

## GROWTH, EQUITY AND ENVIRONMENTAL ASPECTS OF AGRICULTURAL DEVELOPMENT IN INDONESIA<sup>1)</sup>

I Wayan Rusastra and Erwidodo<sup>2)</sup>

### Abstrak

Tantangan pembangunan pertanian berkelanjutan mencakup tiga faktor yang bersifat sinergis dan komplementer yaitu mempertahankan laju pertumbuhan, pengurangan kemiskinan dan mencegah kerusakan lingkungan. Kebijakan harga yang diterapkan selama ini dinilai telah berhasil mendorong adopsi teknologi, peningkatan produksi, dan pendapatan petani. Di samping itu pengembangan kelembagaan dan visi pembangunan pertanian secara dinamis, peningkatan efisiensi dan penciptaan teknologi baru telah memainkan peranan penting dalam strategi peningkatan produksi. Bagi petani padi sawah khususnya di luar Jawa masih terbuka peluang cukup besar untuk mendapatkan tambahan produksi melalui perbaikan efisiensi usaha tani dengan memperbaiki kemampuan manajemen petani. Bagi petani padi lahan kering dan palawija, hanya penelitian dan terobosan teknologi baru yang dapat memecahkan masalah peningkatan produksi dan pendapatan petani. Upaya pengentasan kemiskinan membutuhkan program yang komprehensif dan perlu dilaksanakan secara simultan. Namun dalam situasi krisis moneter dan ekonomi sekarang ini, tekanan pada pembangunan pertanian dan pedesaan yang berbasis pada sumber daya lokal diyakini akan mampu mempertahankan keberlanjutan pembangunan dengan sasaran utama peningkatan ketahanan pangan, pengurangan kemiskinan, dan perbaikan distribusi pendapatan. Pemerintah telah menerapkan beberapa program yang berkaitan dengan proteksi sumber daya alam dan lingkungan. Beberapa program telah berhasil dilaksanakan secara memadai seperti pemberantasan hama terpadu (PHT) dan pengelolaan daerah aliran sungai seperti Daerah Aliran Sungai (DAS) Brantas. Di lain pihak program konservasi tanah dan air seperti teknologi tanaman lorong dan sistem usaha tani tumpang sari tanaman keras dan komoditas pangan menghadapi tantangan dalam pengembangannya. Dalam mendorong implementasinya di lapangan, petani perlu difasilitasi dengan kredit, ketersediaan sarana produksi, penyuluhan dan pembinaan, serta kepastian hukum dalam penguasaan lahan.

**Kata Kunci :** pertumbuhan produksi pangan; pemerataan dan pengentasan kemiskinan; proteksi lingkungan dan sumber daya alam; pembangunan pertanian berkelanjutan.

### Abstract

The challenge of sustaining agricultural development consists of three complementary and synergies dimensions, i.e. maintaining economic growth, promoting equity and protecting the environment. Price support policy is essential for enhancing technological adoption, increasing output and farmer income. In addition, dynamic institutional and vision of agricultural development, efficiency improvement and technological generation played an important role in the production strategy. Off-Java wetland rice farmers have greater opportunities to gain production through enhanced technical or economic efficiency by improving their managerial skills. In contrast, for dry land rice and secondary crops' farmers, only research and technological breakthrough can solve the low productivity problems and increase farmers' income. Poverty alleviation requires comprehensive efforts that should be conducted in a simultaneous manner. However, the monetary and economic crisis recently faced by the government, provides strong reasons to focus attention on agriculture and rural development availing the best chance to stimulate sustainable growth that address food security, poverty and income distribution concerns. The government has implemented some programs dealing with sustainable agricultural development. Some of those programs were successfully implemented such as integrated pest management (IPM) and Brantas watershed resource management. On the other hand, soil conservation technologies such as alley cropping and timber-food crops farming system (TFS) have difficulties for wider implementation. To promote the implementation of those technologies, the farmer have to be facilitated with better economic environment and land ownership rights for legal certainty on cultivated land.

**Key words :** food production growth; equity and poverty reduction; natural resources and environmental protection; sustainable agricultural development.

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2) Research staff (Associate Researcher) and Head of Research Service Division, CASER, Bogor, respectively.

## INTRODUCTION

Over the past three decades, Indonesia has maintained an average annual growth rate of 7 percent, reducing absolute poverty from 56 percent to 12 percent of the population, maintaining fundamentally sound macroeconomics policies, and transforming GDP per capita from US\$ 70 to \$ 1,300. In addition, there has been a remarkable improvement to quality of life indicated by a two-thirds drop child mortality rates, an improvement of basic literacy and a half reduction of rural population growth rate (Sudarsono, 1998; Tabor, 1998).

