Rural Development through Commodity-Based and Agribusiness-Oriented Farming Systems

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Abstract

Indonesia has a firm commitment to increase farmers' welfare through the implementation of various programs of agricultural development. During the last three decades, food, fisheries, and livestock production increased substantially and rural poverty decreased at a sizable rate. These agricultural development programs are continuously improved in accordance with the dynamic changes in the strategic environment, internationally as well as domestically, including those related to economic globalization. A model of commodity based- and agribusiness-oriented farming systems was designed in order to increase productivity, efficiency, and farmers' income. New elements to these farming systems include the emphasis placed on the importance of market orientation in product development, full farmers' participatory approach in new technology adoption, and close guidance by researchers and extension workers in program implementation. To assess its suitability for each locally specific socio-agro-ecosystem, since 1995/1996 a rice-based farming system has been introduced at the farm level. This assessment activity is relatively large, involving more than 100,000 farmers and 46,000 hectares of paddy fields. In the present paper, the concept of this new approach to farming systems and present results of the assessment are discussed. In brief, the new approach of rice-based farming systems is promising in terms of increase of farming efficiency and farmers' income.

Introduction

Indonesia's development program for three decades (since 1969) has led the country to be among the high-performing economies in Asia, with an average growth rate of 7 % per year. Agriculture, which covers food crops, tree crops, livestock, and fisheries plays an important role, even though its share in the country's GDP (Gross Domestic Product) is decreasing over time. At present, the share of the agricultural sector in the country economy and labor absorption is about 17% and 46%, respectively. The contribution of the agricultural sector to the reduction of poverty is also significant. The number of Indonesian people in absolute poverty decreased from 58% in 1960 to 17% in 1990, and reached a value of 10% in 1996. Most of the poor people live in rural areas and their main source of income is agriculture.

Within the agricultural sector, rice accounts for a sizable proportion in terms of economic role. Rice is the staple food for about 97% of Indonesian people, and accounts for 24% of total consumers' food expenditure (Kasryno, 1996). Indonesian agriculture is also characterized by small-scale and household farming. In 1993, there were 17.78 million household

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farmers with an average land holding size of 0.86 hectares. The distribution of land holdings was skewed, around 48.5% of the farmers operated less than 0.5 hectares of farm land, while only 1.3% of the farmers operated more than 5 hectares (Rusastra, 1996).

Development is a dynamic process. Changes in the strategic environment such as economic globalization and trade liberalization force Indonesia to change its development orientation. Besides these forces, in the case of the agricultural sector, the role of rice in the economy and the predominance of small-scale farms are major determinants in agricultural policy formulation. Therefore, since the early 1970s, increasing rice production to maintain self-sufficiency has been the core of the agricultural development policy. At the same time agricultural development policies must also consider the welfare of small-scale farmers as a priority.

One of the agricultural development programs that accommodate such a policy is the Commodity-Based and Agribusiness-Oriented Farming Systems. In the Indonesian terminology, it is called System Usaha Pertanian Berbasis Komoditas (SUP). Basic concept of this development model was formulated by Dr. Faisal Kasryno, Director General of the Agency for Agricultural Research and Development, Ministry of Agriculture. This SUP model was initially launched in 1995/96 as action research at the farm level, involving more than 100,000 rice farmers and covering 46,000 hectares of land with irrigated rice farming. Based on this assessment, a model of farming systems which fit to the locally specific agro-ecosystems and socio-economic conditions is going to be formulated and hopefully will be widely adopted by farmers. Further assessment of this SUP model for commodities other than rice is also being conducted (Adnyana, 1995 and Suryana and Adnyana, 1997).

The objective of this paper is to discuss the basic concept and procedures of this Commodity-Based and Agribusiness-Oriented Farming System (SUP) model. Results of the assessment of Rice-Based SUP program in five selected provinces are presented.

