Labour represented the highest proportion of the production costs (about 54.6 per cent of the total input costs, followed by chemical fertilizers (about 22.4 per cent) and very little on organic fertilizer (less than 1 per cent). Seeds also represent a relatively high proportion of the production costs (about 4.8 per cent). Based on these figures it can be expected that any change in the price of fertilizer would have some impact on agricultural practices. Yet as discussed earlier, farmer respondents tended to continue using the same amount of chemical fertilizers, at least in the short-term.

To examine the real impact of changes in input prices, the study would need to be conducted over a longer period of time than that covered by this study.

The Department of Agriculture 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. These figures show that the use of chemical fertilizers is still dominant in the Indonesian agricultural sector. At present, the application of chemical fertilizers in rice farming is still considered important to prevent a drastic decrease in productivity. However, in the long run, this practice is decreasing soil fertility and causing environmental degradation in general.

Fertilizer that is not absorbed by the soil may be washed into rivers, streams and ponds, where the accumulation of fertilizer may contaminate the water and promote the growth of water plants (*gulma*). Thus, whilst the overall quantity of water resources is not affected, the quantity of clean water resources is diminishing.

Most of the farmers who took part in the study understand that soil fertility decreases with the prolonged use of chemical fertilizers. As can be seen from Table 4.13, 140 (54 per cent) of the 261 farmer respondents noticed a decrease in soil fertility as a result of prolonged use of chemical fertilizers. Another 83 (32 per cent) said that the quality of the soil remained constant, and about 38 (14 per cent) had no idea about the changes in soil fertility. These figures demonstrate that a decrease in soil fertility subsequent to the prolonged use of chemical fertilizers is already a problem.

4.3.3.3 Pesticides and their impacts

It is also understood that the continuous application of pesticides over long periods has a negative effect on the environment and affects people's health

Table 4.13: Changes in soil quality due to the use of chemical fertilizers in the sample villages in Java, December 2002 – January 2003

Villages	Constant fertility (persons)	Decrease in fertility (persons)	No idea (persons)	Total (persons)
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** (32%)	**140** (54%)	**38** (14%)	**261** (100%)

Source: Primary data.

directly and indirectly. Farm labourers or farmers who are exposed to the pesticides during application and while working on the farm mainly suffer the direct impact, whereas all those who consume raw foods and drink water contaminated by pesticides and fertilizers are said to suffer the indirect impacts. The air is also contaminated during the application of pesticides. Irham *et al*. (2003) stated that continuous dependency on chemical pesticides has had adverse effects on the agricultural environment, because the plant absorbed only 1 per cent of the pesticide and the rest remained in the environment. Resosudarmo and Thorbecke (1998), quoting Achmadi, noted that in 1988 approximately 3,000 cases of acute poisoning associated with the use of pesticides were recorded in the agricultural sector. They also noted that each year approximately 35 per cent of farmers using pesticides contracted chronic pesticide-related illnesses.

BPS provided figures showing that in 1990 approximately 40 million people worked in the agricultural sector and around 28 million farmers and agricultural workers used pesticides. Thus it is estimated the number of chronic pesticide-related illness cases for 1990 is approximately 9.8 million (i.e. 35 per cent of 28 million people).[21] These

Table 4.14: Medical costs related to pesticide use before and after 1998 in the four selected villages of Java

	Medical cost (Rp)						
	1 - 20,000		20,000 – 50,000		None		
Villages	Before 1998	After 1998	Before 1998	After 1998	Before 1998	After 1998	Total (n)
Central Java							
Pucangan	13	10	3	5	52	53	68
Kebagoran	4	2	-	-	38	40	42
West Java							
Gegesik Wetan	57	16	14	40	30	45	101
Panggang Sari	17	12	5	13	28	25	50
Total	91 (35%)	40 (15%)	22 (8%)	58 (22%)	148 (57%)	163 (62%)	261 (100%)

Source: Primary data.

[21] However, the land research agency in Bogor found that the resistance of pesticides used after 1995 has been very short, so it may not have a negative impact on health.

Table 4.15: Availability and utilisation of water by island, 1995 (in million m³/year)

Island	Water availability	*Water Uses*					
		Irrigation	Drinking & industry	Flushing	Water pond	Poultry	Total
Sumatera	426,642	28,358	1,684	1,974	1,517	89	33,622
Java	122,697	52,486	4,524	5,445	721	140	63,316
Nusa Tenggara	43,702	5,657	7,267	195	38	48	13,205
Kalimantan	518,382	3,409	224	327	735	14	4,709
Sulawesi	139,584	14,007	313	444	330	65	15,159
Maluku & Papua	496,423	167	86	115	0	5	373
Indonesia	1,747,430	104,083	14,097	8,499	3,341	367	130,384
(%)	-	(79.8)	(10.8)	(6.5)	(2.6)	(0.3)	(100%)

Source: BPS, 1996.

illnesses include headaches, weakness, insomnia, concentration difficulties, nausea, excessive sweating and salivation and tightness in the chest. Based on several interviews with medical doctors working in public hospitals and public health centres in Jakarta, it is estimated that the total health costs associated with acute and chronic pesticide poisoning cases was Rp 0.67 billion and Rp 8.33 billion respectively.