Recent development indicates that agriculture has been the main engine of rural economic growth. Agricultural growth averaged about 3.8 percent annually, approximately 2 percent higher than the rate of rural population growth. In 1995, agriculture contributed about 16 percent of GDP, employed about 48 percent of the labor force and generated approximately one-quarter of non-oil export. Compared to two decades ago, the share of agriculture in GDP and in the labor force is steadily declining. During that time (1975), agriculture accounted for 30 percent of GDP and 62 percent of total employment. Food expenditures in 1996 accounted for about 44 percent of national income. Amongst the poor, both in rural and urban areas, food expenditures account for between 60 to 70 percent of disposable income.

The main sources of agricultural growth have change over time. From the mid-1970s to the mid-1980s, the intensification of rice production was the primary engine of rural growth. Starting in the mid-1980s, diversification into higher value products was the main source of agricultural growth. With slow growth in both demand for and supply of rice, and limited growth in the other food crops, the rate of growth in agriculture slowed. Farm food crops contributed a very large share in agricultural GDP, i.e. about 53 percent in 1995. But while a slow growing food sector dampened the agricultural growth performance, rapid growth in services and labor-intensive industrialization bolstered rural income (Tabor, 1998).

The challenges of sustaining development consists of three complementary dimensions (World Bank, 1994) are: (1) maintaining robust economic growth by capturing the enhanced opportunities for development and diversification; (2) promoting equity by reducing poverty and broadening participation in development; and (3) protecting the environment by

conserving resources and limiting pollution. There are strong synergies exist among growth, equity and environmental protection. Growth generates the employment and increase in resources necessary to reduce poverty and improve environmental management. Equitable development broadens the base of growth and reduces poverty as a major source of pressure on the environment. Protection of the environment fosters efficient, long-term growth and benefits the poor, who tend to suffer most from environmental degradation.

Based on the above backgrounds, the objectives of this paper are to review (1) the performance and perspective of farm food crops' growth and development; (2) the performance and strategies for poverty reduction; and (3) the performance and strategies for sustainable agricultural and food crop production.

## FOOD PRODUCTION GROWTH AND INCOME GENERATION

Agricultural policy-makers in Indonesia face and will have to face challenges of continuing economic growth while maintaining self-sufficiency and food security as well as generating new productive employment opportunities for a rapidly growing labor force. To maintain food production growth in the short-run, policy-makers set price support and input subsidy programs to stimulate farm producers to increase output along the existing production process. However, in the long run, food production only can be increased by improving physical and institutional infrastructures and effectively shifting production function. Due to budget austerity faced by the government, the improvement of institutional development such as extension and research systems may be more appropriate to improve farm efficiency or to generate new technology.

## Perspective of Price Policy and Institutional Development

Most of studies conducted in Indonesia (Rachmat, 1986; Kasryno, 1986; Simatupang and Noekman, 1988; Hermanto, 1990; and Rusastra, 1995) indicated that price support scheme was effective to enhance technology adoption and increase output and farmer income. However, price support itself can not work effectively without supplemental programs.

According to Ellis (1989) and Timmer (1991; 1993), the following supporting factors are needed to make price support program be a sound policy (1) the availability of technology and widespread use of purchased input; (2) the improvement of input-output market, better rural infrastructure and institutional change; and (3) the existence of strong bureaucratic capacity, limited intervention to few commodities of strategic importance, in addition to appropriate magnitude of output supply and demand parameter with respect to output price.

The study dealing with wetland and dry land rice indicated that Java rice farmers were more responsive to price change compared to off Java rice farmers (Rusastra, 1995). This finding implies better physical and economic environment as well as better implementation of rice development program for rice farming in Java compared to outside of Java. The role of capital on output supply and input demand was also higher in Java. For both regions, the effect of technology was negligible, even negative outside of Java. These indicated that in some degrees, wetland rice farming outside Java were less intensive, in addition the current technology did not have its best performance due to broad spectrum of its development.

In addition to price policy for input and output, institutional development played an important role in food crop (rice) production. Timmer (1981) revealed that many of Indonesia's present rice problems have their roots well into the past. It was in May 1963 that Government of Indonesia (GOI) introduced Panca Usaha Tani (Five Efforts in Farming), i.e., the application of high yielding variety (HYV), fertilizer, better land preparation, irrigation, and pest control, to modernize Indonesia's agriculture (Murai, 1980). This program was able to increase rice productivity by more than 100 percent (Taryoto et al., 1993). It was a starting point of BIMAS (Mass Agricultural Guidance) which began in the rainy season of 1965/1966.

The Third Five Years Development Plan (FYDP), 1979-1983, can be considered as the period of spectacular production increase due to the implementation of a new program in 1979 called INSUS (Special Intensification) in rice production. The technological package under INSUS consists of specific recommendation of fertilizer application, selection of good quality seed, the formation of farmer groups, and synchronized planting (Sawit and Manwan, 1991).