Commodity-Based and Agribusiness-Oriented Farming Systems (SUP)

The SUP model uses the Farming System Development (FSD) approach introduced by FAO as a model building. It covers several aspects, as follows: (1) taking account of interaction, constraints and opportunities on small-scale household farming system practices, (2) integrating the predicted impact of macroeconomic policies related to agricultural development on farmers' income and welfare into the model, and (3) evaluating the impact of the changes in resources management and farming system development on productivity and farm household welfare.

In the long run, the objective of SUP is to develop agribusiness-oriented household farming systems as part of sustainable development in rural areas. Meanwhile in the short run, the objectives are: (1) to increase the productivity, efficiency, and competitiveness of small-scale household farming, (2) to increase farm household income and welfare, and (3) to promote agribusiness development in rural areas.

Experiences led to the conclusion that a "top-down" approach in research planning and its implementation could not answer the need of development process, particularly for small farmers in the case of agriculture. Problems will always appear when planning, identifica-

tion, formulation and preparation of a program are undertaken without consultation with the end user. In addition, in the past, a program was usually focused only on a single aspect such as commodity, variety improvement, irrigation system, etc. As a result, technological innovation could not be adopted by the ultimate user (farmers) because such partially top-down designed program did not consider factors affecting farmers in making their decision.

The SUP model uses a participatory and multi-disciplinary approach. In this approach, understanding of farm household characteristics as the smallest analytical unit is very important. Any system in the model is considered as a part (sub-system) of a larger system. Furthermore, coordination with local government is very important both in planning and especially in the implementation of the program because practically the local government has authority in the process of development of the region.

The other important element in the SUP model is locally specific technology. This is based on the concept that to explore potential comparative advantages as the main principle of mutually beneficial trade, Indonesian agricultural development policy should be based on the specific structure resource endowment of each region. This implies that for every different location or region there should be a specific technology to be applied in accordance with local bio-physical and socio-economic conditions. In the case of Indonesia, this consideration is a prerequisite since the diversity of the country's natural resources conditions is very large.

A new farming technological package is designed by utilizing the synergetic relation among sub-systems within a farming system. The technological package must be technically applicable under locally specific agro-ecosystem conditions, economically profitable by increasing efficiency and competitiveness of the activities, socially acceptable and environmentally friendly.

In contrast to other farming system development concepts which treat a household farming as the smallest core economic unit, the SUP model considers a group of farmers which operate a certain acreage or amount of asset (animal) consolidated in a compact unit that ensures economic efficiency as a core development unit.

Based on these considerations, a SUP model consisting of five basic components was developed :

1) First, new or improved technological packages. This technology must be designed for a year-round farming system based on a predominant or main commodity. In a rice field, for example, rice must be the core commodity, but the technology may include rice-fish farming in the wet season and other food crops such as corn or soybean in the dry season.
2) A unit of development must be in accordance with economy of scale principle, to ensure farming efficiency. A unit of rice-based SUP, for example, must cover a compact unit of 500 hectares of rice fields. Since the average land holding size in Java is less than 0.5 hectares, at least 1000 farmers will be involved in a unit development of rice-based SUP model. As another example, a unit of beef fattening SUP must at least cover 200 head of cattle involving about 40 farmers.
3) Introduction of new technological packages is closely guided by a multidisciplinary team, consisting of at least one researcher and two extension workers. The team task is to give intensive guidance to farmers for the application of the introduced technology.
4) Farming practices are entirely conducted by farmers on their own land. Basically, all the

farming practices are performed by farmers and expenditures are borne by them. This full participatory approach by farmers is designed to ensure the sustainability of the program.

5) Implementation of this SUP model must be harmonized or coordinated with other government and non-government organizations, including informal leaders at local level. Since these SUP activities cover the whole system of agribusiness, the activities will involve many local institutions. Accordingly, design and implementation of a SUP in a specific area should be compatible with the existing local development program.

