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THE IMPACT OF AGRICULTURAL MACHINERY EQUIPMENT ON RICE FARMING IN EAST JAVA IN EFFORT TO SCARCITY OF THE LABOR

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ABSTRACT
Although the agricultural sector is the main sector of absorber labor, but now the agricultural sector have labor problems. Agricultural labor is limited in number and there is a phenomenon of scarcity of labor. To overcome these problems, one of the ways that the government has done is to allocate agricultural machinery to farmer groups. This study aimed at identifying farm machinery (alsintan), primarily planting tools (transplants) and harvesters (combine harvester) that have been applied to rice farming in East Java; to know the impact of the use of these two agricultural machinery in rice farming; as well as the option of agricultural mechanization policy in East Java, was conducted from April to November 2015. The research was conducted using survey method with qualitative and quantitative approach. The results showed that two brands of transplants used by farmers in East Java, Yanmar and Kubota were identified. As for the combine harvester identified 3 brands, namely Quick, Crown and Futata. The use of alsintan (transplanter and combine harvester) in rice farming can accelerate and efficient the process and reduce production cost. In addition, the use of these two alsintan in rice farming in East Java can be used as a solution to overcome the scarcity of agricultural labor. In order to optimize that allocated for farmer groups, need for guidance and structuring of the Services Unit of Alsintan (UPJA) in farmer groups, considering the future of prospective alsintan services as a profitable commercial business.

KEY WORDS
Agricultural mechanization, alsintan, farming, rice, policy options.

In Indonesia, the agricultural sector is the main sector of absorbing labor. According to Dewi (2016) agricultural sector contribution to the absorption of labor is quite large, that is 62.48%. Labor is an important factor in determining the success of farmer in the implementation of farming. Many factors influence farmers' interest in the agricultural sector. Panurat (2014) from the results of his research concluded that the factors that affect farmers' interest in agricultural sector are land area, experience, income, aid and education. Furthermore, it is stated that the labor in agricultural sector has characteristics that are very different from those of other sector other than agriculture.

The agricultural sector currently have considerable problems, namely the scarcity of labor and the declining interest of young people in the agricultural sector. From various sources of data obtained picture that every year less than 270 thousand farm families switch professions in non-agricultural (Anonimous, 2014). In rice farming, scarcity of labor resulted in the retreat of planting, thus affecting plant growth and product quality (Suratiyah, 2009). The same thing was stated by Ahmad and Haryono (2007) that the limited of labor when planting rice seedlings causes the planting schedule to be not simultaneously affecting the decrease of rice production. How important the existence of labor to agricultural production sector. Putra and Nasir (2015) from the results of his research concluded that in addition to planting area variable, other factors that affect the high level of agricultural production in Aceh Province is labor. Until now, the study of agricultural mechanization to resolve the deficiency of labor in rice farming is still scarce. One of strategy to overcome the threat of scarcity of labor in agriculture is the application of agricultural mechanization (Agricultural Research Agency, 2016). A thorough review of the contribution of mechanization in overcoming the scarcity of labor is urgently needed to be an input for policy makers and

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feedback for practitioners and mechanization researchers (Agricultural Research Agency, 1981 and Simatupang, 2003).

From 2009 to 2016, East Java Province has received a variety of agricultural machinery tools from the Ministry of Agriculture that are allocated to farmer groups. Among agricultural machine tools allocated to farmer groups in East Java are 7606 unit of hand tractors, 782 units of transplanters, and 1161 units of small and medium combine harvester. Need to do assessment to know existence of machine tool of agriculture to rice farming in East Java.

Objectives: (a) Identifying agricultural machine tools, especially the transplanter and harvesters that have been applied to rice farming in East Java; (b) Knowing the impact of agricultural machine tools on rice farming in East Java; (c) Formulate agriculture mechanization policy options in East Java.