Because rice production was not keeping pace with demand growth and INSUS rice intensification

program implemented since 1979 seemed to be leveling-off, then since 1987 GOI introduced SUPRA INSUS (Super Special Intensification Program). Sawit et al. (1989) recorded that Supra Insus was the extension of the BIMAS program to cover 10 components as the following (i) cropping pattern; (ii) certified rice seed; (iii) balanced use of different types of fertilizer; (iv) achievement of cultivation density of at least 20,000 plants per hectare; (v) better harvest and post harvest handling; (vi) better method of land preparation; (vii) the application of chemical growth stimulants (hormones); (viii) integrated pest and disease management; (ix) better water management techniques; and (x) rotation of rice varieties throughout the season. Together, the components may be regarded as a technology package.

All these kinds of intensification programs, started by Bimas in mid 1960s, initiated the major breakthrough in institutional adjustment (Jatileksono, 1993). The government has institutionalized this system from the national level down to the provincial, district, sub-district, and village levels. This was accomplished by setting up farm localities, named as village unit localities, to improve and increase efficiency of the delivery system for agricultural inputs, particularly high-yielding seeds, fertilizers and pesticides, as well as to channel agricultural credit and information on new technologies.

Each village unit locality was complimented by the establishment of a village unit bank to serve farmers with subsidized credit, and of a village unit cooperative to serve farmers both in supplying agricultural inputs collectively and in selling rice output. The rice intensification program has been implemented by providing farmers with credit in the form of a package of agricultural inputs plus some cash money intended to support the cost of living during the land preparation period.

### **Vision and Strategy for Agricultural Development Toward the 21<sup>st</sup> Century**

The Agency for Agricultural Research and Development (AARD) in Kasryno (1998) formulated the vision of agricultural development toward 2020 which entails the following characteristics: (1) Optimal and sustainable utilization of agricultural resources (land, water, manpower, capital, and technology); (2) Application of comprehensive agricultural diversification (horizontal, vertical, and regional dimensions); (3) Application of modern agricultural

technologies with high degree of adaptability to local specific endowment; and (4) Improvement of efficiency in agribusiness practice by producing competitive agricultural commodities through the application of higher science and technology contents and being able to mutually enhance the living conditions of farmers and consumers.

In order to implement those visions, the AARD established Assessment Institute for Agricultural Technology (AIAT) at the mid of 1994 located in 27 provinces with the main objectives: (1) to bring closer, synchronizes and integrate research activities with the need of users and other stakeholders such as regional government, cooperatives, NGOS, private investors, or as business partners of farmers; (2) to strengthen research-extension linkages in creating adaptive and specific location technologies by employing participatory approach, so that the communication with farmers as a strategic point can be established; and (3) to fasten the process of technology adoption in order that competitiveness and growth of agricultural sector can be attained by optimizing the use of available resources.

With the creation of AIAT the mechanism of research and assessment programs and technology recommendation have to be modified and adjusted (Kasryno, 1996). It will be started with the identification of the need and availability of agricultural technology in the regional basis. Based on these findings, the package of technology for a certain commodity at regional level will be designed and formulated. This becomes a bottom up research and development input for the research institution to design its program for local technology assessment. Adaptive research at the AIAT should be conducted by multi-disciplinary teams including researchers and extension specialist from the AIAT. The final result of this action research is the location specific technology alternatives as input for official recommendation at regional level, or as input for further research design for commodity research institute (CRI) within AARD.

As a breakthrough of agricultural development to implement the vision 2020, the AIAT develops and continues promoting the assessment program on agribusiness management system (SUP) on the basis of agro-ecology and resource potential. Action research of SUP on prioritized commodities are done as an alternative model to develop modern, strong, and efficient agricultural production system. Specifically, the objective of SUP assessment are (Kasryno, 1998): (1) designing SUP model based on prioritized

commodities which match the local environments, (2) finding-out SUP development pattern for special commodities which are dynamic and competitive as well as matching the need of clients, and (3) fostering the establishment of agribusiness growth center in rural areas.

There are five components characterizing SUP development assessment. The components are summarized as (1) introduction of new technology to increase production and productivity; (2) application of technology in the area which fulfill economies of scale; (3) closely guided in technology application at the field by a team consisting of researchers and extension workers; (4) application of participatory approach to encourage active participation of the farmers; and (5) better coordination at all stages, from planning, implementation to evaluation.