Table 4.14 presents the results of primary data collected from the four sample villages regarding the amounts farmers spent on medication in relation to illnesses related to pesticide use. As we can see, before trade liberalization 148 of the 261 farmer respondents (57 per cent) did not spend any money at all on curing pesticide-related illnesses, and this figure increased only insignificantly to 163 farmers (62 per cent) after trade liberalization in 1998. The number of farmers who spent less than Rp 20,000 (US$ 2) on such medication decreased after trade liberalization. This suggests that at least some farmers used less pesticide as a result of the IPM programme and the increase in the price of pesticides. However the number of farmers who spent between Rp 20,000 and Rp 50,000 (US$ 2-5) per case on medication to cure illnesses related to pesticide use increased from 8 per cent before trade liberalization to 22 per cent after trade liberalization. On the whole, then, the data do not indicate that there was a minor impact of pesticide use in the rice farming in the studied villages.

4.3.3.4 Water resources

Water is a key agricultural resource, especially in rice farming, and Indonesia is endowed with abundant water resources. Table 4.15 shows the availability of water and its uses according to sectors and islands in Indonesia. Java uses the greatest percentage of its available water resources (51.60 per cent), followed by Nusa Tenggara with 30.2 per cent.

The agricultural sector uses the most water. In 1995, agriculture accounted for 79.8 per cent of the total water use, followed by drinking water and industry (10.8 per cent) and city flushing (6.8 per cent). Water ponds and poultry use a relatively small amount of water (less than 3 per cent). The impact of trade liberalization on the water supply is not particularly relevant, since water is in abundant supply in Indonesia. The problem is more in terms of distribution. During the rainy season water is particularly abundant and many places suffer from floods, while during the dry season many rice fields do not receive enough water. An effective water management system is necessary to balance distribution, for example by building dams to collect water in reserves during the rainy season and developing irrigation channels to distribute it during the dry season. Table 4.16 presents the total availability of water per capita and shows that, in 1995, Java was in a more critical situation compared to the other islands, since the per capita water availability was the lowest (1,013 m³/person). The highest per capita availability was in Maluku and Papua (118,224 m³/person). The average availability of water for the whole of Indonesia was about 8,489 m³/person.

Table 4.16: Water supply, population, and water supply per capita by island

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

Source: BPS, 1996.

Figures on total water use in Java are presented in Table 4.17. In 1995 the agricultural sector accounted for about 82 per cent of total water use, mainly for irrigation purposes. City flushing and spraying accounted for another 8.6 per cent, drinking and industry 7.1 per cent, while water ponds and poultry used relatively insignificant amounts.

The abundance of water does not mean that water is not a problem. If not properly managed, the oversupply of water can cause floods and erosion. This occurs mainly during the rainy season due to poor forest cover and crop mismanagement. The lack of forest and vegetation in upper areas means that the water is not properly retained in watersheds and therefore becomes scarce during the dry season. Stringer *et al*. (2002) projected that by 2020 the demand for water in agriculture will have declined as a result of significantly improved and more efficient irrigation systems and changes in the economic structure. Water consumption is expected to fall by 4 per cent by 2010 and by 36 per cent by 2020. They also projected, however, that water quality will decline as a result of higher emissions of pollutants from major industries.

Whilst dams serve the purpose of redistributing water during the dry season, adequate forest cover in the watershed area helps prevent erosion and promote biodiversity. Due to the unavailability of data on forest and rice field biodiversity, this aspect will not be measured and valued in the present study. However, biodiversity is understood to be important and needs to be examined.

4.3.4 The environmental impacts of decreases in rice prices due to trade liberalization

Following the logic presented in UNEP's *Reference Manual for Integrated Assessment of Trade-Related Policies* (pp 25-29), the environmental impacts of trade liberalization can be divided into product, technology, scale, structural and regulatory effects. Table 4.18 helps us to understand the different effects of trade liberalization in the rice sector.

Table 4.17: Total water use in Java by sector, 1995

Sector	Volume (million m^3)	%
Irrigation	52,486	82.9
Drinking/Industry	4,524	7.1
City flushing and spraying	5,445	8.6
Brackish water pond	721	1.2
Poultry	140	0.2
Total	63,316	100

Source: BPS, 1996.

4.3.4.1 Product effect

This is associated with goods or inputs that can improve or deteriorate the environment. In the case of rice, trade liberalization has resulted in an increase in rice imports, but the commodity itself does not have any direct impacts on the environment.

4.3.4.2 Technology effects

These include changes in production techniques brought about by the trade reforms. In the sample villages, the main technology effect was in terms of changes (albeit insignificant) from chemical to organic fertilizer. In fact, most farmers continued to use chemical fertilizers and only supplemented them with insignificant amounts of organic fertilizers, because farmers considered the organic fertilizer to be too bulky and its effects on the soil too slow. In addition, organic fertilizer turned out to be more expensive than chemical fertilizer.

4.3.4.3 Scale effects

These relate to an increase in the use of natural and environmental resources as a result of an expansion of economic activities following trade liberalization. These effects are difficult to measure because, although domestic rice production dwindled at the time of radical trade liberalization, and the price of rice dropped because the domestic market was flooded by rice imports, the net result was that more rice became available on the market. What's more, the domestically produced rice price dropped drastically due to the low quality of domestic rice and competition with imported rice. Rice milling industries suffered from the lack of paddy inputs (unhusked rice) because farmers were not attracted to selling their rice, while food industries that use husked rice as a production input developed faster due to the increased availability of cheap rice on the market. The scale effect of a decrease in the price of rice is that farmers may seek other sources of income, for example from sand-digging and quarrying, and the decrease in rice production and lower net incomes of farmers results in lower revenues for the local Government from land taxes. As a result, the local Government will be more intent in searching for and exploiting the local natural resources as its main source of income by relaxing the issuance of permits (see the analysis on the impact of trade liberalization and decentralization system).