METHODS OF RESEARCH

The research was conducted from April to November 2015. The sample of research location was conducted in Gresik, Lamongan, Ngawi, Tulungagung. Consideration of research location, besides rice production center, research location districts also potency of scarcity of agricultural labor and number of allocation of alsintan. The research was conducted using survey method with qualitative and quantitative approach. Primary data was obtained from direct interviews to repondents represent of farmer groups and agricultural machinery service providers. Secondary data is obtained through data / reports of relevant agencies and written data in the field. To identify farming machine tool and its application on rice farming, interview to farmer group determined by purposive sampling with criterion of group of receiver of agriculture machine tool and machine tool user of farm at rice farming (Notoatmodjo, 2010 and Sugiyono, 2010). While the survey for agricultural machine tool providers is conducted on individuals who are determined by purposive sampling according to Sugiyono (2010) and Notoatmodjo (2010) with the criteria concerned have own agricultural machine tools and serve the use of agricultural machine tools.

In order to formulate agriculture mechanization policy options in East Java, Focus Grup Discussion (FGD) were conducted at the provincial level. FGD participants included farmer groups / farmer group associations using agricultural machinery tools, researchers, extension workers, agricultural machinery service entrepreneurs, agricultural departement.

The analysis used in this research are descriptive analysis, cost and benefit / impact analysis, and synthesis on the results of previous research.

RESULTS AND DISCUSSION

Characteristics of Respondentsю Respondents who became the object in this study were farmers who were collected in farmer groups and agricultural services providers, all 15 people with details of 60% of farmers of alsintan users and 40% of alsintan services provider (Table 1).

Table 1 – Characteristics of respondents

No.	Description	Percentage (%)	Information
1.	Farmer	60	- His status as Chairman of the Group - His status as a member of the group - Alsintan users
2.	Alsintan service provider	40	- Alsintan by own - Serving the use of alsintan services to the farmers

From the interview results it is known that the farmers of respondents generally feel having experience and sufficient ability in operationalizing the soil cultivator, the two-wheel tractor. The reason that this farming tool has been known to farmers long ago. However, generally farmers feel that their experience using planting machine tools (transplants) and

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harvesting tools (combine harvester) is still limited. Farmers' experience using both alsintan, generally only 1-2 times rice planting season. Respondents farmer rated their lack of experience in operationalizing the two machines because they are generally new to both devices in the last 3 years. Moreover, the aid of transplanter machines and combine harvester from the government is allocated to farmer groups rather than individual farmers. According to the assessment of the farmers of the respondents, allocation of alsintan assistance to the group needs to be followed by the training of operational equipment as well as the arrangement of the existing Service Unit of Alsintan (UPJA) in the group. In this way, the farmers of the respondents had confidence that the device given by the government to the group would be beneficial for the group to improve their farming performance. Farmers of respondents expect that allocation of alsintan to farmers or groups is increasing or UPJA or service provider business of alsintan is growing. Farmers of respondents believe that the use of alsintan is one way to get efficiency and effectiveness rice farming, which is also believed to increase revenue.

The results of interviews at the service provider of alsintan, obtained a picture that the business of agriculture providers in the future is quite promising. Alsintan service providers, generally judge that now and future alsintan is a necessity for farmers to increase farm income him. Especially supported by the fact that at this time to get labor in land, planting and harvesting farmers have difficulty. Although the government has provided alsintan assistance, the alsintan services provider still believes that its business will still be needed by farmers. Considering that the allocation of agricultural equipment from the government is only allocated to farmer groups and also the existence of food self-sufficiency program through UPSUS Pajale activities that encourage farmers to farm rice effectively and efficiently. To realize an efficient and effective rice farming system one of the keys using of alsintan.

The results based on interviews to farmers and alsintan service providers, indicate that currently agricultural sector has undergone transformation and modernization. Verma and Tripathi (2016) suggest that agricultural mechanization is an important element in the transformation and modernization of agricultural system. While Mehta et al. (2014) revealed that mechanization plays an important and key role to improving and increasing agricultural production, especially in developing countries.