### **Efficiency Improvement and Technology Generation for Production Gain**

As mentioned formerly, due to budget constraint faced by the government, the role of efficiency improvement is important in fostering production growth. A study using the combination of cross-section (12 provinces) and time series data (1973-1991) indicated that the magnitude of economic inefficiency for rice farming in Java for the last five years (1987-1991) decreased remarkably, and even disappeared in East Java and Yogyakarta (Rusastra, 1995). On the other hand, the economic inefficiency outside Java is still large and varied among provinces even after 20 years of applying the new technology. Six out of eight provinces have magnitude of economic inefficiency ranging from 10%-52%. It seems that there is no significant economic gain that can be achieved by improving managerial skill of farmers in Java, but conversely it is true outside Java at given technology and resource endowment.

A study which links technical efficiency of irrigated wetland rice farmers in West Java with individual farmer characteristics showed that (1) educational level, and number of household member are not related to technical production efficiency level; (2) off-farm income and employment level are positively related to technical efficiency level; (3) income from and employment level in non-rice production activities are not related to the rate of technical efficiency; and (4) technical efficiency for both owner operator and tenants are not significantly different (Syafa'at, 1990).

For dry land rice farming, inefficiency performance was decreasing over time, and most disappeared for the last five years (Rusastra, 1995). It seems that productivity potential of the current technology was almost completely exhausted and farmers were reasonably efficient in allocating their resources, but they are generally still poor. Therefore, the production or economic gain should be achieved through better improvement of the external factor outside the farmer control. Achieving economic gain through improving the efficiency performance is no longer an attractive objective. This evidence should encourage stronger commitment of the government to create new technology that can improve the exhausted productivity potential of the current technology adopted by dry land rice farmers in the upland area.

The main finding of study by Squires and Tabor (1991) about technical efficiency for secondary crops conducted in Indonesia (on and off Java) seems to be important and interesting such as (1) for cassava, there were clear opportunities to realize important production gains without introducing new technological regimes or even incremental technical change; (2) There is little apparent gain from advancing technical efficiency for mungbean and peanut farmers, therefore development of new technologies will offer the best source of future production gains; and (3) For all commodities, technical efficiency was not significantly related to farm size, therefore promoting land consolidation or land ceilings are not required for technical efficiency improvement.

## INTERTEMPORAL DIMENSION AND STRATEGY FOR POVERTY ALLEVIATION

### The Relationship between Growth and Poverty Alleviation

There is a distinct positive relationship between growth of the economy and poverty reduction. Growth with equity or growth with improved income distribution is now widely recognized throughout the third world. Broaden the bases of growth in line with the economic structure will give more room for poverty reduction. In 1996, the contribution of agriculture in the Indonesian economy is 15.4 percent, but its share on total employment is still 46 percent. Therefore, driving growth and giving high priority in agriculture and rural development is very important, in addition to

maintaining growth in other sectors, for the benefit of poverty reduction.

During 1974-1983, annual GDP of Indonesia grew at an average rate of 6.5 percent. In 1984-1993 and 1994-1996 average annual growth rate increased 8.9 and 8.3 percent, respectively. Agricultural sector on the other hand grew only at an average rate 3.5 percent annually in 1974-1983, 4.3 percent during 1984-1993, and 7.3 percent during 1994-1996. It seems that the growth rate and productivity of agricultural sector is lower than non-agricultural sector over time. Within the agriculture itself, the role of food crop's sub-sector for the last two period is still dominant with the average proportion of 60.8 and 48.9 percent, but its growth rate is lower than agricultural sector as a whole, i.e. of 3.2 and 2.6 percent per annum, respectively. Agricultural diversification, with the emphasis of sub-sector outside food crop will play an important role in poverty reduction in the future.

Over the past two decade in line with economic growth, Indonesia had made tremendous progress in reducing poverty and malnutrition. In 1976, 40.1 percent of the population were classified under poverty line, and then decreased sharply to 11.3 percent in 1996. The rural population classified as poor is bigger than urban resident. In the rural area, its proportion had fallen from 40.4 to 12.3 percent, and from 38.8 to 9.7 percent in the urban area during the same period of time. Even though absolute rural poverty level was reduced, Indonesia's rural areas still remain very poor indeed. In 1995, 30 percent of the villages in Western Indonesia and 56 percent in the eastern part were considered as *backward* or severe poor villages. For the country as a whole, 43 percent of all villages received INPRES IDT (Presidential Instruction for Severe Poor Villages) in 1995, including 70 percent of all Eastern Indonesia villages (Tabor, 1998).

### The Strategy of Poverty Alleviation

Food deficiency and poverty causality relations are commonly referred as "vicious cycle of poverty". The government intervention is needed to break the cycle. This maybe the main instrument to alleviate poverty in Indonesia (Sudaryanto et al., 1992). The expenditure data suggested that the major portion of the low income households' expenditure was spent on foods especially for those who live in rural area. Rice was a dominant source of energy for the poor rural household living in most of the regions, except those who live in

North Sulawesi, Maluku, and Irian Jaya which mostly depend on tubers (cassava or sweet potato) as their main sources of energy. The evidence indicated that poor people were not always benefited from most of the food policies, therefore targeted policies which directly help the poor to get more access to food are really needed.

