ORGANIC FERTILIZER UTILIZATION AND ITS POTENTIAL AMOUNT IN NGAWI REGENCY, INDONESIA

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1. BACKGROUND

Recently, the amount of chemical fertilizer applied to farmlands increase to obtain the high yield of rice in Indonesia. Continuous chemical fertilizer application on farmlands causes a shortage of organic matter, micronutrient contents and population of microorganisms in soil. However, because of lack of resources, less organic fertilizer is applied on farm lands. In order to keep the high crop productivity, the increase of organic fertilizer utilization is demanded.

In this study, the amount of organic and chemical fertilizer used in Ngawi, Indonesia, was investigated. And factors affecting the utilization of organic fertilizer were identified from the questionnaire survey. Finally the recommendation to increase organic fertilizer utilization was discussed.

2. METHOD

Ngawi regency, Indonesia, was selected as a study area. It is located on the west side of East Java Province and adjacent to Central Java Province including 19 sub regencies. Its agricultural land occupies 40% of the total area and rice is the major agricultural production.

Questionnaire survey was conducted on September 2013. A number of respondents is 250 by random sampling from 19 sub regencies. Respondent characteristics such as sex, age, farming experience (years of farmer in doing crop cultivation), formal education (in school or college), non-formal education (such as a training program to learn agriculture new technology held by government), rice field area, income, distance to rice field (the distance of respondents' house to their rice field) and farm unit (the distance of respondents' house to shop that sells agricultural input such as fertilizer), membership in farmer group (consist of farmers living in a same village, and holds a group meeting periodically), and application levels of chemical and organic fertilizer were asked. Secondary data such as a number of population, recommended fertilizer application levels, crops cultivated, population number of animals raised, and waste generation were collected from the Agricultural Food Crop and Horticulture Agency, The Agency of Statistic, and The Agency of Public Works of Ngawi Regency, and The Ministry of Environment, Indonesia.

3. RESULT OF QUESTIONNAIRE SURVEY

Table 1 shows the average amount of chemical and organic fertilizers used for rice cultivation. All respondents use chemical fertilizers for rice production. The higher amounts of chemical fertilizer were used compared to the recommended amounts suggested by the government of Ngawi regency. On the contrary, respondents use smaller amount of organic fertilizer compared to the recommended amount. The percentage of respondents who use organic fertilizer was 58%.

Fig 1 shows that respondents who have higher rice field area apply more amount of organic fertilizer. Usually the large rice field areas are located on lowlands and the smaller rice field areas are located on uplands. As shown in Fig 2, respondents in uplands use smaller amount of organic fertilizer compared to who in lowlands. The farmers in uplands have smaller and larger number of terraces compared to in lowlands areas. The farmers in uplands could not afford to apply the organic fertilizer on the small terraces due to requirement of additional work. Further investigation is necessary to provide a concreate reason.

Fig 3 shows the relationship between the distance from the respondent's houses to their rice field and organic fertilizer application level. It was found that no relationship.

Fig 4 shows the relationship between formal education level of respondents and organic fertilizer application level. The farmers who

in rice cultivation Average Government Kind of amount recommendation fertilizer (kg/ha) (kg/ha) Chemical - Urea 342 150 - ZA 117 100 - SP36 81

331

- NPK

Table 1. Fertilizer application level



300

Figure 1. Relationship between organic fertilizer application level and rice field area



Figure 2. Difference of organic fertilizer application level on location of farm land



Figure 3. Relationship between organic fertilizer application level and distance to rice field



Figure 4. Difference of organic fertilizer application level on formal education level

have higher education are using larger amount of organic fertilizer.

High educated farmers might realize the importance of the organic fertilizer application for the improvement of soil conditions and continuous rice productions.

Fig 5 shows the difference of organic fertilizer application level between respondents who have a non-formal education or not. The respondents who have an information from the program are using higher amount of organic fertilizer (386 kg/ha) compared to who do not have the program (306 kg/ha). In the program, farmers can learn the value of organic fertilizer for the rice yield improvement.

As shown in Fig 6, respondents who are the members of farmer groups use larger amount of organic fertilizer (393 kg/ha) compared to who are not the member of farmer group (198 kg/ha). The members of farmer group learn about current agricultural technologies presented by the agricultural extension officers in the farmer group meeting.

To increase the application level of organic fertilizer on rice field, the importance and application method of organic fertilizer to improve the rice productivity through the non-formal education and the farmer group meeting is required.

4. ESTIMATION OF POTENTIAL AMOUNT OF ORGANIC FERTILIZER

The potential demand and supply of organic fertilizer in Ngawi was calculated. For the estimation, animal manure, municipal solid waste (MSW), crop residue such rice straw, and human excreta were considered as a source of organic fertilizer. The value used for the estimation is shown by Table 2 and 3. The weight









loss of material during composting process (51%) was also considered¹). In 2011, total population of Ngawi was 911,911 heads. Crop harvested at the same year was 154,600 ha. Also, it was reported that organic fraction in MSW was 48.9%.

Table 2 shows the potential amount of organic fertilizer from animal manure. About 182,000 t was estimated as the potential amount of organic fertilizer. If all rice farmers in Ngawi follow recommended value of organic fertilizer (2000 kg/ha), the potential demand would be about 309,000 t in 2011. Consequently, there is a 127,000 t of shortage from supply quantity of organic fertilizer produced from only animal manure.

Table 3 shows the estimated potential production of organic fertilizer from other organic sources. The total amount of potential organic fertilizer was 573,000 t and this amount was larger than the demand of organic fertilizer as shown above. Because Ngawi is the center of rice production in East Java Province, the first priority would be rice straw as source of organic fertilizer.

5. CONCLUSION

Rice field area, distance, formal and non-formal education, and membership of farmer group influenced the organic fertilizer application level on rice field. In order to increase organic fertilizer utilization, the education for farmers through non-formal education program and the farmer group meeting was important. It was found that organic fertilizer application levels were lower than recommendation value. However, there was a difference between potential supply and demand of organic fertilizer in Ngawi. Rice straw could be the best source for organic fertilizer.

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from animal manure 2011				
Source	Manure	Population	Potential	
	production	number	of organic	
	(wet kg/head/day)	in 2011 (heads)	fertilizer (t)	
Cow	7 ²⁾	101,047	131,000	
Goat	0.67 ³⁾	73,679	8,600	
Sheep	0.67	30,984	3,600	
Chicken	$0.2^{4)}$	1,040,974	38,800	
Total			182,000	

Table 3. Potential of organic fertilizer from MSW,

human excreta, and rice straw 2011

Source	Waste generation	Potential of organic fertilizer (t)
MSW in total	0.8 kg/day	66,000
Human excreta	1135 g/day ⁵⁾	192,000
Rice straw	4 t/ha (dried form) ⁶⁾	315,000