Planting Equipment Performance and Its Impact on Rice Farming. The results of identification indicate that rice planting equipment (transplanter) circulating in East Java mostly branded YANMAR and KUBOTA. YANMAR transplanter is commonly used in Gresik area. One of the farmer groups that use it is Bangeran Farmer Group in Bangeran Village, Dukun Sub-district, Gresik District. Based on the interviews, the YANMAR transplanter can complete the planting with 1 hectare area with the period of 6.5 - 7.0 hours. One day can only work on 1 ha of land. The advantages of this planting tool is can be set planting. Operation of this planting equipment requires 2 operators. Problems in the field are encountered: (a) the operators are still limited, (b) the farmers do not want to make their own "dapok" breeding, they can make groups. Land area of 100 ha group, if simultaneous planting must be done at least within 3 weeks (21 days), so 1 unit of transplanter can only serve 21 ha. To fulfill all group land, so 4 transplants are needed. The use of YANMAR transplanters for rice planting is cheaper than conventional methods using human labor (Table 2).

KUBOTA transplanters are commonly used by farmers in Lamongan. One of the uses of this planting tool is a farmer group in the Village Gempoltukmloko, Sarirejo sub-district, Lamongan District. From the interviews it was found that the division of planting wages using tools was: 40% for operators, 30% for operations (seeds, oil, fuel oil), 10% for groups and 20% for maintenance. According to farmers the production is higher than the manual way, because rice plants are not stagnant, seeds stuck shallow.

Based on Tables 2 and 3, it is illustrated that the use of transplanter planting tools in addition to saving time, also saves costs. This fact is in line with Sahara et al. (2013) which suggests that rice farming by using planting machine to move rice seedlings (Rice Transplanter) can the efficiency of working time and can save the cost of planting more than

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Rp 1.5 million. While Harnel (2012) from the results of his research concluded that the use of rice transplants can reduce the cost of planting up to 49.7%. The results of this study indicate that the use of planting machinery (transplanter) provides the efficiency of rice farming by reducing the cost of planting a range of Rp 2 - Rp 6 million or can reduce the cost of planting more than 50%. A transplanter is a planter of seeds with the number, depth, spacing and uniform planting conditions. The use of transplanter as a means of planting rice seedlings is expected to reduce the time and cost required, work capacity becomes higher and farmer income increases. Due to its small and light construction, the transplanter is well suited to wetland conditions in Indonesia that generally have small plots and land ownership structures (Harnel, 2012).

Table 2 – Comparison of Planting Costs with "Yanmar" Transplanters and Ways Conventional per Ha in Bangeran Village, Dukun Sub-district, Gresik District

No	Description	Transplanter (Yanmar)		Conventional		Information
		Physical	Valur (Rp)	Physical	Value (Rp)	
1	Rent a nursery for 1 ha	-	-	1 ha	350,000	-
2	Purchase of seeds	28 kg	700,000	50 kg	400,000	-
	-Seedling / seedling treatment	-	-	3 OH	300,000	-
	-Unplug the seeds	-	-	14 OH	1,400,000	-
4	Purchase of fuel	5.5 litre	45,000	-	-	-
5	Planting costs	-	1,050,000	31.5 OH	1,575,000	60% for group, 40% for operator
6	Embroidered cropping edge	2 OH	100,000	-	-	-
7	The amount of costs	-	1,895,000	-	4,025,000	-
8	Cost Difference	-	-	-	2,130,000	-

Table 3 – Comparison of Planting Costs with Kubota Transplanters and Conventional Ways per Hectares in Gempoltukmloko Village, Sarirejo Sub-district, Lamongan District

No	Description	Transplanter (KUBOTA)		Conventional		Information
		Physical	Value (Rp)	Physical	Value (Rp)	-
1	Rent a place and nursery	-	-	1 ha	1,900,000	-
2	Unplug the seeds /daut	-	-	20 OH	2,400,000	-
3	Purchase of fuel oil	5.5 litre	45,000	-	-	-
4	Planting costs	-	2,100,000	40 OH woman	4,000,000	40% for operator, 30% for operational costs, 10% for groups, 20% for equipment maintenance costs
5	Embroidered cropping edge	2 OH	100,000	-	-	-
6	The amount of costs	-	2,245,000	-	8,300,000	-
7	Cost Difference	-	-	-	6,055,000	-

Cropping is an important activity in rice cultivation that requires about 25% of labor (Umar et al., 2017). The use of transplanter in addition to saving planting time, is also able to reduce manpower manually. Suhendrata (2013) from the results obtained data that rice planting by using transplanter, in addition to increasing rice income of Rp. 2,690,000, -, can also save the planting labor ranges 70-80%, where manually planting requires 10-15 people labor by using a transplanter only required 3 people labor.