It is obvious that the increasing rice production is essential and still needed to meet the increasing demand for rice due to increasing population and income. In order to reduce the *pressure* to rice production, the government has implemented crop diversification program, which also includes livestock and fisheries development. Agricultural development program was intended to improve farmers' income *especially in the marginal area (including non-land resource based agriculture)* and to diversify domestic food supply that will benefit the poor. Agricultural based processing industry can play an important role in increasing value added as well as the time and space utilities of secondary crops and many perishable agricultural products. These will contribute to employment opportunities and income generation for the lower income class as well as the promoting domestic food supply diversification.

The strategies to reduce poverty that had been implemented and still get more attention in the coming years such as stated by the World Bank (1994) are (1) the promotion of a broad-based pattern of growth that expands opportunities for the productive use of labor; (2) the widespread provision of education and health services that enhance the poor capacity to grasp those opportunities; and (3) to give appropriate attention to non-agricultural (and within agriculture, non-rice) activities anticipated to give greater contribution to poverty reduction. As poverty become less widespread and more localized and because of benefit leakage to the relatively better-off, then targeting social expenditure to the poor and near-poor is likely to be an increasingly important tool in order to achieve equally dramatic gains in poverty alleviation and equity in this coming years.

Starting by FYDP VI the GOI give special emphasis to poverty reduction program in Eastern Indonesia. Efforts in these regions centers around the development of rain-fed agriculture, fisheries and agro-forestry activity (Tabor, 1998). Earlier attempts to promote development in those regions are the transmigration program. These efforts were broadly successful in helping to open-up new areas, but their impact on reducing poverty was less pronounced.

Eastern part of the country is favorable for livestock development. Recently, the emphasis of livestock development is to shift cattle raising to eastern part of Indonesia to substitute for the 500,000 head imported annually. A combination of better genetics, nutrition and disease control efforts is planned to support higher small holder cattle production system. Fishery is a major source of employment and incomes in this part of the country. During the 1990s, fishery has been the single most rapid source of growth in Indonesian agriculture. Coastal fisheries resources need to be carefully managed to ensure sustainable development.

Some small agricultural development project scales have been mounted in almost each of the provinces of eastern Indonesia. While the project differ in term of sub-sector or commodities, they tend to involve a core of farm-to-market road development (physical infrastructure), technology demonstrations, provision of technology packages to poor farm families and strengthening local research and extension services (Tabor, 1998). In practice, the area development project still faced some difficulties in designing project suitable for the respective area and farmers' need, a lack of suitable agricultural development technology, and inadequate attention to marketing and market prospect in project formulation (World Bank, 1998; Rusastra et al., 1998). Indonesia's newly created network of technology assessment institute (AIAT) could come to play a more important role in area development effort. Greater effort needs to be made to involve the private trade and agribusiness community in area development efforts, both during project design and project implementation, in conjunction with researchers, extension workers, and the best practice's farmers.

## PROTECTION OF RESOURCES AND ENVIRONMENT FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT

Sustainable growth will depend on efficient use and conservation of natural resources, including preventing pollution from destroying those resources. Policies that reduce the pressure of population growth make an important contribution to environmentally sustainable growth. Sustainable use of natural resources is particularly important to Indonesia's prospects because direct extraction and primary processing sectors accounting for about 40 percent of GDP, and the primary sector still generates about 60 percent of export earning and 50 percent of employment (World Bank, 1994). In

addition to utilizing the resources bases, growth will lead to increase urbanization and industrialization. It is expected that the share of manufacturing in GDP could be doubled over the next two decade, and at the end of the Second Long Term Development Plan (year of 2025), half of the population may reside in rural areas. Rising pollution and congestion intensify the need to ensure sustainable use of the capacity of the environment as a sink for urban and industrial wastes.

Alleviating poverty is both a moral imperative and a prerequisite for environmental sustainability. The poor are both agents and victim of environmental damage. Program that help to alleviate poverty, also support sustainable development. For example, Pakpahan (1993) argues that the root of soil and water conservation problem lies in poverty, related to the limited access to income generating sources. Poverty is the main factor affecting the improper use of land and conservation effort. Therefore, human and institutional aspects are probably important consideration in the effort to introduce sustainable agricultural development (Uphoff and Sawit, 1995). Property right, for example, are an important factor which stimulates farmers to implement conservation technology (Wiradi, 1995).