4.3.4.4 Structural effects

These relate to changes in the economic structure due to specialization in the production of goods and services that offer competitive advantages. Trade liberalization, in addition to other development factors, tends to encourage farmers to sell their land for non-agricultural uses rather than shift

Table 4.18: Checklist of impacts of trade liberalization on the economy and the environment in Indonesia's rice sector

Economic effect	Related economic/ environment factor	Air quality	Water supply	Water quality	Land quality	Erosion	Bio-diversity
Product effect	Rice imports	(0)	(0)	(0)	(0)	(0)	(0)
Technological effect	Fertilizer use	(0)	(0)	(0)	(0)	(0)	(0)
Scale effect	Increase in rice availability promotes activities in other sectors	(-)	(-)	(-)	(-)	(-)	(-)
Structural effect	Shift from agricultural to non-agricultural land use	(-)	(-)	(-)	(-)	(-)	(-)
Regulatory effect	Reducing input subsidies	(+)	(0)	(+)	(+)	(0)	(+)
	Floor price	(+)	(+)	(-)	(-)	(+)	(-)

Notes: (+) : positive impacts
(-) : negative impacts
(0): neutral impact

to other non-rice crops. As mentioned earlier, despite the decrease in the price of rice it was found that most of the respondents (90 per cent) maintained the same rice-growing area and volumes of inputs. Only very few of the farmer respondents shifted to other crops, and even they returned to rice farming again.

As can be seen from Table 4.19, among the 261 farmer respondents, 159 (61 per cent) never planted other crops, whereas 17 per cent of them changed crops for less than one year, 20 per cent changed crops for one to two years, and the remaining 2 per cent did so for more than two years. This information may lead to wrong conclusions because the change to other crops was only temporary, and finally many of them mixed rice and non-rice crops.

In Pucangan village of Kebumen *Kabupaten* in the Central Java province, one of the larger farmers converted 0.50 Ha of rice fields to grow oranges when the price of rice declined dramatically during the 1980's. After three harvests the orange plantation was damaged by a virus attack so he converted back to rice farming. When the price of rice dropped again in 1998, he attempted to grow oranges a second time, but after two harvests, a virus attack once more damaged the plantation. Finally, he decided to remain with rice farming on all of his land, irrespective of what happened to the price of rice. Rice is easier to store and lasts longer, while fruit growing requires specialized technology due to the fact that fruit is perishable and more vulnerable to disease.

Another example of land-use conversion is in the village of Kebagoran, Kebumen *Kabupaten*, Central Java province, where farmers sell soil from their land to the roof-tile factories. Although this practice existed before trade liberalization in 1998, the decrease in the price of rice has further encouraged farmers to do so. The practice consists in digging out one meter deep of soil of which 25 centimetres are ploughed back into the rice field and the rest is sold as raw material for the manufacture of roof tiles. The soil digging operation takes approximately six months per hectare of land and earns the farmer a rental income of Rp 15 million per Ha, which is about six times higher than the net income from rice farming. Rice cannot be grown on the land during the soil digging operation, but it can be grown the following season, although the yield is lower.

When this practice – termed locally as rental (*sewa*) – is carried out on one piece of land, the farmers of neighbouring lands usually follow suit to avoid landslides. As a comparison, the income from permanently selling a plot of land (as opposed to selling the dug-out soil) was Rp 65 million per Ha in early 2003, which was only about four times the *sewa* price.

The manufacture of roof tiles has also boosted activity in the firewood industry, which involves cutting down trees in the upper regions. The negative impacts of this practice include loss of soil fertility, heavy erosion and increased sedimentation of rivers and dams. It can be observed in various *Kabupatens*. The roof tile industry grew

Table 4.19: Number of farmers who planted crops other than rice in the selected villages in Java, December 2002 – January 2003

Villages	Never	Yes for < 1 year	Yes 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.

Table 4.20: Improvements in flora and fauna in the past 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 (70%)	68 (26%)	11 (4%)	261 (100%)

Source: Primary data.

alongside the housing sector, which developed significantly even before 1998. Increasing amounts of soil and firewood were required in the manufacture of bricks and roof tiles, thus aggravating erosion and sedimentation. Recently (2003 and early 2004) many places in the Java and Sumatera islands suffered floods and land slides causing many deaths and financial losses.

4.3.5 The impact of decentralization on resource management

The Indonesian Government decentralized in January 2001 and in the process it allocated a larger share of the revenues from natural resources to local Governments. Consequently, these natural resources have become the main source of revenue for many local Governments, and those governing lands richer in natural resources such as oil, gas, coal, forests and fish have benefited from higher incomes. For instance, 15 per cent of the revenue from fossil fuel is distributed to the local Government and 85 per cent is retained by the central Government. For forest resources and coal mining local Governments receive 80 per cent of the revenue and the central Government retains just 20 per cent.[22]

On the other hand, the central Government has reduced its subsidies to local Governments and pushed them to find their own financial resources. Consequently local Governments tend to deplete the natural resources more in order to meet their local budgetary requirements. In particular, forest resources have suffered from logging, including illegal logging, and very slow reforestation. As already mentioned, deforestation results in flooding and erosion during the rainy season and water shortages during the dry season. In 2002, Java experienced an especially long drought during which the water levels in most dams in Java declined and both irrigated and rain-fed rice fields could not be supplied with sufficient water. Poor forest management thus threatens the survival of rice farming which requires a lot of water particularly for the high-yielding rice varieties. As rice farming continues to experience more difficulties, farmers are increasingly likely to seek other sources of income, and natural resources are at risk of being further depleted as a result of deforestation, quarrying and other non-agricultural activities.