Implementation of SUP model must follow 10 steps in the following order :

1) Identification of prospective commodity, using demand-driven approach.
2) Identification of development units based on agro-ecosystem suitability.
3) Identification of technology availability at agricultural research centers and technology needs for improved farming practices based on agribusiness approach.
4) Adaptation test of agricultural technology in locally specific development areas.
5) Identification of farmer groups and their current farming practices and management.
6) Formulation of agricultural technology packages based on specific commodity and location.
7) Development of priority commodity-based and agribusiness-oriented farming systems.
8) Creation of implementing organization, including a multidisciplinary team of researchers and extension workers.
9) Dissemination of the program to local officials and key farmers, training of staff (trainers) and training of and extension to all farmer participants.
10) Formation of support services, mainly for enhancing farmers' capability and access to economic and social institution services.

The leading institution to implement the assessment of SUP model is the Assessment Institute for Agricultural Technology (AIAT) that operates at regional/provincial levels. These AIATs were established in each province in 1995. Under the direction of AARD, AIATs' main mandate, among others, is to carry out applied research appropriate to the needs of their particular province. AIAT members staff are composed of both agricultural researchers and extension subject matter specialists.

Results of Rice-Based SUP

In the fiscal year 1995/96, the assessment of the rice-based SUP model was undertaken in 14 major rice production provinces, covering 46,000 ha and involving more than 100,000 farmers, including Aceh, North Sumatera, West Sumatera, Lampung, West Java, Central Java, Yogyakarta, East Java, Bali, West Nusa Tenggara, South Sulawesi, Southeast Sulawesi, Central Sulawesi and North Sulawesi.

Based on the principle of economy of scale, the size of each unit in the assessment area consisted of at least 500 ha of irrigated land. Therefore, there were 92 assessment area units. To assess the impact of the model, each assessment unit was divided into two groups of areas in which different technologies were applied. In the first 50 ha, a new technological package was introduced, while improved conventional technology was applied in the other 450 ha. In

this paper, the former will hereafter be referred to as introduced technology and the latter as improved technology.

The package of introduced technology consisted of 5 components :

1) Newly released high-yielding varieties, Memberamo and Cibodas for rice, while for corn Bisma and Wisanggeni and for soybean Pangrango. Other recommended commodities included legumes, onions and red chilli for vegetables and inland water fish. Secondary crops as complementary commodities were mostly planted in season III and fish was cultured in the wet season.
2) Direct seeding system. This was actually the key component which distinguished introduced technology from improved technology. Direct seeding system is a rice planting system without nursery unlike in the conventional system. Direct seeding can be performed either manually or by using a mechanical tool. Land preparation for both methods is basically the same. However, to obtain optimum yield, land preparation should be performed in a proper way. Land which is prepared in a "deep" manner will be conducive to rapid crop growth and will enable to prevent crop collapse during the generative stage. The surface should be flat enough to control the depth of water.
3) Locally specific fertilizer composition. The dosage and fertilizer composition (Urea, TSP and KCL) followed the recommendations based on the results of soil analyses.
4) Introduction of mechanical tools, both for planting (direct seeder) and fertilizer application (fertilizer applicator).
5) A full year-round cropping pattern. Cropping pattern used in different locations varies with local soil structure and agro-climatic conditions. However, the common cropping pattern used in the assessment areas consisted of two rice croppings and one cropping of secondary crops or fish. Some examples are presented in Table 4.

It was expected that the introduced technology would lead to the increase of production, efficiency, cropping intensity, time saving, which in turn would result in the increase of farmers' income and welfare.

It was already mentioned that the participants in the program are guided by a multidisciplinary team. At the initial stage, the team identified the conditions of existing farming systems and the commodities commonly cultivated by the targeted groups. At the operational stage, the team tasks were securing input supply, providing training and improved coordination and cooperation among farmer groups in using mechanical tools and other technologies. At the regional level the training was given to researchers and extension workers from all units of assessment areas to become trainers (training for trainers). The subjects covered during the training were (1) approach of FSD, (2) package of technology, (3) farm management, and (4) farm record keeping (FRK), including computer programing which will be used in the analysis of the FRK. Farmers were also trained by using participatory on-farm method.