The GOI has implemented some programs dealing with sustainable agricultural development, such as watershed resource management, integrated pest management (IPM), and program preventing erosion and soil degradation. Urban and industrial water pollution problems have direct impact on shrimps industry in which nearly \$US 900 million shrimp export were lost in 1992 in Java (Tabor, 1998). In several river basins, government has taken steps to oversee the use of the water resources and establish an integrated approach to its development and management. A number of river basin authorities have been established, the most successful of which is the Brantas corporation in Central Java.

In response to the brown plant hopper outbreak of 1986, the government banned the application of 57 insecticides on rice, phased out pesticide subsidies and recommended adoption of integrated-pest-management (Tabor, 1998). The IPM originally started with irrigated rice and now included secondary food crops, horticulture, and small holder cash crops. Since rice account for close to 90 percent of the pesticide use in the agriculture sector, the fallen utilization in rice generate a significant fall in application level. The hike in agro-input price resulting from devaluation should inspire farmers to seek less-costly approach to pest

control. The monetary crisis would be a good moment to accelerate IPM-base training, to encourage the use of IPM methods for environmental protection and sustainable agricultural development, and to discourage unsafe use of agro-chemicals.

Among soil conservation technologies, alley cropping has certain advantage over terracing, particular in that (Susilawati *et al.*, 1997): (a) cost are lower, (b) soil productivity can be maintained, and (c) it may be applied on all soil conditions. A disadvantage of alley cropping relates to time taken for soil erosion control to become effective. However, over the longer time period, soil conservation control through alley cropping is more economically efficient than that for terracing. The review studies indicate that *Flemingia congesta* is the most effective soil erosion controlling leguminous shrub of those studies. In implementing alley cropping, land holding status is one determining factor in farmers' willingness to apply the technology. That is why the effort to disseminate soil conservation technology has often used some incentive in term of land ownership rights for farmers. Although alley cropping technology has currently been applied and adopted by farmers to a limited degree, there are still four main issues obstructing farmers' adoption of the technology are (a) small scale land holding; (b) limited capital; (c) production input availability; and (d) lack of technology information.

There are some indications that gradual change toward less labor. Intensive agriculture has taken place due to a shortage of labor availability in this sector. Consequently, there is a strong indication of the application of the sustainable small holder timber-food crop farming system (TFS) as a soil conservation technology in the upland area (Gunawan *et al.*, 1996). The sustainable TFS has provided benefits for farmers, whilst at the same time maintained the soil fertility and reduced the surrounding forest destruction. This traditional conservation model has been sustained because of the economic incentives to farmers. Therefore TFS involves an economic decision.

The TFS is characterized by high initial investment and fluctuating farmers' income. Introduction of TFS one large scale, especially to poor farmers will be restricted by the inability of farmers to bear cost in the first years. Provision of credit should be designed to promote implementation of TFS. Alternatively a gradual move in TFS may be possible. On the other hand, the improvement to TFS must be carefully designed so as to avoid destruction of the

well-developed traditional production system. The involvement of farmers in the planning and research to develop and implement an improved system will be the best learning process for farmers.

## CONCLUSION

- (1) The government should choose an encompassing policy that will achieve food crop development with the least cost. This study indicated that price support was the best policy to increase food crop production and to generate employment opportunities in the rural areas. The implementation of the price support policy will have wide policy implication in the food crop development strategy. For food crop commodities, being economically efficient just for import substitution (such as rice and soybean) requires a broad and flexible concept of self-sufficiency. The implementation of this concept would link domestic price with their opportunity cost in the world market, and have to permit import and export in addition to domestic procurement as a vehicle for maintaining a minimum buffer stock. In addition, the production growth rate of the respective commodities has to be in line with the rate of domestic consumption. By doing so, a huge surplus can be avoided and a small amount of import is possible. Beside that, in touch with the long-run world parity price, the cost of import, butter stock, and export subsidy will be minimized.
- (2) Wetland rice farmers outside Java and cassava farmers in and outside Java have wide opportunities to experience production gain through enhanced technical or economic efficiency by improving their managerial skill. This implies that the government should spend more funds for better extension services and conducted adaptive research in order to have a location-specific technology, especially for wetland rice farmer outside Java. For poor dry land rice and secondary crops (mungbean and peanut) farmers, only research and technological breakthroughs can solve the problems of low and stagnant growth of productivity and increase farmers' income. There was no substantial production or economic gain from increasing efficiency for dry land rice, mungbean, and peanut. Those evidences should encourage stronger commitment from the government to create new technological breakthroughs to improve the exhausted productivity potential of those commodities.
- (3) The effective implementation of the price support policy needs some precondition as the supporting environment such as technological change and the wide spread use of purchased input. This supporting environment is expected to yield the best effect to increase food crop production. Improve input market, better rural infrastructure, and institutional change are needed to assure that price increase are transmitted to the producer. In this regard, the government has wide opportunities to launch the investment policy and other policy options that reduced marketing cost, to make market more competitive and reliable for the effective implementation of price support. In the case of wetland rice in Java, dry land rice, mungbean, and peanut, the implementation of price support should be complemented with the generation of new technology and other public investment beyond farmers' control.
- (4) Poverty reduction requires some comprehensive efforts which have to be conducted in a simultaneous manner. Those efforts consist of maintain growth in all sector of economic activities, wide spread of economic development, and resources as well as environmental protection. The monetary and economic crisis of 1997 and 1998 provide strong reason to focus attention on agriculture and rural development. A resources-base recovery will provide the best chance to stimulate sustainable growth that addresses food security, poverty and income distribution concerns. The government of Indonesia gives all effort to restore sustainable rural growth and development and promote rural off-farm employment linked to a rising trend in agricultural productivity and income. As long as budget is available, the farmers should be facilitated with agricultural credit and better extension services for better technology adoption, maintaining productivity and increasing farmer income.
- (5) The government of Indonesia has implemented some programs dealing with sustainable agricultural development such as watershed resource management, integrated pest management (IPM) and program preventing erosion and soil degradation. Some of those programs were successfully implemented such as integrated pest management. Soil conservation technologies such

