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**The Efficiency of Paddy Production Factors on Farm Land  
Consolidation in Sukoharjo Regency**

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## **ABSTRACT**

### **Background**

Food has become a serious concern of the government and the public in early 2013. Based on Law No.7 of 1996 concerning Food, food security is defined as the condition of food fulfillment for every household, which is reflected in the availability of sufficient quantity and quality, safe, equitable and affordable food. Food availability is not a single factor that creates food security but also food access and food absorption. If the three indicators of food security namely food availability, food access and absorption are not fulfilled, there will be food insecurity, i.e. a condition where we cannot obtain sufficient food. One of causes of food insecurity is the inefficient use of land and other production factors. Narrow land use cannot be separated from the existing tenure system for farmers, so that this will result in a low productivity.

The current condition of land tenure in rice farming is land ownership is continued to diminish. There is also an agricultural land institution within the land tenure system, where it is included norms and habits that are structured and patterned and practiced continuously to meet the needs of community members that are closely related to the livelihoods of the agricultural sector in the countryside. Narrow land tenure, especially for paddy farmers, needs to be consolidated so that agricultural

businesses can economically meet the minimum scale. (Ekowati and Edy, 2015; Ekowati *et al.*, 2016). Consolidation can takes form of land or business consolidation. Consolidated farming is an effort to manage rice fields in a certain area, managed by several people as managers so that it can technically meet business scale that can provide certain margins to managers and farmers as land owners, farmers get incentives, and can be a provider of labor services. (Rachman, B. *et al.*, 2012). This is important to be able to increase rice productivity and efficiency in allocating the use of production factors. Therefore, studies on the use of production factors in land consolidation need to be carried out.

## **STUDY PURPOSES**

The study purposed to describe the strengthening of institution for field's farmers. and analyze farming efficiency.

## **METHOD OF RESEARCH**

The study was conducted using a survey method to analyze the use of production factors for rice farming. The study location was determined based on the planting potential, rice production, and the existence of land consolidation in Sukoharjo Regency. This research was conducted in Tawangsari and Mojolaban Districts and in Dalangan and Dukuh Villages. *Quota sampling method* is carried out to determine the number of rice farmer samples without calculating the number of population as a sample frame. The number of samples in were is 140 respondents. The analytical method used is descriptive and efficiency analyses.

## **RESULTS AND DISCUSSION**

### **General Description of Research Location**

The population of Dalangan Village is 5,079 people which consisted of 2,571 men and 2,508 women. The population in majority is worked as farmers. Agricultural

sector has an important role in supporting food availability. (BPS, 2017) Thus agricultural productivity, especially rice, becomes the main concern here. This is supported by land consolidation and corporate farming activities.

### **Respondent's Identity**

Respondents of study are included 140 farmers consisting with an average land area of 0.45 ha, 90 farmers registered in the land institution and 50 farmers not registered in the land institution, with an average age of 54.14 years From the illustration, it is known that 80% of farmers are in their productive age, 20% of them are unproductive , and 35% are high school graduates. This indicated that farmers can easily receive information about agricultural land institutions. Thus, institutional dynamics can work well. This is evidenced from farmers who are members of institutional groups that can easily interact with each other and provide benefits for each member. Moreover, it is supported by the length of farming activity of 61% between 11-20 years and length of farming of 22.94 years, 63% of land tenure between 0.25-0.5ha or on average of 0.45ha.

### **Agricultural Land Institution**

The institution of agricultural land conducted in the research area takes form of land consolidation. Land consolidation is an activity that combines social, economic, technological, and value added engineering. Social engineering is conducted by knowing empirically and case studies on the conditions of rural agriculture. Economic engineering is conducted by developing access to capital for procurement of inputs and market access with the intention of providing added value to the activities of rice farming.

Land institution with land consolidation approach as an effort to intensify production which intensively carried out by the government is the institutional development of rice commodities. With these considerations, the experience of

institutional development on rice commodities is the basis for designing the Corporate Farming institution towards small farmer empowerment. Land consolidation aims as a rule on land area and land use planning, especially on agricultural land, as a process for planning the distribution or fragmentation of land ownership into a land regulation pattern suitable for farming activities with infrastructure such as public facilities.