As presented in Table 1, the assessment areas in 14 provinces ranged from 1,000 ha in Yogyakarta to 6,000 ha in West Java and East Java. It was also shown that the average cropping intensity was 262% while four of them, namely North Sumatera, Lampung, Yogyakarta and Bali showed a value of 300% and the least was recorded in Southeast Sulawesi with 200%.

Table 1 Acerage and cropping intensity of rice-based SUP, by province, 1995-1996

Province	Acreage (ha)	Cropping intendity (%)
1 Aceh	2,000	295
2 North Sumatera	3,000	300
3 West Sumatera	4,000	278
4 Lampung	4,000	300
5 West Java	6,000	215
6 Central Java	5,000	257
7 Yogyakarta	1,000	300
8 East Java	6,000	295
9 Bali	2,000	300
10 West Nusa Tenggara	2,000	275
11 South Sulawesi	4,000	238
12 Southeast Sulawesi	3,000	210
13 Central Sulawesi	2,000	225
14 North Sulawesi	2,000	205
Total	46,000	262

Source: Adnyana (1997), pp. 32-33.

Table 2 Productivity comparison between New Technology and Improved Technology introduced in the rice-based SUP model

Provinces	Season I (Wet season 1995/96)			Season II (Dry season 1996)		
	New tech. (ton/ha)	Improved tech. (ton/ha)	Difference (%)	New tech. (ton/ha)	Improved tech. (ton/ha)	Difference (%)
1 Aceh	8.04	7.49	7.3	7.25	6.30	15.1
2 West Java	7.25	6.07	19.4	7.39	6.68	10.6
3 Yogyakarta	7.73	6.44	20.0	6.96	6.67	4.3
4 Bali*)	8.60	7.46	15.3	8.00	7.40	8.1
5 South sulawesi	8.55	7.70	11.0	8.24	7.75	6.3

*)Except Bali in season II which used IR-64 for improved technology, for both new and improved technologies use the same rice seed variety, Memberamo was used.
Source: Adnyana (1997), pp. 42-43.

Tables 2, 3 and 4 present some assessment results in five selected provinces i.e. Aceh, West Java, Yogyakarta, Bali and South Sulawesi. Table 2 presents a comparison of productivity between the two technologies in season I (wet season 1995/96) and season II (dry season 1996). In both technologies the same variety, Memberamo, was used indicating that the new technology led to a higher productivity, ranging from 7.3% to 20.0% in season I and from 4.3% to 15.1% in season II.

Table 3 Comparison of benefit and cost between New Technology and Improved Technology in the eice-based SUP model

Provinces	New technology			Improved technology		
	Cost (Rp. 1,000/ha)	Gross income (Rp. 1,000/ha)	Gross B/C	Cost (Rp. 1,000/ha)	Gross income (Rp. 1,000/ha)	Gross B/C
Season I :						
1 Aceh	1,816	3,377	1.86	1,862	3,146	1.69
2 West Java	1,354	2,900	2.14	1,247	2,428	1.94
3 Yogyakarta	1,124	3,094	2.75	1,247	2,640	2.11
4 Bali	1,053	3,354	3.19	980	2,904	2.96
5 South sulawesi	1,120	3,420	3.05	894	3,080	3.45
Season II :						
1 Aceh	1,224	3,045	2.49	1,499	2,646	1.77
2 West Java	1,322	3,210	2.43	1,691	3,247	2.14
3 Yogyakarta	726	2,784	3.84	762	2,680	3.51
4 Bali*)	1,092	3,200	2.93	1,173	3,034	2.58
5 South sulawesi	1,004	3,296	3.28	1,001	3,100	3.09

Exchange rate: Rp. 2,400/US $.
*)Bali in season II, used IR-64 rice variety for improved technology instead of Memberamo.
Source: Adnyana (1997), 42pp.

