Factors Affecting the farmers to still practicing SRI in Malang Regency, Indonesia

Setiyo Yuli Handono[1]
[1]Department of Socioeconomic,
University of Brawijaya (UB)
Malang City, Indonesia
handono@ub.ac.id
handono1@gmail.com

Abstract— **The objectives of this research is to study the role and function of the SRI project, socioeconomic characteristics and factors affecting the farmers status (still practicing SRI or Non SRI). Descriptive statistics such as mean, frequency, and percentage were used to analysis the socioeconomic characteristics, and agricultural production system of the farmers, and independence tests Chi-Square statistic to analyze the relationship among socioeconomic or other factors that are independent variables and the farmers status that is a dependent variable. The results revealed that there are three roles and functions of the SRI project. First, increasing rice yield, means that practice of SRI on rice farming is able to enhance productivity compared with the conventional method. Second, input saving, minimizing input used, such as water, seeds and others. Third, environment sustainability, practicing this method will help to recover soil fertility, and maintain the sustainability of field production. Concerning the socio-economic characteristics of farmers were male, at an average age of 49 years. Most of the SRI farmers finished secondary school, while nearly half of the Non SRI (N-SRI) farmers finished elementary school. There were also members of an agricultural group. The relationship among socioeconomic or other factors and farmers status revealed that age, size of rice field, labor, single or double seedling, soil organic fertilizer, farmer practices and drought had a significant relationship (P=0.000-0.050) with farmer status (SRI or N-SRI farmers). Meanwhile, the marital status, the level of formal education, main occupation, second occupation, and land holding had no significant relationship with the farmer status.**

Keywords; roles and functions of SRI; socioeconomic Characteristic; factor affecting

I. INTRODUCTION

Rice is the seed of the monocot plants Oryza sativa or Oryza glaberrima. As a cereal grain, it is the most widely consumed staple food for a large part of the world's human population, especially in Indonesia. Rice as a basic commodity for Indonesian people is as a source of energy. The increase in rice production in Indonesia is assumed to have an amount as Indonesian population density for now or in the future. In this case, to increase the rice production the use of science and technology, through research and projects is needed to help maximize the rice production and increase the farmers' welfare.

International Rice Research Institute (IRRI) reported (2007) that Indonesia is the third largest rice producer, and consumer in the world. As compared to other foods and cereals, rice has been the staple food for Indonesian people (above 95%) with 133 kilogram of rice being consumption per person, per year. Regarding this phenomenon, the rice diversification failure is due to the fact that most of the Indonesian people believe that the definition of eating is eating rice, and in spite of carbohydrate needs to meet the energy requirements being fulfilled by eating other sorts of meals, Indonesian people still think they need to eat rice [1].

The Indonesian National Logistic Department (BULOG) supplies 1.5 million tons of rice. Furthermore, in 2010 Bulog imported another 1.5 million tons of rice including 0.8 million tons from Thailand and 0.7 million tons from Vietnam to maintain the national minimum stock of rice (market operation and to alleviate the potential rise of rice commodity in domestic markets [3].

In 2010, rice was mainly grown in an area of 13.12 million hectare, with the average production being 65.98 million tons. In 2010, the Indonesian population was about 237.60 million people [4]. At the current rate of population growth, the Indonesian government should produce more than 100 million tons of rice by 2025 for food commodity. Thus, there is a demand as a challenging task for policy makers, researchers, and other stakeholders, to provide the targeted rice demand.

An agricultural intensification program in farming was started in 1960s, known as the green revolution. In Indonesia, this intensification program was on trial in 1937 before the Indonesian in-dependency. This program was aimed to increase rice production without changing the rural social structure. The basic assumption was that rice crop production should increase. The result of the green revolution was supported by several programs such as; rehabilitation of drainage, financial support programs, and so on [5].

In 1950s, the government efforts to increase rice production was emphasized with the land-crop expansion and the construction of irrigation systems. The expansion of

farming areas was successful due to the conversion of sugar cane areas into rice crop areas. The average rice production in 1956-1960 was approximately two tons per hectare [6].

The Indonesian institution for agricultural research and development is The Indonesian government institution (Department of Agriculture) whose program is to increase rice production, and keep up food security, especially with the use of technological innovation. Dealing with the fact that most of the farming area in Indonesia have been classified as less fertilized lands, an environment friendly technology innovation is badly needed. One of the environment friendly technology innovations is through the System of Rice Intensification (SRI).

