

**SUSTAINABLE AGRICULTURE DEVELOPMENT IN INDONESIA:  
PROBLEMS AND POLICIES**

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**Abstracts**

Productivity, income and employment are issues associated with agricultural development in the developing countries such as Indonesia. Government intervention and support for special project and program have been introduced and created acceleration the growth of adoption and increase the utilization of agricultural technology. However, these efforts did not lead on sustainable agriculture development. In developing agricultural is likely happen to meet sustainable development of agricultural as a comprehensive systems in agriculture and rural development. In regard to sustainable agriculture development, in the last v3 years, efforts have been made based on historical evident and specific situation of agriculture in Indonesia. Problems in connection with specific condition for sustainable agriculture development have been identified and policies have also been formulated. Through agricultural revitalization program, collaboration among agricultural institutions has been intensively strengthened in program development and execution.

**Key words:** Agriculture, Government, policy and strategy, sustainable.

**I. INTRODUCTION**

**1.1 Definitions and Terms**

Some terms defy definition. "Sustainable agriculture" has become one of them. In such a quickly changing world, can anything be sustainable? What do we want to sustain? How can we implement such a nebulous goal? Is it too late? With the contradictions and questions have come a hard look at our present food production system and thoughtful evaluations of its future. If nothing else, the term "sustainable agriculture" has provided "talking points," a sense of direction, and an urgency, that has sparked much excitement and innovative thinking in the agricultural world.

The word "sustain," from the Latin *sustinere* (sus-, from below and *tenere*, to hold), to keep in existence or maintain, implies long-term support or permanence. As it pertains to agriculture, sustainable describes farming systems that are "capable of maintaining their productivity and usefulness to society indefinitely. Such systems... must be resource-conserving, socially supportive, commercially competitive, and environmentally sound." (John Ikerd, as quoted by Richard Duesterhaus, 1990)

"Sustainable agriculture" was addressed by Congress in the 1990 "Farm Bill" (FACTA, 1990). Under that law, "the term sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations; and
- Enhance the quality of life for farmers and society as a whole."

## 1.2 General aspects linkage on Sustainable Agricultural Development

### *Ecological Aspect*

Agriculture profoundly affects many ecological systems. Negative effects of current practices include the following:

- Decline in soil productivity can be due to wind and water erosion of exposed topsoil; soil compaction; loss of soil organic matter, water holding capacity, and biological activity; and salinization of soils and irrigation water in irrigated farming areas.
- Agriculture is the largest single non-point source of water pollutants including sediments, salts, fertilizers (nitrates and phosphorus), pesticides, and manures. Pesticides from every chemical class have been detected in groundwater and are commonly found in groundwater beneath agricultural areas.
- Water scarcity in many places is due to overuse of surface and ground water for irrigation with little concern for the natural cycle that maintains stable water availability.
- Other environmental ills include over 400 insects and mite pests and more than 70 fungal pathogens that have become resistant to one or more pesticides; stresses on pollinator and other beneficial species through pesticide use; loss of wetlands and wildlife habitat; and reduced genetic diversity due to reliance on genetic uniformity in most crops and livestock breeds.
- Agriculture's link to global climate change is just beginning to be appreciated. Destruction of tropical forests and other native vegetation for agricultural production has a role in elevated levels of carbon dioxide and other greenhouse gases. Recent studies have found that soils may be sources or sinks for greenhouse gases.

### *Economic and Social Aspects*

Economic and social problems associated with agriculture can not be separated from external economic and social pressures. As barriers to a sustainable and equitable food supply system, however, the problems may be described in the following way:

- Economically, agricultural sector includes a history of increasingly large federal expenditures and corresponding government involvement in planting and investment decisions; widening disparity among farmer incomes; and escalating concentration of agribusiness—industries involved with manufacture, processing, and distribution of farm products—into fewer and fewer hands. Market competition is limited. Farmers have little control over farm prices, and they continue to receive a smaller and smaller portion of consumer dollars spent on agricultural products.
- Economic pressures have led to a tremendous loss of farms, particularly small farms, and farmers during the past few decades—more than 155,000 farms were lost from 1987 to 1997 (Gold, 1999). This contributes to the disintegration of rural communities and localized marketing systems. Economically, it is very difficult for potential farmers to enter the business today. Productive farmland also has been pressured by urban and suburban sprawl, some farmland have been lost to development.