The results of the field study show several reasons why farmers are willing to join the land consolidation institutional program, i.e. can increase production, facilitate farmers in farming, reduce production costs, increase production, and rice fields can be managed together. The farmer's reason or motivation to participate in the program are based on their own will, government programs, and invited by other farmers.

In general, corporate refers to the organic concept of society in which there is no fundamental conflict of interest among various groups, because they are part of the same organ unit (Tupawana and Enoch, 2002). The important rationale of *corporate farming* is to micro-implement the *Economies of scale* principle, i.e. the wider the business management, the more efficient the costs, which includes crop management, production facilities cost, transportation cost, and marketing cost of rice farming. In addition, there are several benefits can be obtained with corporate farming, such as access to information, access to capital, and bargaining position in the market. According to Asmani (2013) and Aprini (2015), the corporate system is the consolidation of farming activities conducted by farmers by applying management principles as a company owned by farmer to achieve effectiveness, efficiency, and sustainability. The corporate farming unites farmer's capital which is managed by planning, organizing, encouraging, and supervising so that there are increases in productivity increases, income, and farmers' welfare. This is consistent with what was suggested by Jin *et al.*, 2017 and Huang *et al.*, 2017 that land consolidation is a way or point of entry into rural development and an important factor to increase productivity, capacity and minimize land conflicts. The land consolidation policy in

China was designed with a purpose to anticipate the loss of agricultural land in order to increase land area and productivity.

## **Farmers Participation in Land Consolidation**

### **1. Dalangan Village**

Farmer's participation in Dalangan Village in Land Consolidation (LC) is begun in 2015. This Land Consolidation is actually a part of the Modern Agriculture Program or often also referred to as Corporate Farming (CF) which was pioneered since 2014. The program implements agricultural mechanization and provides agricultural equipments such as land processing tractors, planting machines, and harvesting machines, also sell rice seeds and organic fertilizer, and provide machine operator. For farmers who have participated since the beginning of the program, they have implemented a modern agricultural program in their 9<sup>th</sup> planting season when the research is conducted.

The socialization of Modern Agriculture Program is carried out through farmer groups, which are members of one Gapoktan, namely Gapoktan Tani Mandiri. In order to support the implementation process, Gapoktan establishes a service unit called UPJA (Equipment and Service Unit) Bagyo Mulyo. UPJA serves two activities, renting agricultural equipment and giving services such as savings and loans.

The basis of land consolidation is the location of the land. Gapoktan chairman Drs Karjono stated that an ideal land consolidation unit would cover 100 hectares of rice fields. The total land area of all Gapoktan members is around 170 Ha. At this time, due to several shortcomings, especially equipment, Gapoktan was only able to organize a consolidation of 70 Ha of rice fields from a total of 100 farmers.

## 2. **Dukuh Village**

Dukuh Village, Mojolaban District is geographically closer to the center of Sukoharjo Regency than Dalangan Village. This village, through Gapoktan Tunas Harapan, also provides modern agricultural facilities such as tractors, power thresher, rice seeds, and chemical fertilizers. Unlike in Dalangan Village, land consolidation has not been fully implemented in Dukuh Village. Most farmers did not even know what and how the land consolidation system was organized.

Since 2015, farmers can borrow agricultural equipment in the form of tractors and power thresher to UPJA Gapoktan at an agreed rental price. This modern agricultural program is socialized through groups by local agricultural counseling personnel. Gapoktan in this village hold regular meetings every month. Through this Gapoktan meeting, the socialization of modern agriculture implementation was informed to members. Each member of the farmer group has the opportunity to use facilities in the form of borrowing agricultural equipment and purchasing production facilities, such as seeds and fertilizer.

Some sources, especially the Gapoktan officials, are aware on the advantages of implementing land consolidation. However, according to them, the concept of land consolidation is difficult to implement in this village for two reasons. First, it is regarding to the very narrow land ownership by farmers in this village, thus to collect an ideal stretch of land for 100 hectares will involve many farmers with different aspirations. Secondly, this is because there are many farmers in this village whose statuses are land cultivators only, the actual landowners are outside the village. This condition complicates the coordination of the implementation of land consolidation.