The SRI program is an effort to overcome the problems of less fertilized land, and to maximize rice crop productivity. In addition, SRI is a set of farming practices which have been developed continuously based on the principle of the environment friendly act, efficient inputs, and it also aims to produce rice with a large and deep root system that is better at resisting drought, storms and heavy rains. SRI is also to implement the principles of an agricultural system ability, economic, social, and environmental sustainability [7].

This fact certainly attracts critical questions as to what extent SRI contribute to a farmers welfare, and the factor affecting why they not practicing it any longer. This research is important to answer these issues. The following are the research questions of the study.

1. How the role and function of the SRI project?,
2. How the socioeconomic characteristics of the farmers?
3. How the factors affecting the farmers status (still practicing SRI or quit SRI)?

II. OBJECTIVES

The general objective of this study is to examine the contribution of SRI project to the economic aspect of the farmers. The general objective can be broken down to three more specific objectives that would together achieve the overall goal of the research as follows;

1. To study the role and function of the SRI project,
2. To identify the socioeconomic characteristics of farmers
3. To analyze factors affecting the farmers status (still practicing SRI or Non SRI)

III. DATA ANALYSIS

Descriptive Analysis

Descriptive statistics such as mean, frequency, and percentage were used to analysis the socioeconomic characteristics of the farmers. Besides, this study also employed qualitative approach, by which the research that was impossible to get by statistical procedures or by other means of quantifications. It means that this is a descriptive study. It so as this study is intended to know the roles and functions in practicing SRI project.

Quantitative Analysis

Using Chi-Square statistic (χ^2) to analyse the relationship between farmers' socioeconomic characteristics and other factors of SRI Project that are independent variables, and farmer status (SRI farmers and N-SRI farmers) that are dependent variable. χ^2-Statistic can be formulated as follows:

$$\chi^2 = \sum\sum \frac{(Oij - Eij)^2}{Eij} \qquad \text{.....[8]}$$

IV. RESULTS AND DISCUSSION

4.1 The roles and functions of the SRI project

Based on in-depth interviews, it can be concluded that there are three roles and functions of the SRI project, firstly this project played a role as a yield enhancement of rice more than so conventional methods. Secondly, it functions as an input saving, from use water, seeds, and others. Thirdly, it served to realize the sustainable agriculture in order to recover land fertility or to maintain the sustainability of field productivity, since the emphasis of this project use natural pesticides and fertilizers known as environmentally friendly.

4.1.1 Increasing rice yield

The role as the crop yields or rice productivity enhancer is to increase the farmers' incomes. One hectare of land in the SRI project may, on average, result in 7 to 10 tons, even 12 to 14 tons if the land is properly processed. As Rasat (leader of the farmer group) said: 'that practicing of SRI project of rice productivity at average may reach 10 to 14 tons even 15 tons/hectare, where at average this production was 6-8 tons/hectare when applying the traditional method, and other farmers applying the SRI also get benefits'.

The economic calculations of conventional methods, the costs to process one hectare about IDR 6 millions with the rice production about 5 tons rice, and the farmer gets a benefit of about IDR 6.2 millions. If the SRI method is applied, the farmer can get a benefit of about IDR 13.2 millions. Therefore, if rice production is made three times a year, the farmer who practices the SRI method may receive more benefits.

Kunto (Agricultural Extension Officer) also suggested that the SRI project played out as an income enhancer (rice production increases), showing that input efficiency, and supporting a sustainable agriculture (leading to natural or organic agriculture). According to Kunto, this project in Malang Regency is still continued. It has become a priority of the Food Agricultural Department, intended to realize self-sufficiency in rice and granary in Malang Regency.

4.1.2 Input saving

Moreover, the secondary role of the SRI is as an input saving, such as use seeds, water, and chemical fertilizers. In one hectare the seed needed is about 7-10 kg in the SRI method and in traditional methods the seeds needed were 40-60 kg/hectare. It means that the efficiency in seed is more than 70% using the SRI method. Then the use of water is also

more efficient by about 40-50% less than in traditional methods. Efficiency is also reached in the use of chemical fertilizers and pesticides.