## II. PROBLEMS IN CONNECTION WITH THE SPECIFIC SITUATION FOR SUSTAINABLE AGRICULTURE DEVELOPMENT IN INDONESIA

### 2.1 General Situation of Indonesian Agriculture in Indonesia

Indonesia has a big population of about 220 million in 2003. Sixty two percent of that population lives in Java Island, which only occupied 7% of the total area. The proportion of agricultural economic active population is more than 45% in 2001, while the contribution of agricultural GDP is only 17%. At the same time, contribution of industrial population was about 25%, while. Thus situation indicates the natural sift of economic structure. The problem is that agricultural sector carries the big portion of population with low income. The ratio between agricultural income and non-agricultural income is about 1: 6

Based on that structural transformation process, the new elected government in 2004 has launched program to **revitalize** agriculture through (a) increase food security system, (b) agribusiness development, and (c) increase farmer's welfare. Increase food security system will include increase food production through crop intensification, land development for new rice land and other food crops, irrigation efficiency, the optimum use of farm machinery, and reduction of post harvest losses. On the other side, agribusiness development will include product diversification, quality achievement and development of rural industry in the rural area. These should be supported by the quality human resource development for extension, education and training. The financial aid will also be created to enable small farmer's access to credit more easily.

In line with implementation of revitalization program, the objectives have been set up of agriculture development are:

- To develop human resource and farm institution
- To optimize the use of agricultural resources for sustainability
- To Strengthen food security and safety
- To increase added value and competitiveness of agricultural products
- To strengthen the growth of economic activities in the village
- To develop management systems of agriculture development which are stressed for farmers.

## 2.2 Historical evident of agriculture development in Indonesia

Agricultural policy in Indonesia has been primarily concerned with implementing production based policies designed to pursue food self sufficiency. Since 1967, Indonesian agricultural development polices have focused on achieving food self sufficiency in rice. This goal was reached in 1984, when, for the first time, domestic rice production exceeded domestic rice consumption. Unfortunately, achieving this goal came at the expense of sustainable agricultural development.

The economic costs of gaining food self sufficiency in rice were extremely high. The Government of Indonesia (GOI) achieved food self sufficiency in rice through extensive government investment and through the implementation of subsidy programs for fertilizer, pesticides and irrigation. Over the period 1970-84, the total irrigated land area increased from 3.7-4.9 million hectares; the use of subsidized fertilizers increased from 0.2-4.1 million tons; and the use of subsidized pesticides increased from 1080-14210 tons. In 1986-87 the total cost of these input subsidies reached US\$725 billion (Barbier, 1999).

In order to increase rice output, the Indonesian government was forced to expand cultivated land area. This expansion was accomplished by investing large amounts of government funds into infrastructure projects, such as the building of roads and processing facilities, and the development of new irrigation networks. The strategy to expand cultivated land area also relied on Indonesia's transmigration program. This program involved moving families out of crowded cities and resettling them on previously undeveloped marginal lands. The economic costs of this program were extremely high-US\$9000 per family (Barbier, 1999)

Input subsidies also generated significant economic costs. For example, "until 1985 the Indonesian government subsidized pesticides at 82 percent of the retail price, at an annual cost of US\$128 million" (Panayotou, 1993). In addition, fertilizer subsidies to farmers reached US\$220.7 million in 1986-1987 (Barbier, 1999). Because farmers were not forced to pay the full cost of their fertilizer and pesticide use, inappropriate application of these toxic chemicals resulted. These costly subsidies resulted in a government induced market failure, which caused farmers to use more pesticides and fertilizer than was economically efficient.