Performance of Harvest Equipment and Its Impact on Rice Farmingю The results of identification indicate that crop harvesting tool (combine harvester) circulating in East Java there are three brands, namely QUICK, CROWN and FUTATA. Small-size rice harvest tools Quick brand are used by farmers and alsintan services provide in Gresik and Ngawi. One of the farmer groups that have used it is farmers' groups in Keniten Village, Geneng Sub-district, Ngawi District. The results of interviews with farmers of respondents obtained information that this rice harvest tool has several advantages, such as in one day can

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harvest rice with 0.7 ha area and within 3 weeks able to harvest rice with 15 ha area. The use of fuel oil relatively economical, ie 10 litres per day. The use of Quick harvester combine for rice harvest in Keniten Village, Geneng Sub-district, Ngawi District can save farmers spend more than Rp 1 million (Table 4).

Table 4 – Cost Comparison of Rice Harvest with Mini Combine Harvester QUICK and Conventional Ways per Ha in Keniten Village, Geneng Sub-district, Ngawi District

No	Description	Mini Combine		Conventional		Information
	-	Physical	Value (Rp)	Physical	Value (Rp)	-
1	Harvest fare		1,575,000			50% for group and 50% for operator
2	Harvesters (male and female)	-	-	14 OH, 14 OH	2,240,000	-
3	Power thresher and equipment rental	-	-	-	700,000	-
4	The amount of costs	-	1,575,000	-	2,940,000	-
5	Cost difference	-	-	-	1,365,000	-

In addition to the Quick brand harvest tools, farmers in the Ngawi region have also used Crown brand harvest tools. One of the groups using Crown brand harvest tools is farmer group in Geneng Village, Geneng Sub-district, Ngawi District. Results of interviews with farmers respondents obtained a picture that the performance of this harvest tool better than similar tools Quick brand. This Chinese-made rice harvesting tool is able to harvest 1 hectare of rice within 3 hours. In 1 day able to harvest maximum 3 ha. The use of Crown combine harvester for rice harvest in Geneng Village, Geneng Sub-district, can save farmers more than Rp 2 million (Table 5).

Table 5 – Comparison of Harvest Costs with Combine Harvester Crown and Conventional Ways per Ha in Geneng Village, Geneng Sub-district, Ngawi

No	Description	Combine Harvester		Conventional		Information
		Physical	Value (Rp)	Physical	Value (Rp)	
1	Harvest fare	-	3,200,000	-	-	40% for Combined farmer groups, 40% of workers, 20% care
2	Harvest Cost (9 tons of grain yield)	-	-	-	5,500,000	Profit sharing 1:8
3	Meal allowance	-	-	-	180,000	-
4	Difference of yield	2 kg/ku	-			-
5	Difference of losses	1.5 ku/ha	-			-
6	Difference in selling price	Rp 1000/ku	-	-	-	-
5	Difference between crop costs	-	-	-	2,480,000	-

The other combine harvester found in the research location is a combine harvester Futata brand. This tool can be found in Pakel Village, Ngantru Sub-district, Tulungagung District and Gandekan Village, Wonodadi sub-district, Blitar District. The results of interviews with farmers of respondents harvest equipment users, obtained a picture that the ability of harvesting tools in 2 hours can only harvest 1,400 m2 and spend 2 litres of diesel. In one day the tool is only able to harvest 0.5 ha. Each 1,400 m^2 if harvest using combine harvester is only Rp 350.000, - plus the cost of transporting 2 people to the road (Rp 50,000, -), whereas if using conventional method cost Rp 500,000, - plus the transporter 4-5 people (2 day). The use of Futata's combine harvester in Pakel Village, Ngantru Sub-district, Tulungagung District can save harvest cost more than Rp 1 million (Table 6).