Hari statement that the SRI is beneficial since it served as an input saving, from seed, water, chemical fertilizers, pesticides and others, so that a relatively some input may result in a better benefit, compared with a conventional method. It is also get by other farmers applying the SRI that it may save some inputs, and as a result the SRI is also called as "*Sistem Rodok Irit"* or Saving/ Efficient System.

Misiadi stated that the SRI project may save the input from water, seeds, and using chemical fertilizers by more than 20-30%. The saving of water is important because conventional rice farming needs a lot of water, so it may be in conflict among farmers. Whereas, in the SRI, conflicts may be avoided because rice does not consume a lot of water. Seeds could also be saved; Misiadi said that one hectare in this project needed about 5 to 6 kg of seeds because single widely spaced transplanting were 30 x 30 cm and one seed per hole.

4.1.3 Environment sustainability

Moreover, the SRI pattern could also recover the soil fertility and keep the sustainability of field productivity. It means that this pattern served as a sustainable agricultural realizer**,** and the sustainable will be better. This pattern was also environmentally friendly since the minimum use of pesticides, chemical fertilizers, insecticides and various toxics.

Moreover, the SRI project leads to organic agriculture, and to minimalize application of chemical fertilizers and pesticides, and also to optimize bokashi, manures, natural enemies, natural pesticieds and others. Hopefully, the SRI project can make farmers aware of the importance of SRI and realize a environmentally friendly and sustainable agriculture. On the basis of the above discussion, it can be concluded that naturally the roles and functions of the SRI project can run well if applied according to the existing manual. If the SRI project runs well and sustainably is applied, it can be a good economic performance for the farmers.

4.2. Socioeconomic characteristics of the farmers

Socioeconomic characteristics of the farmers (respondents) include gender, age, religion, marital status, education, and numbers of family, main occupation, second occupation, and status of organization, participation and position in the organization. The characteristics of SRI farmers and Q-SRI farmers are presented in Table I.

TABLE I. THE SOCIOECONOMIC CHARACTERISTIC OF THE FARMERS

List	SRI farmers (N=25)	%	N-SRI farmers (N=85)	%
1. Gender				
- Male	25	100.00	85	100.00
2. Age (years)				
- < 30	-	-	3	3.53
- 30 – 45	7	28.00	26	30.59
- 46 – 60	15	60.00	38	44.70
- > 60	3	12.00	18	21.18
3. Religion				
- Muslim	25	100.00	85	100.00
4. Marital status				
- Married	25	100.00	84	98.82
5. Education				
- No school	-	-	1	1.18
- Elementary school	7	28.00	41	48.23
- Junior high school	5	20.00	21	24.71
- Senior high school	11	44.00	17	20.00
- Diploma or university	2	8.00	5	5.88
6. Family members (person)				
< 3	1	4.00	3	3.53
3 – 4	18	72.00	56	65.88
5 – 6	5	20.00	22	25.88
> 6	1	4.00	4	4.71
7. Main occupation				
Rice farmer	21	84.00	71	83.53
Other profession	4	16.00	14	16.47
8. Second occupation				
Rice farmer	4	16.00	14	16.47
Other profession	21	84.00	71	83.53
9. Participation in farmer organization				
- Yes (active)	25	100.00	82	96.47
- No (passive)	-	-	3	3.53
10. Participating organization				
- Farmer group	15	60.00	82	96.47
- Association of farmer group	3	12.00	1	1.18
- Farmer group and association	7	28.00	2	2.35

Table I shows that all the SRI or N-SRI farmers are all male where most ages are 40-60 years old, 60.00% for SRI farmers and 44.70% for N-SRI farmers. Moreover, all respondents are Muslims. Most SRI and N-SRI farmers have family members of 3-4 persons (72.00% and 65.88%).

Concerning with the education level, 44.00% of SRI farmers finished from senior high school and 48.23% of N-SRI farmers finished from elementary schools.

About main occupation, most respondents work in rice farming where 84.00% and 83.53% for SRI and N-SRI

4.3 Factor affecting farmer status (still practicing or Non SRI)

This section focuses on the factors affecting farmer status (still practicing SRI or quit SRI). Table 2 reveals that age, size of rice field, labor, single or double seedling, soil organic content, farmer practice and drought had a significant relationship with farmer status (still practicing or quit SRI). Meanwhile, the marital status, the level of formal education, number of household members, main occupation, secondary occupation, land holding, and the status of farmers joining in organizations had not significant relationship with farmer status. Each factor that has a significant relationship with farmer status is presented in Table II below.