Members of this group join the modern agricultural program for several reasons, the main reasons are because they have more efficient farming expectations, the results will be better, and reduce costs due to Gapoktan coordination. Another reason is because they participate like other members, so they can learn to solve the problems they face.

Group members can use the equipment provided by Input Division in the Gapoktan. Regarding to this, there are only tractors and power thresher available, while the planting machine has not been provided because it is more difficult to implement related to more specific seed sowing methods. Seed requirements can also be fulfilled by Gapoktan because the Gapoktan chairman now is also a seed breeder. Farmers are free to choose seeds, including those from Gapoktan which consist of Gapoktan seeds and those that personally supplied by the group leader.

Both of Gapoktans have different focus to increase the capability of group. This mean that role of Gapoktan is the same in term of production, productivity, income by approaching the technology. That point met to Nuryanti and Swastika, 2011 that farmer's Group has Role to implement the agricultural technology and Deininger, 2014.

### **Rice Farming Production and Revenue**

Rice farming production collected by farmers who are members of institutional and non-institutional approaches shows different results. It is known from the results of rice farming production for a seasons that there are differences in operating costs, production, and income. The difference is IDR 170,844.9, - for cost and 763.6 kg / ha / season for production or 2.29 tons / ha / 3 planting seasons. The income of farmers who are members of agricultural institutions is greater than the income of those who are not registered in the farmer institutions, i.e. IDR. 31.563.645,34 / ha / season and Rp. 28.326.960,63 / ha / season. The income difference is IDR. 3.236.684,71 / ha / season. While the land tenure of farmers who are members of Land Consolidation is 0.46 ha and 0.416 ha for members of Non-Land Consolidation. The generated income based on their respective land tenure is IDR. 14,203,640.40 / season and IDR. 11,784,015.62 / season and there is a difference of IDR 2,419,624.78 / season.

Table 1. Rice Farming Analysis between Land Institution and Non-Land Institution of Farmers

No.	Information	Land Institution		Non-Land Institution	
		Total	IDR/ha	Total	IDR/ha
I	Fixed Cost				
	- Depreciation	143,936.72		135,551.70	
	- Water fee	84,564.49		347,739.29	
	- Land rent	1,046,679.00		1,334,272.00	
	- Tax	153,043.80		31,505.53	
	Variable Cost				
	- Seed	42.82	453,28.01	40,31	402,116.40
	- Urea Fertilizer	190.81	362,536.10	170,89	333,872.10
	- SP3 Fertilizer	163.74	344,429.70	158,59	322,977.39
	- NPK Fertilizer	215.08	510,084.20	218,90	459,398.75
	- Manure	133.42	76,792.59	89,56	54,098.12
	- Herbicide		27,071.46		50,076.96
	- Pesticide		622,405.00		550,452.10
	- Labor force		3,734,805.00		3,708,261.18
	Total Expenditure		7,559,476.66		7,730,321.56
II	Revenue	9,743.90	39,123,122.38	8,980.33	36,057,282.19
	Grain price per kg :				
	- IDR 4,015.14/kg				
III	Income (IDR)		31,563,645.34		28,326,960.63
IV	Profitability (%)		417.54		366.44

Source: Primary Data.

Seed extraction, planting, and harvesting are activities where groups of farmers who are members of the institution can save operational costs. This happens because the institutional management has used equipment for planting and harvesting activities, so that it can save costs as well as trays used for hatchery that do not require cost for the seed extraction.

### Efficiency Analysis on the Use of Production Factors

Efficiency is a concept that explains the extent to which the production factors used in a production process can give maximum benefits (physical products or profits). In the agricultural context, efficiency is a concept that shows the

effectiveness level of production factors such as land, labor, and other production factors used in farming.

*Return To Scale* (RTS) was used to determine whether the farming activities experience increasing, constant, or decreasing return to scale rules. The RTS value is obtained by summing up all the regression coefficient values from the input variables used.