4.3.6 Flora and fauna

As can be seen from Table 4.20, the farmers from the selected villages have indicated some environmental improvements over the past five years. Out of the 261 farmer respondents 182 (70 per cent) said that there was now more flora and fauna than prior to 1998. In particular they have indicated seeing more birds, fireflies, frogs, snakes, snails and eels in the rice fields. Also, certain plants, especially grass, grow better. But 26 per cent of the respondents said that the quality of the environment was still poor in terms of air and water quality.

[22] Law No. 25, year 1999 on Intergovernmental Finance in Indonesia.

5. Valuation of the impacts

After analysing the integrated assessment of the economic, social and environmental impacts of trade liberalization, it is imperative to carry out an economic valuation of those impacts, so that benefits and costs can be computed and compared, and decisions can be made based on the net benefits.

5.1 Methodology chosen

Policies have both positive impacts (benefits) and negative impacts (costs). To determine whether a policy is sound or not, its net economic, social and environmental costs and benefits need to be computed. The present project also employs an extended cost-benefit analysis in order to measure the economic, social and environmental impacts of the AoA.

5.1.1 Economic valuation

The method used to valuate the economic impacts involved measuring the changes in incomes based on the Input-Output Table using the market price. The economic impact is traced through the use of input and output tables involving 7 x 7 sectors namely the 66 x 66 Input-Output table from which the input coefficient of each sector is available and can be used to calculate the impact of changes in production or output of the rice sector. However, only the direct impacts are valued; the backward and forward linkages are not valued in monetary terms.

5.1.2 Social valuation

The social impacts will be measured in terms of changes in poverty, employment, demography, urbanisation and health. The pattern of relationships among individuals will be explained qualitatively, while social impacts will be valued using surrogate market prices.

5.1.3 Environmental valuation

The environmental impacts will be valued in terms of changes in the quantity and quality of land and water resources and the quality of the air. Changes in land use – particularly from rice to non-agricultural uses – as a result of differences in the price of rice will be measured based on a replacement method and changes in income.

With the RCM, the total expenditures for building the rice production facilities, such as dams, irrigation canals, measurement gates, irrigation roads, including irrigation staff and agricultural services were computed. The loss of incomes was also calculated.

Macro-economic data on the rice sector were collected from the department of public works (KIMPRASWIL), the irrigation services at the *Kabupaten* and provincial levels, the agriculture services and the BPS.

Data on local prices and the perception of local farmers and traders concerning the impacts of the change in the price of rice were collected at the farm level using questionnaires. A RRA was held with a group of Government employees, village office staff and a group of farmers.

5.2 Values of economic, social and environmental changes in trade related policies on the rice sector

This study relies on the primary data collected from Gegesik Wetan Village, West Java and

Pucangan Village, Central Java as well as on the secondary data from a study carried out by other researchers in West Java and East Java.

Two approaches to measure the impact of changes in agricultural practices on the environment are the replacement cost method (RCM) and the contingent valuation method (CVM).

5.2.1 Replacement cost method

This is a macro-data approach that attempts to evaluate the multiple functions of the paddy fields from a cost perspective, i.e. by measuring the maintenance costs for all agricultural facilities such as dams, irrigation systems, irrigation roads and any other facilities that serve the agricultural sector. In view of the limited data available, the scope of this study is limited to flood protection, erosion management and rice production foregone as a result of converting land from agricultural to non-agricultural uses. The total replacement costs are assumed to be the environmental costs that are engendered when rice production is ceased due to land conversion for other purposes.

5.2.2 Contingent valuation method

This is a micro data approach. This method is often based on the concept of 'willingness to pay' for environmental protection. Questionnaires are used to collect data from farmer respondents concerning their willingness to pay to maintain rice production. However, farmers commonly do not wish to express their willingness to pay. To overcome this, the concept of 'willingness to accept' is used instead, and farmers are asked how willing they would be to surrender rice production activities.

The related environmental impacts should be found when there is a change in agricultural practices, either in the amount of land used for rice cultivation or the volume of agricultural inputs used for rice crops. However, data regarding rice production seems confusing because on the one hand the rate of land conversion has been relatively high for Java since the 1970's, yet at the same time both the rice growing areas and rice production are increasing, even since trade liberalization.

So again it is somewhat difficult to examine the impacts of trade liberalization on rice production and the environment.

5.2.3 The economic value of rice fields in Java

Another study has determined the value of changes in rice production on the environment by looking at the values of rice fields in terms of their function in

Table 5.1: Total economic, social, and environmental values of rice fields in Java, 2001

No.	Function	US$/Ha/Year
	Economic:	
1	Rice production	**1,430.09**
	Social:	**396,43**
2	Socio-cultural preservation	92,62
3	Urbanisation prevention	303.81
	Environment:	**2,101.12**
4	Flood protection	711.41
5	Water retention	488.99
6	Erosion prevention	6.98
7	Landslide prevention	656.78
8	Assimilator of organic waste	234,31
9	Air quality protection	2.65
	Total	**3,927.64**

Source: Irawan *et al.,* 2002.

preventing erosion, controlling floods, preventing land slides, retaining water and maintaining air and water quality.[23] Table 5.1 shows the values obtained from this study.