In terms of income, the new technology gave higher gross profit, except for South Sulawesi in season I. As shown in Table 3, in season I, Gross B/C ratio (benefit/cost ratio) of new technology in Aceh, West Java, Yogyakarta and Bali, respectively was 1.86, 2.14, 2.75 and 3.19 compared to 1.69, 1.94, 2.11 and 2.96 in the case of improved technology. In South Sulawesi the Gross B/C of the new technology was 3.05 compared to 3.45 for the improved technology. In season II the new technology gave a greater Gross B/C in all the selected provinces. As reported by Suryana (1997), direct seeding increases efficiency through the reduction of labor use and cost of planting up to 40-60%, reducing total cost up to 5-10%. In addition to overcoming labor shortage, direct seeding practice and use of fertilizer applicator were more convenient for farmers as they did not have to bend when planting and fertilizer application were conducted.

Data presented in Table 4 show the Gross B/C ratio of a full year cropping system. They also indicate that the new technology leads to higher income, reflected by the higher B /C ratio in the pattern of three rice croppings with the two technologies (RN-RN-RN compared to RI-RI-RI) in Aceh (2.19 compared to 1.79), Yogyakarta (3.00 compared to 2.48) and Bali (3.07 compared to 2.65). Obviously, the one year benefit earned partly depended on the commodity cultivated in season III. It is shown that the pattern in which soybean cultivation was combined with rice cropping involving new technology gave the highest B/C ratio in South Sulawesi (3.24) and Bali (3.06) while in West Java combination with corn (2.72) gave a greater B/C compared to soybean (2.56).

Table 4 One-year round benefit and cost of the rice-based SUP model, by cropping pattern, 1995 - 1996

Provinces	Cropping pattern	Cost (Rp. 1,000/ha)	Gross income (Rp. 1,000/ha)	Gross B/C
1 Aceh	RN-RN-RN	4,191	9,210	2.19
	RI-RI-RI	4,686	8,370	1.79
2 West Java	RN-RN-CO	2,719	7,406	2.72
	RI-RI-SB	2,892	7,406	2.56
	RI-RI-FI	2,684	6,158	2.29
3 Yogyakarta	RN-RN-RN	2,977	8,928	3.00
	RI-RI-RI	3,141	7,794	2.48
4 Bali	RN-RN-RN	3,051	9,362	3.07
	RN-RN-SB	2,729	8,354	3.06
	RI-RI-RI	3,213	8,530	2.65
	RI-RI-PN	3,074	8.788	2.86
5 South sulawesi	RN-RN-SB	2,660	8,616	3.24
	RI-RI-MB	2,472	7.080	2.86

Notes:
RN = Rice with new technology
RI = Rice with improved technology
CO = Corn
FI = Fish
SB = Soybean
PN = Peanut
MB = Mungbean
Rice cropping pattern (3 times) is drawn from five times within two years.
Exchange rate: Rp. 2,400/US $.
Source: Adnyana (1997), p. 45.

Concluding remarks

The rice-based and agribusiness-oriented farming systems (Rice-Based SUP) enable to increase the productivity, farming efficiency, and farmers' income. By using this new approach, the farming system model which covers a larger scale may stimulate rural development. Agribusiness-oriented approach will dynamically improve the rural economy not only in terms of farming activities but also in terms of other highly related activities such as agro-industries and agricultural trade.

Although the coverage of this farming system is large enough, it is still in the stage of assessment/action research. Therefore, implementation over a much wider scale requires further assessment to obtain a more stable outcome, including assessment of the non-rice-based SUP. Nevertheless, some components of the introduced technology, such as new high-yielding varieties and direct seeding method, have spilled widely even to non-cooperator farmers at a faster rate.

This phenomenon suggests that assessment development pattern like the SUP model, in which the socialization is carried out in the initial stage very intensively and is supported by genuine involvement of the local government, might be used as a reference in introducing a

new package of agricultural technology to small-scale farmers. A nation-wide mass program needs a good coordination among all parties (policy makers, operational officers, etc.) involved, both at the national and regional levels. It is not always easy as often every party has different, or even conflicting interests. It was found that a "top-down" bureaucratic approach in the form of direction given by higher level local government officials was effective to initiate a new program introduced to small-scale farmers in a paternalistic type of society.

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