Table 2. *Return to Scale* of Rice Farming registered in Land Institution and Non-Land Institution

Production Factors	Regression Coefficients	
	Land Institution	Non-Land Institution
Land area	0.413	0.251
Seed	0.193	0.233
Urea Fertilizer	0.141	0.145
SP36 Fertilizer	0.116	0.141
NPK Fertilizer	0.157	0.128
Manure	0.071	0.168
Herbicide	0.067	0.124
Pesticide	0.062	0.094
Labor force	0.084	0.105
Total	1.304	1.385

Based on Table 2, it can be seen that the sum of regression coefficients of the variables in rice farming in Land Institution and Non-land Institution is greater than 1. This shows that rice farming in Sukoharjo Regency, especially in Tawangsari and Mojolaban Districts follows the rules of *increasing return to scale*, meaning that any additional production factors will increase the production of rice farming in the long term. Therefore, it is necessary to make business expansion to reduce the average farm costs so as to increase the farmer's income.

Efficiency illustrates the use of several inputs to generate products that can provide maximum benefits. The study results on rice farming efficiency are presented in Table 3 and Table 4.

Table 3. Efficiency of the Use of Production Factors in Rice Farming of Farmer's Land Institution

Production Factors	Average Input	Reg Coeff	PMXi	NPMXi	Input Price	Efficiency
Land area	0.46	0.41	1,815.82	7,444,875.67	3,000,000	1.28
Seeds	19.77	0.19	848.55	3,479,082.33	1,2500	2.78
Urea fertilizer	88.11	0.14	619.93	254,1713	1,900	1.33
SP3 fertilizer	75.61	0.12	510.01	2,091,054.67	2,100	9.95
NPK fertilizer	99.32	0.15	690.27	2,830,134.33	2,300	1.23
Manure	61.61	0.07	312.16	1,279,869.67	325	3.94
Herbicide	0.23	0.07	294.57	1,207,764.33	16,500	7.32
Pesticide	544.01	0.06	272.59	1,117,632.67	450	2.48
Labor force	23.13	0.08	369.32	1,514,212	50,000	3.03
Production (kg)	4,396.667					
Grain price (IDR)	4,100					

Table 4. Efficiency of the Use of Production Factors in Rice Farming of Farmer's Non-Land Institution

Production Factors	Average Input	Reg Coeff	PMXi	NPMXi	Input Price	Efficiency
Land area	0.42	0.25	1023.07	4,194,611.60	3,000,000	1.39
Seeds	16.76	0.23	955.30	389,3802.80	12,500	3.11
Urea fertilizer	71.06	0.14	591.02	240.8997,52	1,900	1.26
SP3 fertilizer	65.94	0.14	574.72	2,342,542.42	2,100	1.11
NPK fertilizer	91.02	0.13	521.73	2,126,563.33	2,300	9.24
Manure	37.24	0.17	684.77	2,791,114.37	325	8.58
Herbicide	0.418	0.12	505.42	2,060,108.22	16,500	1.24
Pesticide	430.1	0.09	366.84	1,495,239.84	450	3.32
Labor force	18.93	0.11	427.98	1,744,446.48	50,000	3.48
Production (kg)	4,076					
Grain price (IDR)	4,100					

Based on the results of efficiency analysis, it is known that the use of land area, seeds, urea fertilizer, SP36 fertilizer, NPK fertilizer, manure, herbicides, pesticides, and labor force has an economic efficiency value greater than 1, both for farmers who are members of the Land Institution and those who are non-members,

which means that the use of production factors is not efficient yet. Thus, the use of these input factors can still be added to increase production.

## **CONCLUSION**

The results of research on agricultural land institution are concluded as follows:

1. The implementation of farmer land institution program through land consolidation can answer the limitations of land, labor, as well as management of production factors can be more easily implemented.
2. Farmers in Dukuh Village of Mojolaban District have not fully implement the land consolidation institutional system.
3. The implementation of Farmers' Land Institution program results in a production increase of 763,9 kg (7.84%) and an income difference of IDR. 3,236,684.71/ha/ season.
4. The utilization of agricultural equipments can provide employment opportunities for housewives in terms of rice seeding.
5. Production factors of land area, seeds, urea fertilizer, SP36 fertilizer, NPK fertilizer, manure, herbicide, pesticide, and labor have not effiecient yet.

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