Since most of the irrigated land in Indonesia was, at the time, devoted to rice production, maintaining and improving the irrigation network was extremely important for increasing rice output. A large part of this maintenance and improvement was paid for through government financed subsidies. These irrigation subsidies imposed a heavy financial burden on the GOI. It was suggested that, in order to irrigate 4 million hectares of land, a government subsidy of US\$440 million was needed (Barbier, 1999). Because farmers were not responsible for paying the full cost of their water consumption, irrigation water was overused and wasted.

Not only were the monetary costs of achieving food self sufficiency in rice significant, the external environmental costs proved considerable as well. Some of the environmental costs affected only the farmer. For example, the input subsidies for fertilizer, pesticides, and irrigation along with the expansion of cultivated land area imposed costs on the cultivator in terms of reductions in agricultural productivity and depletion of resources. Some unfortunate non-user externalities also emerged from such a production-led approach. These external costs resulted from fertilizer and pesticide pollution, as well as from the depletion of natural resources (i.e. water resources).

The negative impacts of the pesticide subsidy in Indonesia have been well documented. The inappropriate use and over application of pesticides by Indonesian farmers led to the evolution of pesticide resistant pests, and the elimination of natural predators that help control pests. For example, in 1986-87, an estimated 50-60,000 hectares of cultivated rice were lost to an outbreak of a pesticide resistant brown planthopper species (Barbier, 1999). This loss of 1 million tons of rice was equivalent to US\$180 million (Barbier, 1999). In addition to these direct user costs, contamination of surface water by pesticide runoff resulted in the decline of fishing productivity and in costs to human health.

The expansion of cultivated land area into marginal lands produced severe erosion problems. Increased rice cultivation on marginal lands by poor, subsistence farmers seeking to meet their basic food needs caused particularly high levels of soil erosion. Losses of fertile topsoil brought about significant declines in agricultural productivity. "Given an estimated 903,092 hectares of critical upland farming area on the island of Java, a rough estimate of the loss in farmers incomes from the failure to control soil erosion was US\$139.8 million per year" (Barbier, 1999). Surface water sedimentation from erosion runoff produced harmful environmental externalities as well. Sedimentation of surface water disrupted irrigation networks, dams and other water systems (i.e. residential water supply systems). This disruption resulted in losses to agriculture, aquaculture and fishing, and losses from diminished navigation and hydropower.

Clearly, Indonesia's production-led approach to achieving food self sufficiency in rice was not sustainable. It has been stated that sustainable agricultural development occurs when "both the real economic costs of production and the real environmental costs of production are expected to remain constant or to fall as production expands" (Barbier , 1999). In order to increase rice output, Indonesia greatly increased both the economic and environmental costs of production. Indonesia's failure to adequately consider the

monetary and environmental impacts of its production-led policies resulted in an unsustainable outcome.

In recent years, the government of Indonesia has realized the importance of sustainable agricultural development. The GOI has become aware that sustainable agricultural development requires integrating natural resource management strategies into agricultural development policies. This is illustrated by the fact that in November 1986 President Suharto issued a decree which banned 57 brands of pesticide, and established the integrated pest management (IPM) program. This program involved controlling pests through the use of the pests' natural predators. Three planting seasons after the decree, the Food and Agricultural Organization (FAO) reported that pesticide use had declined by 90%, while average rice yields had risen from 6.1 tons per hectare to 7.4 tons per hectare (Panayotou, 1993). Indonesia's IPM strategy has served as the first step in the country's quest to achieve sustainable agricultural development. If agricultural development is to become sustainable in Indonesia, development strategies must continue to be modified so that the economic costs as well as the environmental costs are taken into account.