TABLE III. THE RELATIONSHIP BETWEEN SOCIOECONOMIC AND OTHER FACTORS AND FARMER STATUS

Factor	χ^2-Value	P-Value
A. Socioeconomic factors		
1. Age (≤49 year, >49 year)	4.193	0.041*
2. Marital status	0.297	0.586^{NS}
3. The level of formal education (1:1-4, 2:5-7)	3.585	0.058^{NS}
4. Family member (≤4 person, >4 person)	0.406	0.524^{NS}
5. Main occupation (Rice Farmers, Others)	0.003	0.955^{NS}
6. Second occupation (Rice Farmers, Others)	0.003	0.955^{NS}
7. Total land holding (≤0.92 ha, >0.92 ha)	1.279	0.258^{NS}
8. Size of paddy field (≤0.6 ha, >0.6 ha)	4.359	0.037*
9. Status of farmer organization participate	0.606	0.436^{NS}
10. The number of cow (≤3 head, >3 head)	1.090	0.297^{NS}
B. Other factors		
11. Labor requirement (≤233 Man-Day (MD), >233 MD) per hectare	4.396	0.036*
12. Single seedlings (≤2seeds, >2seeds) per hole	104.525	0.000**
13. Soil organic fertilizer (≤ 1 times, >1 times) per season	54.448	0.000**
14. Farmer practice of SRI Project (≤moderate, >moderate)	10.524	0.001**
15. Drought (low, high)	4.352	0.037*

** significantly at α=0.01; * significantly at α=0.05; NS: non significant

farmers, respectively. It difference with second occupation, most respondents work in agricultural sector or other profession where 84.00% for SRI farmers and 83.53% for N-SRI farmers.

The relationship between age and farmer status

There was a relationship between age and farmer status with α = 0.05 level of significance of 0.05 (P = 0.041) (as shown in Table II). Because of the P-value of ≤ α, the alternative hypothesis is accepted, implying that there was a relationship between the two variables.

Based on the empirical result, it was shown that age is one of the factors that made farmers quit using the SRI. Moreover, age also caused some implications for the practice of the SRI. First, in SRI Project (SRI farmers) is more labor intensive than N-SRI farmers, also needs more energy, especially physical and financial resources, from land preparation, planting, weeding and others. It means that the older the farmer, the lower their physical strength. As a result, relatively older farmers tend to quit practicing the SRI.

Secondly, the SRI model is more complicated than a conventional model. Older farmers tend to object to practicing the SRI, and to quit its application. Thirdly, older farmers tend to return to their old culture (conventional model), it is difficult to change their old habits to the SRI project. So that, they tend to quit practicing the SRI project.

The relationship between size of paddy field and farmer status

There was a relationship between the size of paddy field and the farmer status with the significance level of 0.05 (P = 0.037). This showed that there is a significant relationship between the two variables.

The fact that farmers who have paddy fields less than and equal to with 0.6 hectares tended to quit practicing the SRI because they thought such narrow fields would only yield a small income. So, they try to increase incomes by working in another sectors, such as in agricultural sector, coolies, retailer and others.

Whereas, farmers with wide paddy fields more than 0.6 hectare, they get optimum benefits from their fields. They would manage their fields well in order to get the best results. One of their efforts to improve the results is to practice the SRI optimally. So, implementation of SRI will improve their production. While farmers with relatively small paddy fields tended to quit practicing the SRI.

The relationship between the need for labors and farmer status

Statistically, we found that there was relationship between the need for labor and farmer status at significance level of 0.05 (P = 0.036). This result shows that relationship between these two variables was strong.

Based on the results it can be concluded that practicing the SRI method needed more man day because farmers have to spend more money for wages. This means that the total

production cost of rice will increase. It is one of the reasons why farmers quit practicing the SRI.

The relationship between single seedlings and farmer status

Statistically, we found that there was a relationship between single seedlings (planting more than one seeds) and the farmer status at significance level of 0.01 (P = 0.000). It implies that farmers planting single or double seeds were those practicing the SRI, however those who planted more than 2 seeds per hole tended to quit practicing the SRI. Transplanting one seed per hole caused farmers to quit practicing the SRI because it was difficult to do, and needs higher costs and was contrary to their habits.