The potential negative impacts of land conversion will be the sum of the total reduction in the rice field area multiplied by the total economic, social and environmental values per hectare of rice field.[24] However, the total costs resulting from the reduction in the rice-growing area must be balanced with the increased benefits due to the reduction in fertilizer and pesticide use. The benefits include a reduction in the department of public health's costs for the treatment of illnesses related to pesticide poisoning. Another expected benefit is the reduction in the number of working days missed by farmers as a result of pesticide poisoning. In 1997, farmers who contracted acute pesticide poisoning missed on average approximately five days of work, while those who contracted chronic pesticide poisoning missed on average about one day of work.[25] As already mentioned, in 1988, 70 per cent of farmers used pesticides and about 35 per cent of them (9.8 million people) suffered chronic pesticide-related illnesses. In 2000, there were 19,864,624 rice farmers in Java so, assuming there was a constant proportion of rice farmers who contracted chronic pesticide-related illnesses, it can be estimated that about 4,866,832 farmers suffered chronic pesticide-related illnesses that year. Based on the estimated health costs for 1997, it is estimated that the total health costs for the treatment of chronic pesticide-related illnesses in 2000 would be:

$$\frac{4{,}866{,}832}{9{,}800{,}000} \times \text{Rp } 8{,}330{,}000 = \text{Rp } 4{,}136{,}807{,}948$$

(US$ 486,683.29)

Based on a total rice-growing area of 11,793,475 Ha in 2000, the total costs of chronic pesticide-related illnesses is Rp 350.77 per hectare (US$ 0.04/Ha).

The number of working days lost as a result of chronic pesticide-related illnesses was found to be one day per person that can be valued as:

1 day x 4,866,832 persons x Rp 20,000
= Rp 97,336,640,000
(US$ 11,451,369 or US$ 0.97/Ha).

Since no figures are available on the number of farmers who suffered from acute pesticide poisoning, the estimated benefits from a reduction of the rice-growing area only take into account chronic pesticide-related illnesses.

Based on the figures showing the total economic, social and environmental values of rice fields, there would be a loss of about US$ 3,927/Ha/year if the rice field were converted to non-agricultural use. Taking into account only the environmental impacts, the cost of the land conversion would be US$ 2,101.12/Ha/year in Java. Table 5.2 summarizes the average values of land conversion in Java.

[23] Irawan *et al.,* 2002.
[24] Sumaryanto and Suhaeti, 1999; Irawan *et al.,* 2002.
[25] Resosudarmo, 2002.

Table 5.2: Summary of the average costs of land conversion in Java

No.	Type of Benefits/Costs	Average (US$/Ha)
1	Gain in health expenditures from not using pesticides	0.04
2	Gain in income from not taking sick leave	0.97
	Total gain	**1.01**
3	Loss in economic value	(1,430.09)
4	Loss in social value	(396.43)
5	Loss in environmental value (floods, erosion, water pool, etc.)	(2,101.12)
	Total loss	**(3,927,64)**
	Total net loss	**3,413.53**

Notes: Rice-growing area in 2000 was 11,793,475 Ha
Health costs for chronic pesticide-related illnesses would be
$\frac{4,866,832}{9,800,000}$ x Rp 8,330,000 = Rp 4,136,807,948 = US$ 486,683.29
The average health costs per Ha of rice field = US$0.41/Ha
The gain of farmers from not loosing one working day because of chronic pesticide-related illnesses is:
1 x 4,866,832 x Rp20,000 = Rp 97,336,640,000 (US$ 11,451,369 or US$0.97/Ha).
Source: processed data.

The statistical data, however, does not show a decrease in the total area planted with rice crops, even after the 1998 radical trade liberalization, so the net benefits of rice growing in Java are US$ 3,413.53/Ha/year. The annual total net benefits derived from rice cultivation in Java from 1997 to 2002 can be seen in Table 5.3.

We can see from the figures in Table 5.2 that the economic value of rice fields is significant for the Indonesian economy. In 2000, Indonesia's GDP was Rp 1,264,918 billion (US$ 148,813,882,400) and the economic value of the rice fields was US$ 40,836.75 (about 27.05 per cent of the total GDP). Consequently, if the price of rice does not act as an incentive for farmers to grow rice, and farmers convert their rice fields to non-agricultural uses as a result, the loss in economic value will be substantial.

The dilemma that Indonesia faces in terms of its rice economy is that it can import cheaper rice from abroad, but by doing so it uses foreign exchange that could be better used for other investments and development purposes. Furthermore, Indonesia has a strong wish to be self-sufficient in food production, particularly rice, to ensure food-security and protect small-scale rice farmers' income and employment.

Table 5.3: Total net benefits derived from rice farming in Java, 1997 - 2002

Year	Area harvested (ha)		Economic value (US$ million/year)	
	Java	Indonesia	Java	Indonesia
1997	5,380,976	11,140,574	18,368.12	38,028.68
1998	5,752,012	11,730,325	19,634.66	40,041.82
1999	5,766,614	11,963,204	19,684.51	40,836.75
2000	5,753,554	11,793,475	19,639.93	40,257.38
2001	5,700,817	11,499,997	19,459.91	39,255.58
2002	5,608,029	11,530,672	19,143.18	39,360.29

Note: The average economic value of the rice field is US$ 3.413.53/Ha/year.
Source: Computed.