### 2.3 Current Problems in Connection with the Specific Situation

Current problems in connection with specific situation of agriculture development have been identified in every aspects of the development. Those are (MOA, 2004):

#### *Land holding*

- Legality problem and conflict of using of land between farmers, industry and government.
- Many farmers have no land (farm labour).
- Small land holding size and fragmented.
- Land productivity decrease due to over application of pesticides in the past.
- Shifting use of land from agriculture to industry or others development purposes.
- Many unproductive/uncultivated lands.

#### *Agriculture Institution*

- Less coordination among agriculture institutions.

#### *Financial/capital*

- Most of farmers have less capital.
- Less appropriate financial support scheme to farmers.

#### *Human resource*

- Limited skill of cultivation technique.
- Less orientation on agribusiness.
- Less capability in assessing market of the products.
- Less knowledge and capability in post harvest handling of the products.
- Less productivity.
- Less regeneration.

- Less educated.

*Technology*

- Technology transfer system is weak.
- Application technology which is not suit to the local specific condition.

*Farmer organizations*

- Less knowledge of management.
- Less capability to assess resources.

*Government Policies*

- Policies on land use need to be review.
- Policies on agricultural infrastructure need to be improved.
- Policies on financial aid to farmers need to be enriched.
- Policies on using of natural resources need to be review.

*Information technology and market*

- Need to optimize the use of information technology system.
- Policies on market, distribution of input and output of agriculture need to be improved.

### III. AGRICULTURAL POLICIES TOWARD SUSTAINABLE AGRICULTURAL DEVELOPMENT IN INDONESIA

#### 3.1 Agriculture Development Policies

In order to overcome those problems, the Government policies which directly link to agriculture have been set up, those are (MOA, 2006):

- Improving coordination among agricultural institutions in formulating policies, developing and executing agricultural development program
- Increasing land productivity and its production sustainability through (1) increasing investment, (2) improvement of legality aspect of land ownership and uses, (3) establishing commodity mapping through out Indonesia.
- Improving capability of human resource for (1) establishing agriculture development policies, (2) conducting training and establishing farmer's organization, (3) improving monitoring and evaluation system.
- Improving agricultural infrastructures, which are include (1) farm infrastructures, (2) farm financial institutions and (3) post harvest handling and market infrastructures.
- Improving innovation and dissemination system of technology in order to (1) respond existing problems, (2) optimize the use of resources based on local specific condition, (3) develop science and technology in agriculture, (4) have

- better feed back for further formulation development policy, strategy and program, (5) accelerate adoption of technology to increase productivity.
- Increasing promotion and protection of agricultural commodities through (1) establishing policy on proper subsidy of agriculture input/output, price and credit scheme (2) increasing export and controlling import, (3) establishing import tariff and regulation, (4) improving standard quality of agricultural products, (5) Strengthening marketing system of agricultural products.

### 3.2 Agricultural Engineering Development Policies, Strategy and Program

Policy for agricultural engineering development should be an integrated policy in the frame work of national policy for agricultural revitalization. It is, therefore, as supporting agen, position of agricultural engineering should be strong enough with respect of helping farmers. Therefore, policy for agricultural engineering development in Indonesia have been setup directed to be able to create (a) the increase of productivity and efficiency of agricultural resources, (b) the increase quality and added value of the agricultural products and its by products, (c) opportunity development of local agricultural machinery industry to produce better quality of the machines which are suitable to local conditions and purchase ability of farmers, (d) opportunity collaboration among small, medium and big sclae industry.

For current situation, relationship among agricultural engineering institutions and farmers has not been harmonize yet. In the most cases, the goverment policies on agricultural development have not accomodate farmer's need. The same thing also occured to local agriculcural machinery producers. It is therefore some machineries needed by the farmers could not be provided by the local producers. The goverment institutions and the local producers have not worked closely yet, especiaaly in research and development of agricultural machinery. Those are the reasons of relatively slow development of agricultural engineering in Indonesia compared to others developing countries.

Based on these conditions it is needed to develop appropriate strategy in promoting agricultural engineering in Indonesia. Strategy development of agricultural mechanization could be able to support development of agroidustry in village areas as well as local agricultural machinery industry it self.