Based on tables 4, 5 and 6, it is illustrated that the use of a harvester (combine harvester) does not only save the costs incurred by farmers for harvesting but also saves

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harvest time and harvest labor. As with planting activities, harvesting is one of the activities of rice cultivation that requires a lot of manpower. Sudalmi (2009) suggested that for rice harvesting manually requires a lot of manpower, ranging from 20-22 people. While using combine harvester for rice harvesting only requires labor range of 3 people. Similarly, the use of transplanters for rice planting requires only 1-2 people. This fact shows that the application of agricultural tools and machinery (alsintan) in rice farming can be used as a solution to the scarcity of agricultural labor. Unadi and Suparlan (2011) stated that in addition to resolve the increasingly scarcity of agricultural labor, agricultural tools and machinery serves to improve labor productivity, improve farming efficiency through energy savings, time and cost of production and save the quality of agricultural products. The same thing was forward by Subagiyo (2016) from the results of his research concluded that alsintan is a necessity for farmers to manage their farming, ranging from hand tractor, power thresher, and other alsintan. Because the use of alsintan can provide benefits in the form of labor cost savings, faster time, so as to increase the Cultivation Index (IP).

Table 6 – Comparison of Harvest Costs with Combine Harvester "FUTATA" and Conventional method per Ha in Pakel Village, Ngantru sub-district, Tulungagung distrik

No	Description	Combine harvester		Conventional	
		Physical	Value (Rp)	Physical	Value (Rp)
1	Harvest fare	1 ha	2,500,000	1 ha	3,500,000
2	Carrier	14 orang	350,000	28	700,000
3	The amount of costs		2,800,000	-	4,100,000
	Cost difference	-	-	-	1,300,000

Another aspect to be gained from the use of combine harvester for rice harvest and profitable to farmers is to suppress yield loss. Sulardjo (2014) suggests that yield losses in rice crops manually are quite high, ie > 3%, whereas harvests with combine harvester yields are relatively small, ie < 1%.

Policy Option Formulation. To overcome the scarcity of labor and efforts to increase the productivity and efficiency of rice farming, it is necessary to input mechanization technology especially on land preparation, planting and harvesting and post harvest activities (Umar, 2013). Therefore, from the field observation and some inputs obtained from the FGD results, the policy options can be formulated as follows:

(1) The government through the relevant technical department needs to identify the needs of the farm machinery in each region according to the agroecosystem condition and in accordance with the demand / that farmers needed before the allocation of assistance to the farmer group;

(2) Before recommending, it is recommended that the government first perform the testing of machinery to be assisted / given to farmer groups, so that the relevant machinery can be operationalized, beneficial, beneficial to farmers and significantly support the self-sufficiency program;

(3) Delivery of agricultural machinery to farmer groups should be accompanied by training for UPJA members as alsintan operator as well as field officers (PPL) as a companion of farmer groups;

(4) The government through the relevant technical department needs to provide guidance and assistance to farmer groups so that the Management Unit of Alsintan (UPJA) will grow and develop;

(5) The development of UPJA in each group is also directed to have ability to care for machineries and workshops of alsintan;

(6) In order to facilitate the use of existing machines in groups, it is necessary to design activities of demonstration using participatory farming by involving farmers, field officers and related stakeholders. The government should be able to facilitate the spare parts and credit of purchase of alsintan for farmer groups.

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CONCLUSION

In East Java, there are two rice transplanter brands, namely Yanmar and Kubota. Being to combine harvester identified 3 brands, namely Quick, Crown, and Futata.

The use of agricultural machinery, especially rice transplanter and combine harvester can be used as a solution to overcome the scarcity of labor on rice farming in East Java.

The implementation of rice transplanter and combine harvester on rice farming in East Java can accelerate and efficient process, while reducing production cost.

In order to optimize the allocation allocated to farmer groups, it is necessary to organize UPJA in the farmer group, considering the prospective alsintan service business as a profitable commercial business.

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