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TECHNICAL EFFICIENCY OF PADDY'S FARMING IN VARIOUS TYPES OF PADDY'S SEEDS IN INDONESIA

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ABSTRACT

The increasing need for food along with increasing population is one of the problems that must be resolved by Indonesia. The government is trying to increase rice production and productivity by using certified seeds. Certified seeds is hyphotized affect to technical efficiency of rice farming. The objectives of this studies are to analyze the level of technical efficiency and to identify the factors that influence the technical efficiency of rice farming in various types of main sources of rice seeds in Indonesia. The study uses secondary data that obtained from Central Bureau of Statistic (BPS), the 2014 Paddy Farm Household Survey (SPD 2014). Data were analyzed using stochastic frontier. The results showed that the average technical efficiency level achieved by farmers in rice farming is 0,656 or less than 0,70 (<0,70) so it can be said that rice farming in Indonesia is still technically inefficient. Factors that affecting the technical efficiency of rice farming in various types of main sources of rice seeds in Indonesia were age, formal education, dummy participation of agricultural extension, and dummy certified seeds.

Keywords: *certified seeds, rice farming, stochastic frontier analysis, technical efficiency, non-certified seeds*

ABSTRAK

Meningkatnya kebutuhan pangan seiring dengan bertambahnya jumlah penduduk merupakan salah satu permasalahan yang harus diselesaikan oleh bangsa Indonesia. Pemerintah berupaya meningkatkan produksi dan produktivitas padi dengan menggunakan benih bersertifikat. Benih bersertifikat diharapkan dapat mempengaruhi efisiensi teknis usahatani padi. Tujuan penelitian ini adalah untuk menganalisis tingkat efisiensi teknis dan mengetahui faktor-faktor yang mempengaruhi efisiensi teknis usahatani padi pada berbagai jenis sumber utama benih padi di Indonesia. Penelitian ini menggunakan data sekunder yang diperoleh dari Badan Pusat Statistik (BPS) hasil Survei Rumah Tangga Usaha Tanaman Padi (SPD 2014). Data dianalisis menggunakan *stochastic frontier*. Hasil penelitian menunjukkan bahwa rata-rata tingkat efisiensi teknis yang dicapai petani dalam usahatani padi adalah 0,656 atau kurang dari 0,70 (<0,70) sehingga dapat dikatakan usahatani padi di Indonesia masih belum efisien secara teknis. Faktor-faktor yang mempengaruhi efisiensi teknis usahatani padi pada berbagai jenis sumber utama benih padi di Indonesia adalah umur, pendidikan formal, *dummy* partisipasi penyuluh pertanian, dan *dummy* benih bersertifikat.

Kata Kunci: benih bersertifikat, usahatani padi, analisis stokastik frontir, efisiensi teknis, benih tidak bersertifikat

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INTRODUCTION

Paddy (*Oryza sativa* L.) is an important commodity for Indonesia. Paddy serves as the main source of income for millions of farmers in Indonesia and as a source of food supply for most Indonesians. Increasing population every year makes increasing in food needs, then it will increase the demand for rice.

Increasing demand of rice has made the government have to make efforts to increase of paddy production in Indonesia, such as make efforts to intensification and extensification in agriculture. Intensification is carried out by optimizing existing agricultural land, while extensification is carried out by expanding the paddy's planting area. These efforts have been able to increase the paddy's production over the last five years (2014-2018), but have not been able to achieve the 2018 paddy's productivity target that set by the government, which is 52,72 quintal / ha (Direktorat Jenderal Tanaman Pangan, 2018).

Productivity of paddy in Indonesia must be increased in view of the increasing need for food. One of the factors that influence plant productivity is seed (Konja *et al*., 2019). Paddy can produce optimally if they are supported by an appropriate biotic and abiotic environment, then supported by recommended management technologies, such as planting use of superior varieties in accordance with their environment (Badan Penelitian dan Pengembangan Pertanian, 2016).

Based to several studies, seeds have a significant influence on increasing plant's productivity, such as in green beans (Sibiko *et al*., 2013), peanuts (Konja *et al*., 2019), wheat (Baglan *et al*., 2020), cane (Suwandari *et al*., 2020) and paddy (Songsrirote & Singhapreecha, 2007; Chandio & Yuansheng, 2018).

Nugraha *et al*. (2015) said that sources of paddy's seeds in Indonesia are divided into two systems, namely formal seedlings and informal seedlings. Formal seedlings carry out planned seed production, mechanized seed processing, planting clear varieties, marketed with identified packaging, and apply quality assurance to produce certified seeds, whereas informal seedlings use visually good visible grain as seeds.

Apart from the advantages of certified seeds, there are still some farmers who prefer to use seeds from their own cultivation or non-certified seeds. Certified seeds are obtained by farmers by purchasing and captive breeding, while non-certified seeds are obtained through self-cultivation. Based on data of 2013 Agricultural Census (ST2013) with spesification of 2014 Paddy Farm Household Survey (SPD 2014) there are 48.995 farmers that use a certified seeds, while 37.928 farmers that still use a non-certified seeds. This data showed that there are still many Indonesian farmers who have not used certified seeds.