as alley cropping and timber food crops farming system (TFS), being successfully adopted by upland farmers in a certain area, have difficulties for wider implementation. To promote the implementation of those prospective soil conservation technologies, the farmers have to be facilitated with technology information, credit or capital, production input availability, and land ownership rights for farmers. It is worthwhile to fulfil and develop these incentives further, so that there is better economic environment on implementing the respective system and legal certainty on cultivated land.

## REFERENCES

- Ellis, F. 1989. Future Rice Strategy in Indonesia: Rice Self Sufficiency and Rice Price Stability. Indonesian Food Journal Vol. 1 No. 1, Bulog, Jakarta.
- Gunawan, M., S.H. Susilawati, and G.S. Budhi. 1996. Small holder Tree Growing on Erosion Prone Marginal Upland: A Case Study in Sumedang, West-Java. Improving Small Holder Farming System in *Imperata* Areas of Southeast Asia. *Imperata* Project Paper 1996/1. CRES-ANU, Canberra; SEARCA, Los Banos; and CASER, Bogor, Indonesia.
- Hermanto. 1990. Demand for Input and Supply of Rice Under Risk and Selectivity Bias: A Study of Indonesian Farmers. Jurnal Agro Ekonomi. Vol. 9 No. 2, Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Jatileksono, T. 1993. Technological Change, Income Distribution, and Institutional Adjustment in the Indonesian Rice Sector. Indonesian Food Journal 4(7), Bulog, Jakarta.
- Kasryno, F. 1988. Supply of Rice and Demand for Fertilizer for Rice Farming in Indonesia. Jurnal Agro Ekonomi. Vol. 5 No. 2. Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Kasryno, F. 1996. Indonesia Rice Economy: A Perspective Toward Year 2010. Revised version of a paper "Indonesia Growing Rice Supplies and Its Challenges", written by the author, presented at The First Asia International Rice Conference, Singapore, October 24-25, 1996. Agency for Agricultural Research and Development, Jakarta.
- Kasryno, F. 1998. Constraint and Opportunities for Further Growth in the Agricultural Sector in Indonesia: The Specific Role of Research. Paper presented at the CIRAD Seminar on the 21<sup>st</sup> Century Agricultural Research in Increasing Agricultural Commodities Competitiveness Toward National and International Market, 5-6 May 1998.
- Murai, Y. 1980. The Bimas Program and Agricultural Labor in Indonesia. The Development Economics, Vol. 18 No. 1. Institute of Developing Economic, Tokyo, Japan.
- Pakpahan, A. 1995. Apakah Ada Ruang Untuk Meningkatkan Pendapatan Petani Lahan Kering Tanpa Merusak Lingkungan. Paper disampaikan dalam lokakarya "Pelebagaan Penelitian dan Pengembangan Sistem Usaha Tani Konservasi di Lahan Kering Bagian Hulu DAS Jratun Seluna dan Brantas", 7-8 Desember 1993, Tawangmangu, Indonesia.
- Rachmat, M. 1998. Elastisitas Permintaan Masukan dan Penawaran Hasil Tanaman Padi di Jawa. Jurnal Agro Ekonomi, Vol. 5 No. 1. Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Rusastra, I W. 1995. A Profit Function Approach in Estimating Input Demand, Output Supply and Economic Efficiency for Rice Farming in Indonesia. Thesis Doctor of Philosophy Univ. of The Philippines, Los banos.
- Rusastra, I W., M. Ariani, V.T. Manurung, B. Sayaka, A. Agustian, dan S. Mardianto. 1998. Kajian Dampak Program Pertanian dan Non Pertanian Terhadap Ketahanan Pangan Rumah Tangga. Kerjasama Penelitian UNICEF dan Biro Perencanaan Deptan dengan Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Satari, G., M. Rachmat, A. Nasution, dan F. Kasryno. 1986. Aplikasi Teknologi Pertanian, Intensifikasi Tanaman Pangan, dan Pola Usahatani. Buku 3. BPS, Pusat Studi Pembangunan, IPB, dan Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Sawit, M.H., A. Saefuddin and I. Manwan. 1989. Penerapan Teknologi Intensifikasi Supra Insus di Jalur Pantura Jawa Barat: Permasalahan yang perlu Diteliti. Jurnal Penelitian dan Pengembangan Pertanian, 8(1), Badan Litbang Pertanian, Jakarta.
- Sawit, M.H. and I. Manwan. 1991. The Beginnings of the New Supra Insus Rice Intensification Program: The Case of the North Coast of West-Java and South Sulawesi. Bulletin of Indonesian Economic Studies. Vol. 27 No. 1, ANU, Canberra.
- Simatupang, P. dan K.M. Noekman. 1988. Pola Usahatani Padi dan Elastisitas Permintaan Masukan Serta Penawaran Hasil di Tingkat Petani di Sumatera Barat. Perubahan Struktur Ekonomi Pedesaan Menuju Struktur Ekonomi Berimbang (Ed. F. Kasryno et al., 1988). Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Squires, D. and S. Tabor. 1991. Technical Efficiency and Future Production Gain in Indonesia Agriculture. The Developing Economic, 29(3), Tokyo, Japan.
- Sudarsono, J. 1998. Environmental Concern Still Lacking. The Jakarta Post, May 16, 1998, Jakarta.
- Sudaryanto, T., Hermanto, Erwidodo, E. pasandaran, and M.W. Rosegrant. 1992. Food Situation and Outlook