6. Project experiences, conclusion and policy recommendations

6.1 Project experience

6.1.1 Methodology

The methodology used to carry out this study was a new experience for Indonesia, in that it involved stakeholders from all levels of the rice economy as well as people from a variety of institutions.

The method consisted in combining data collected in the course of the study with information from other studies. It also incorporated opinions and suggestions from various actors of the rice economy such as rice farmers, rice traders, agricultural input suppliers, local or village administrators, local Governments and stakeholders at the central level.

This research project involved not only researchers from the city of Jakarta, but also teaching staff from a local university outside Jakarta and 13 students. The students and researchers went to the field and talked with farmers, traders and village officials. In the process they learned more about collecting and processing data.

Since this study considers economic, social and environmental impacts, it attempts to find a specific methodology for each. The economic impact was calculated using the production approach and the Input-Output table; the social impact was calculated using a cost–benefit approach; and the environmental impact was computed using a 'with' and 'without' project approach while recognizing the multifunctionality of the rice field.

6.1.2 Project benefits

The substance of the study will be useful for the development of policy recommendations and will provide background material to support the arguments of Indonesian negotiators and delegates at WTO conferences related to the AoA.

Another benefit of this project has been its capacity building function, since the country research teams were provided with a methodology as well as technical and financial support from UNEP. Without this support the research teams would have had little opportunity to be exposed to an international forum. Although many good research reports already exist, foreign researchers have carried most of them out.

Importantly, this study was lead by Jenderal Soedirman University, a relatively small university in Indonesia that has never previously had an opportunity to conduct such a large project.

6.1.3 International consultation

International consultation where researchers from different countries were brought together to discuss similar projects and exchange experiences was useful for disseminating information, knowledge and methods to conduct effective research, as were the materials, comments, suggestions and guidance provided by UNEP.

6.2 Conclusion

6.2.1 Rice production

a. Since its independence in 1945 Indonesia has been struggling to attain food self-sufficiency, especially in rice because of its multifunctionality and important role in the economic and political stabilization of Indonesia.

b. Rice is the main staple food of the Indonesian people and is an essential element of rural

development in Indonesia. The rice-growing area and total rice production are ranked the fourth highest in Asia, yet domestic rice production is still insufficient to meet domestic demand.

c. A high volume of chemical fertilizers is used in rice farming in Indonesia. Without it, rice production would be even lower than at present.

d. The Indonesian Government faces a dilemma between (i) maintaining rice production at a high level, saving on foreign exchange by not importing rice, maintaining the environmental benefits and values of rice production in retaining water, preventing erosion, landslides, etc., and (ii) keeping rice production at a modest level now and perhaps at a lower level in the future, using its foreign exchange to import rice and improving the quality of the environment by using less chemical fertilizers and pesticides.

e. Rice production has strong forward and backward linkages that encourage the development of other industries, particularly in rural areas. This means that development of the rice sector has a great impact on agricultural development in particular and on rural development in general.

f. Changes in rice production should have impacts on other industries; particularly rice mills, rice trade, livestock and poultry (which are fed on rice bran, a side-product from the rice mills)

g. Even though there is almost no economic rent in rice farming, many farmers continue to plant rice rather than other crops because of its function in ensuring food security for themselves and their families.

h. Land in Java is especially suitable for rice farming as a result of the development of Government-funded irrigation infrastructures.

i. Looking at the costs and benefits of the impacts of the decrease in the price of rice together with the increase in fertilizer prices, the GOI may choose a policy that keeps the price of rice low through heavy rice imports, whilst at the same time supporting the rice sector with subsidies. However, this policy requires a strong government budget, yet at present financial resources are scarce due to the heavy foreign debt burden.

6.2.2 Rice consumption and imports

a. From the demand side, the per capita consumption of rice of Indonesians seems too high (130 kg/per capita) compared to other countries in Asia, Latin America and Africa, and about 21 per cent of household budgets go towards purchasing rice. The Indonesian people should diversify their food consumption by substituting rice for other products such as cassava, corn, sweet potatoes, potatoes, wheat, sago, taro, banana, etc. and so reduce their per capita rice consumption.

b. Furthermore, rice should become a luxury commodity so that people appreciate it and reduce their rice consumption and waste. This would decrease the demand for rice as well as rice imports, and Indonesia could thus save its foreign exchange for other development purposes. Indonesia produces sufficient quantities of the substitutes, such as cassava, taro, banana and sago, although they are considered inferior to rice.

c. Total rice imports had been fluctuating annually, but since 1994 Indonesia has been a net importer of rice. Rice imports reached their highest level in 1998 (over 6 million tons) with radical trade liberalization. They subsequently decreased but remained at a high level of about 3 million tons in 2002 and are estimated to reach 4.5 million tons in 2003.