Currently, appropriate strategy has been established in promoting agricultural engineering development is **selective, progressive and participative**. Selective strategy meant that technology level and type of mechanization which would be implemented should be suited to the local or region conditions. The local conditions which have to be considered in this strategy are physical, socio-economic-culture, farming system and farm infrastructures aspects. Progressive meant that the level of technology should be implemented and always gradually improved from low level into higher level. These changes of technology level are respect to agricultural development from traditional into modern agriculture. Participative strategy meant that the implementation of agricultural

engineering development have to be done by involving the active participation of agribusiness society, including consumers/farmers, related industry and producers and financial institutions. Therefore, this development could be handled by single institute.

Agricultural engineering development programs in Indonesia must be designed and implemented comprehensively which are well integrated and coordinated with programs of other sectors. National development programs in agriculture, industry, trade, infrastructures, education sectors and regional development programs have to be taken into considerations in developing agricultural engineering programs.

Based on 50 years experiences in the development of agricultural engineering in Indonesia and lessons learned from experiences of others countries such as Korea, Thailand and Vietnam, agricultural engineering development programs should be directed to: (a) develop a model systems technology transfer (adoption) from research institutions to local industries and end users, (b) strengthen agricultural engineering institutions which included national level, provincial level as well as farm level, government and private institutions, (c) strengthen research and development program, (d) develop good communication and strengthen collaboration among agricultural engineering institutions, (e) provide adequate technical knowledge and number of human resource, (f) develop financial support systems which are accessible by the farmers.

In order to achieve the objectives and targets in the development of agricultural engineering in Indonesia, the following are some action programs:

1. Supporting infrastructures development such as rehabilitation and construction of irrigation scheme and farm road for improvement transportation systems of input and output of agriculture.
2. Improving accessibility credit schemes available for farmers, including credit of agricultural machinery for farmers and small and medium scale of agricultural machinery industry.
3. Strengthening capacity building of agricultural engineering institutions, national and provincial level, government and private institutions, research, development and extension.
4. Strengthening the use of locally made agricultural machinery. By this policy, while subjected to support development of priority commodities, simultaneously, it is also strengthen the growth of local agricultural machinery industry and provide job opportunity.
5. Improving procurement, testing and evaluation procedure and selection systems in order to insure quality of agricultural machinery used.
6. Training and extension which cover operation, repair and maintenance of agricultural machinery should be conducted for farmers as well as agricultural machinery hiring services (UPJA) in order to optimalize the use of agricultural machinery in farm level.
7. Development of human resources related to development of agricultural engineering especially in research and extension.
8. Strengthening collaboration among agricultural engineering institutions in the field of research, development and dissemination of technology.
9. Strengthening collaboration with others respective institution in the development and adaptation of technology.

#### IV. CONCLUSION

In recent years, the government of Indonesia has realized the importance of sustainable agricultural development. The GOI has become aware that sustainable agricultural development requires integrating natural resource management strategies into agricultural development policies. Indonesia's IPM strategy has served as the first step in the country's quest to achieve sustainable agricultural development.

Currently, Problems in connection with specific condition for sustainable agriculture development have been identified and policies have also been established. Through agricultural revitalization program, collaboration among agricultural institutions has been intensively strengthened in program development and execution.

Policy for agricultural engineering development should be an integrated policy in the frame work of national policy for agricultural revitalization. It is, therefore, as supporting agen, position of agricultural engineering should be strong enough with respect of helping farmers. Therefore, policy for agricultural engineering development in Indonesia have been setup directed to be able to create (a) the increase of productivity and efficiency of agricultural resources, (b) the increase quality and added value of the agricultural products and its by products, (c) opportunity development of local agricultural machinery industry to produce better quality of the machines which are suitable to local conditions and purchase ability of farmers, (d) opportunity collaboration among small, medium and big sclae industry.

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