- for Indonesia. Collaborative Research Between IFPRI, Washington D.C., and Center for Agro Socio Economic Research (CASER), Bogor, Indonesia.
- Susilawati, S.H., G.S. Budhi, and I W. Rusastra. 1997. Alley cropping farming Sistem in Indonesia (A Review). Improving Smallholder Farming Systems in *Imperata* Areas of Southeast Asia. *Imperata* Project Paper 1997/3. CRES-ANU, Canberra; SEARCA, Los Banos, CASER, Bogor, Indonesia.
- Syafa'at, N. 1990. Faktor-faktor yang Mempengaruhi Efisiensi Teknis Relative dan Sikap Petani dalam Menghadapi Risiko Produksi pada Usaha Tani Padi Sawah di Lahan Beririgasi Teknis. *Jurnal Agro Ekonomi* Vol. 9 No. 2, Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Tabor, S. 1998. Back to Business: Revitalizing Rural Development in Indonesia. Working paper presented at Bulog, The National Food Logistic Agency, Jakarta.
- Taryoto, A.H., A. Mintoro, A. Zulham, T. Pranadji, R.N. Suhaeti, G.S. Budhi, T.B. Purwantini, dan B. Sudaryanto. 1993. Analisis Perubahan Kebijakan Organisasi Ekonomi dalam Bidang Pangan dan Dampaknya terhadap Produksi, Distribusi, Peningkatan Pendapatan dan Kesempatan Kerja di Indonesia. Monograph Series No. 10. Pusat Penelitian Sosial Ekonomi Pertanian, Bogor.
- Timmer, C.P. 1981. The Formation of Indonesian Rice Policy: A Historical Perspective. *Agricultural and Rural Development in Indonesia* (Ed. G.E. Hansen). Westview Press Boulder, Colorado, USA.
- Timmer, C.P. 1991. Institutional Development: Indonesia's Experience in Stabilizing Rice Market. *Indonesia Food Journal*. Vol. 2 No. 3, Bulog, Jakarta.
- Timmer, C.P. 1991. Building Institutions for Food Policy Analysis. *Indonesian Food Journal*. Vol. 4 No. 7, Bulog, Jakarta.
- Uphoff, N. dan M.H. Sawit. 1995. Pendekatan Partisipatif dalam Pengelolaan Daerah Aliran Sungai (DAS). Paper disampaikan dalam Lokakarya "Pembahasan Hasil Penelitian dan Analisis Pengelolaan DAS", 20-24 Nopember 1995, Garut, Indonesia.
- Wiradi, G. 1995. Masalah Penguasaan Tanah dalam Perspektif Pengelolaan Daerah Aliran Sungai, 20-24 Nopember 1995, Garut, Indonesia.
- World Bank. 1994. *Indonesia: Sustaining Development*. A World Bank Country Study. The World Bank, Washington, D.C., USA.
- World Bank. 1998. *Coral Reef Rehabilitation and Management Project*. The World Bank, Washington, D.C., USA.