6.2.3 Rice trading

a. In the 1990s, Indonesia implemented structural adjustment and liberalization policies to favour economic development by correcting macroeconomic deficiencies and leading its economy to a more liberalized market. Several of these policies had been reflected in domestic trade and development policies that had also affected rice production and rice trading activities. The rice cultivation area, rice yield and the use of natural resources and chemical inputs were also affected.

b. Trade in foods, especially in strategic food commodities such as rice, corn and soybean, has been increasing since Indonesia imple-

mented trade liberalization in late 1998. Since then, Indonesia has been challenged with the relatively low international price of these commodities. As a result, the incentive for local farmers to plant rice, corn and soybean on their farmland has been declining and they have devoted their resources to non-farm activities instead.

c. Indonesia is one of the liberalized developing countries. In 2003 Indonesia applied tariffs of 0-10 per cent for about 83 per cent of the commodities it produced. Due to Government budget constraints it has also significantly reduced domestic support, particularly market price support for agricultural products. Dumping and cheap imports have prevented the domestic price of agricultural products from rising.

d. Trade liberalization could reduce the incentive to plant major food crops, including rice, even though it is not the single factor to spur agricultural land conversion.

e. Since 1994, Indonesia has gone from being a net food exporter to a net food importer. From 1988 to 2000, total net food imports amounted to about US$ 863 million per year. The IDR for the main food crops from 1998 to 2002 more or less doubled compared to before 1998. After implementation of radical trade liberalization in 1998, the IDR increased from 5.1 to 10.3 per cent for rice and from 30 to 47 per cent for sugar.

f. Indonesia is becoming a high-risk country in terms of food security due to its lack of foreign exchange, its heavy debt and the instability of the domestic currency (RP).

6.2.4 Employment opportunities in the rice sector

a. It is estimated that in 2002 around 63 per cent of the total population lived in rural areas, with most of the rural people working in the agricultural sector. About 21 million households were engaged in rice production and most of them were small-scale farmers.

b. Rice production had been pushed significantly through Government investments in agricultural infrastructures, mainly dams, irrigation systems and agricultural services. In addition to their use for irrigation, dams are also a source of drinking water and hydropower. A conversion from their use in rice production to non-agricultural uses may mean a waste in Government investments.

6.2.5 Trade policy for rice

a. In recent years rice has become the most controversial commodity within the multilateral trading system because it is a staple food for poor people and provides a livelihood for many poor farm workers. Indonesia's policy in connection with rice trading has been to focus on achieving better conditions for the Indonesian people.

b. Policy measures should be able to inform negotiators, increase transparency, achieve joint positions and generate national capacity in sectors such as Government, academia and the private sector to promote sustainable development of rice production.

c. To direct policy-making and conduct current and future negotiations with the goal of sustainable development, the relationship between international trade and sustainable development has not yet been clearly understood and established.

d. Considering the economic, social and environmental impacts of trade liberalization together, the possibility of convincing policy makers to adopt measures that might mean sacrificing income for sustainable development is low.

6.2.6 Impacts of the AoA on rice farmers

6.2.6.1 Economic impacts

a. It is difficult to single out the impacts of the WTO AoA on the rice sector because trade liberalization happened at the same time as the structural adjustment to pull Indonesia out of the economic crisis in 1998.

b. It seems that rice production in Indonesia has dwindled because of the low price of rice,

although rice farmers have been struggling to survive in this sector. Implementation of the AoA has tended to cause the real price of rice to decrease, which may drive farmers out of rice production and into other sectors that offer better sources of income.

c. In the rice sector trade liberalization has had both positive and negative welfare effects for the rural population and the poor. On the one hand liberalization and free trade has benefited poor consumers in terms of cheap imports and low prices for rice, but on the other hand it has also meant the elimination of input subsidies and other agricultural support that results in higher production costs for rice, which is unfavourable for rice producers.

d. The decline in the real price of rice together with the increase in production costs discourages farmers from using new farm technologies and maintaining rice crops. As a result, rice yields have been declining.

e. Only an insignificant number of rice farmers converted their wet land to dry land to make it suitable for growing high value crops such as fruits and vegetables because they lack the required skills and fruit crops are at high risk of pest and virus attacks. In addition, fruits and vegetables are more perishable and marketing channels for fruits and vegetables are not yet well developed compared to rice.

f. Investigation into whether trade liberalization has decreased the domestic rice price has resulted in a non-rejection of the hypothesis that trade liberalization has no impact on domestic rice prices. This is perhaps because combined rice production and total imports just meet rice demand.

6.2.6.2 Social impacts

a. Some rice farmers continue to grow rice even when it is not profitable which has an impact on their families' welfare, savings and investments, particularly human investments. Other rice farmers prefer to leave rural areas to take up jobs in urban areas, which in turn causes urban congestion.

b. Successful rural development will certainly result in more equal income distribution, reduce the number of poor people and prevent uncontrolled urbanisation. So it is impossible to develop organized urban areas without paying attention to rural development.

c. Trade liberalization may have a wide-ranging impact on poverty. After the economic crisis and trade liberalization the number of people living below the poverty line increased. Trade may also have a significant impact on poverty because it is related to economic variables that affect both household income and expenditures.

d. Using a CGE model for Indonesia, called WAYANG, Croser (2002) predicted that the complete elimination of all tariffs and tariff-equivalent import licenses would reduce poverty and improve the welfare of households. However, the wealthy benefit more than the poor, thus widening the income gap between households in each socio-economic group.

e. It is evident that, at present, Indonesia is facing artificially low rice prices on the international market, and this acts as an economic disincentive for Indonesian farmers to produce rice and will, in turn, have a negative impact on poverty in rural areas.

f. Based on national employment data, one can argue that the level of unemployment increased during the co-existence of trade liberalization and the economic crisis in Indonesia. Most of the displaced workforce, particularly from industrial and urban sectors, was absorbed by the agricultural sector, which can be viewed as temporary relief. In the longer term, however, the high rate of labour absorption in agriculture will generate more poverty in rural areas.

g. Productivity growth of agricultural commodities, particularly food crops such as rice and sugar, is stagnant or even negative. Farmers have had little incentive to use new technology and new seeds or varieties, or to invest in agriculture. This has had negative impacts on farmers' incomes and on poverty reduction. In 2001, about 77 per cent of the 37.1 million poor people lived in rural areas. Most of them work

in the agricultural sector, particularly in the food sub-sector.

h. In 2000, around 63 per cent of 52 million households in Indonesia lived in rural areas. Low productivity and high poverty have encouraged most rural people to move into urban areas to find jobs, causing urban congestion and increasing social unrest.

i. Many people in rural areas are also affected by the monetary crisis, because the sudden bursts of inflation have curtailed the purchasing power of the poor throughout the country.