3.5 The relationship between organic fertilizer materials and farmer status

Statistically, we found that there was a relationship between organic fertilizer materials and farmer status at a significance level of 0.01 (P = 0.000). This result shows that the relationship between these two variables was strong. Cross tabulation of the result is presented in Table 7.

|

Table 8 shows that all of the SRI farmers have relatively high levels of practice in SRI principle were those who were still practicing the SRI. However, 68.2% of the N-SRI farmers with a relatively low level of practice were those who quit practicing the SRI. It implies that the farmers possessing a relatively higher level of practice SRI principles tend to practice the SRI.

Therefore, the practice in SRI principle is one of factors that influenced farmers to continue or quit practicing the SRI. For example, some farmers have understood the SRI principle well or well enough, from land preparation until harvesting, but some of them are still confused about meeting or had difficulties in practicing it. So that, they preferred using old methods and quit practicing the SRI project.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. There are three roles and functions of the SRI project. First, increasing rice yield, means that practice of SRI on rice farming is able to enhance productivity compared with the conventional method. Second, input saving, minimizing input used, such as water, seeds and others. Third, environment sustainability, practicing this method will help to recover soil fertility, and maintain the sustainability of field production.
2. Concerning the socio-economic characteristics of farmers, either SRI or n-SRI farmers, the different percentages are shown on an education level, where most of the SRI farmers (44.00%) finished secondary schools, while most of the n-SRI farmers (48.23%) finished elementary schools. Other characteristics showed almost the same percentage. Based on the result about agricultural production system shows that most farmers owned their own land (49.04% and 69.00% for the SRI and N-SRI farmers, respectively). Furthermore, 65.39% of the SRI farmers and 57.30% of the N-SRI farmers used their land for rice farming. It shows that the most of the farmers have the same tendency to use their land to plant rice.
3. Based on the quantitative analysis using Chi-Square statistic (χ^2) it is shown that age, size of rice field, labor, single or double seedling, soil organic content, farmer practice and drought had a significant relationship with farmer status (still practicing or Non SRI). Meanwhile, the marital status, the level of formal education, number of household members, main occupation, secondary occupation, land holding, and the status of farmers joining in organizations have not significant relationship with farmer status.

RECOMMENDATIONS

1. The policy implication of findings in this study is that government should give support, such as intensive training about principle of SRI (transplanting young seedlings, transplanting the seedlings with a wide spacing, and one or two seeds per hole), simplify access to credit, prevention and treatment of pests and diseases.
2. Government should give support to extension officers do training, counseling for all farmers, specific to farmers, such as; older farmers, farmers who own or have small land areas, farmers who continue low-level practices of SRI and others.
3. Government should develop a policy or promotion of SRI. Incentives for growing SRI project in the form of subsidy for equipment, manure, organic pesticides etc. may help in the promotion of SRI. This policy to improve in SRI project for expanding in area SRI project, and increasing the number of farmers to practice the SRI project.

REFERENCES

[1] Erwidodo. Agricultural Policy Reforms in Indonesia: Accelerating Growth with Equity. http://www.agnet.org/library/eb/434/. 2010

[2] Prabowo, Hermas E. Efforts to Release the Rice Dependencies. (*Upaya Melepaskan Dependensi Beras*), *Kompas (Newspaper in Indonesia)*, Bisnis dan Keuangan. 20 Februari 2007.

[3] Meylinah, Sugiarti and Slette, John. 2011. Rice and Corn Update January 2011. www.gain.fas.usda.gov.

[4] BPS. 2011. http://www.bps.go.id/ (accessed February 8, 2011).

[5] Tjondronegoro, Soediono. The Green Revolution and Social Change in Rural Java (*Revolusi Hijau dan Perubahan Sosial di Pedesaan Jawa*). LP3ES : Jakarta. 1990

[6]Jatileksono, T. Equity Achievement in the Indonesian Rice Economy. Yogyakarta. Gajah Mada University Press. 1987

[7]Anonymous. 2010. http://info.worldbank.org/etools/docs/library/ 245848 / about.html. (accessed February 4, 2011).

[8]Singarimbun, Masri and Effendi, Sofian. Survey Research Methods (*Metode Penelitian Survai*). Jakarta : LP3ES.1989