6.2.6.3 Environmental impacts

a. It is also understood that rice farming plays an important role in protecting the natural environment, except for the negative impact of fertilizer and pesticide use.

b. It is commonly understood that the continuous application of chemical fertilizers on rice fields decreases soil fertility in the long run.

c. Trade liberalization has no product, technology or regulatory effects, but it does have structural and scale effects. Structural effects include changes in land use from rice production to non-agricultural uses since farmers find rice-growing unattractive because of the lower profits, and prefer to convert the land for non-agricultural uses that increase its economic rent such as real estate, trading and industrial development. Scale effects include the expansion of other activities as a result of cheap rice and the existence of backward and forward linkages. Rice mills suffered from a shortage of raw materials but the manufacture of cooked food products was better able to survive.

d. Significant increases in rice production have been achieved through Government investments in the development of agricultural infrastructures. Converting the land from rice-growing areas to non-agricultural uses means a waste of these Government investments.

e. The total impacts of shifting from rice production to other activities and the disappearance of rice fields may have net costs rather than net benefits. The calculation not only considered the economic and social functions of rice production, but also the multi-functionality of rice fields in preventing floods and land slides, retaining water, maintaining water supplies and controlling the air quality.

f. Converting rice fields to non-agricultural uses produces a net social loss of about US$ 3,413.53/Ha/year and a net environmental loss of US$ 2,100.11/Ha/year.

g. It was found that, in 2002, the economic value of rice fields in Java was about US$ 19,143.18 million per year, and about US$ 39,360.29 for the whole of Indonesia.

h. Finally, this study concludes that trade liberalization contributes partly to environmental improvements because of the reduction in the use of chemical fertilizers and pesticides, but this was counterbalanced by environmental degradation as a result of converting land use from rice farming to non-agricultural activities, though, in practice this has seldom occurred.

6.3 Policy implications

a. Increasing production and productivity of food crops that have a comparative advantage may have a significant impact on food security and poverty reduction.

b. Wealthier countries should significantly reduce support to their agricultural sector, whether domestic support or export subsidies, and including food aid.

c. Although trade liberalization allows an increase in rice imports and makes more rice available to the poor at a reasonable price, it also places a burden on farmers and farm labourers. Policies should have a double function in protecting farmers as well as poor consumers.

d. The Government has to maintain a certain tariff level to protect domestic rice producers, but in parallel it should design a direct subsidy policy to support poor rice consumers.

e. The Government should design a new agricultural policy to increase rice production and yield and reduce rice imports and save foreign exchange.

f. The Government should develop a policy that encourages Indonesians to diversify their diet and thus reduce the per capita consumption of rice.

g. The Government should develop rice-marketing infrastructures to reduce marketing margins and increase farmers' incomes.

h. The AoA should allow the practice of subsidizing the cost of farm inputs to reduce farmers' production costs since, in Indonesia, rice is not produced for export but to ensure domestic food security, especially for poor farming households.

i. Organic fertilizer that is similar in quality, practicality and cost to inorganic fertilizer should be developed in order to encourage farmers to use it.

j. Allowing Indonesian rice prices to fall to the level of world markets would undervalue the contribution of rice production to Indonesian social welfare. A sustained period of low domestic rice prices can impair Indonesia's capacity to produce adequate quantities of rice in the future. Free trade of rice is not the only solution for maximizing the welfare of the Indonesian population. Appropriate tariff levels should be implemented and domestic support should be provided.

k. It is critical that policy instruments be devised to encourage domestic farmers to continue cultivating rice – even where private economic profitability is marginal. It appears that no appropriate instruments are available at this time, so it may be worthwhile considering devising the following new instruments:

   – matching funds for extension subsidies and to support rice farmers
   – ensuring that adequate financing is made available to carry out the necessary research to maintain existing irrigation systems and develop new irrigation schemes
   – maintaining a system of incentives that would induce serious rice research, either independently or in collaboration with IRRI researchers
   – research and extension should be made an integral part of the university's mandate to provide learning, conduct research and serve local communities
   – this study highlighted the unavailability of data on forest and rice field biodiversity, but since this aspect is important it needs to be examined.

6.4 Present limitation

This study faces limitations in assessing the economic, social and environmental impacts of the AoA because other factors such as the structural adjustment for growth and to combat the economic crisis occurred at the same time as the implementation of the AoA.

Furthermore, this study mainly concentrates on Java because, although rice is planted in many other islands, Java is the main rice-producing island, with approximately 56 per cent of the rice being produced there. The field survey only involved 261 rice farmers in four villages in two *Kabupatens* of two provinces, West Java and Central Java and therefore its application to other areas may be limited.

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