The increasing of paddy's productivity through the use of certified seed sources is a problem that must be studied are related to the efficient use of the production factors. According to Baglan *et al*. (2020), the adoption of certified seeds has a significant and positive influence on technical efficiency. Several studies that regarding the technical efficiency of paddy's farming with certified seeds and non-certified seeds in Indonesia were carried out by Podesta & Rachmina (2011) and Maryono (2008). Podesta & Rachmina (2011) said that technical efficiency of Pandan Wangi in Cianjur Regency by using certified seeds and non-certified seeds is efficient. The technical efficiency's value of Pandan Wangi with certified seeds is higher than non-certified seeds. In contrast with Maryono (2008)'s studies that regarding the technical efficiency of paddy's farming with the certified seed program in Karawang Regency, the results showed that the average of technical efficiency planting in period I (before the program) was higher than the average of technical efficiency planting in period II (after the program).

The results of previous studies indicated that the effect of using certified seeds on technical efficiency tended to vary, where some researchers stated that the use of certified seeds was more efficient than the use of non-certified seeds. The studies have also shown that the technical efficiency of paddy's farming is locational casuistic, so it can not show in general of paddy's farming in Indonesia in relation to the use of the main types of seed sources. Based on this, we wanted to study about the level of technical efficiency of paddy's farming in Indonesia, related to the use of seed types, namely certified seeds and non-certified seeds. This study will

be used for making decisions in increasing the technical efficiency of farming in various types of main sources of paddy's seeds in Indonesia.

This research was conducted to answer the problem regarding how is the level of technical efficiency of paddy's farming and what are the factors that significantly influence the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia. This research aims to determine the level of technical efficiency of paddy's farming and the factors that significantly influence the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia. This study has two hypotheses, namely: (1) the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia is technically efficient, (2) the factors that have a significant influence on the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia are age, education, dummy participation of agricultural extension, dummy farmer group membership, and dummy certified seeds.

METHODS

The data that used in this study comes from secondary data obtained by Central Bureau of Statistic (BPS) through 2013 Agricultural Census (ST2013) 2014 Paddy Farm Household Survey (SPD 2014). Agricultural Census done in every 10 years. The 2013 Agricultural Census (ST2013) is the 6^{th} census that conducted by BPS since 1963. SPD 2014 conducted in all districts / cities in Indonesia. SPD 2014 includes a paddy comodity such as a hybrid, inbred, and upland paddy. This survey was conducted from 26 May to 7 July 2014. The secondary data that used in this study is the data from survey in 2014 and published in 2016.

The data of SPD 2014 has a sample of 8.933 census blocks, each block consists of 10 paddy's farmer households, except for DKI Jakarta where there are less than 10 paddy's farmer households in each block, so the sample is 87.330 paddy's farmer households. Then, this samples were reduced to 78.513 paddy's farmer household samples according to the data required in the study. The data that used in this study includes the demographics of paddy's farmer households, the participation of farmers in agricultural extension and membership of farmer groups, harversted land size, the production of paddy, sources of paddy seeds used, and the number of inputs used, including the number of seeds, the amount of chemical fertilizers (Urea, TSP / SP36, ZA, KCL, and NPK), and labor. These data are calculated during one planting season. Based on survey data information in the ST2013-SPD/SPW.PCS, purchased seed and the results of seed breeding are categorized as certified seeds, while those from self-cultivation is categorized as non-certified seeds. Seed breeding is the activity of multiplying certified superior variety seeds, while seed cultivation is an activity of propagating non-certified seeds.

The data that obtained will were analyzed using descriptively quantitatively with *stochastic frontier* analysis. S*tochastic frontier* is a method for estimating production's constraints (*production frontier*) using available data through a form of certain functions (Coelli *et al*., 2005). The *stochastic frontier* analysis model used to estimate the estimated parameters of paddys' farming in Indonesia is as follows:

$$Ln\ Y = \beta_0 + \beta_1 ln X_1 + \beta_2 ln X_2 + \beta_3 ln X_3 + \beta_4 ln X_4 + vi\text{-}ui \qquad (1)$$

Where:

Y = The production of paddy (kg)
β_0 = Constant
$\beta_1 - \beta_4$ = Coeficient factors
X_1 = harvested land size (m^2)
X_2 = the amount of chemical fertilizers (kg)
X_3 = the number of seeds (kg)
X_4 = the number of labor (HOK)
vi = *random error*
ui = *one-side error term* ($U_i \geq 0$)

Furthermore, the estimation of the parameters in the *stochastic frontier* analysis equation is carried out using the *Maximum Likelihood Estimation* (MLE) with the help of frontier 4.1c software. Based on Batesse dan Corra dalam Tinaprilla *et al*. (2013), expected that the log likelihood's value using the MLE > OLS method, so that the production function using the MLE method can be said to be good and according to conditions in the field. Then, we must calculate the value of technical efficiency with the following equation:

$$TE_i = \frac{Y_i}{Y_i^*} = \frac{\sum_{j=4}^{4} \exp(aX_{ij} - u_{ij})}{\sum_{j=4}^{4} \exp(aX_{ij})} \quad (2)$$

where *TEi* is the technical efficiency of paddy's farmers -*i*, Y_i is the amount of actual production of paddy's farmers -*i*, Y_i* is a potential production of paddy's farmers -*i*, *X* is the input, *a* is the parameter of production input, u_{ij} is the technical inefficiency variables, *i* is a paddy's farmers -*i*, dan *j* is the input -j. The value of technical efficiency is inversely related to the value of technical inefficiency effects. Coelli *et al*. (2005), Farming will be categorized as technically efficient, if the value of technical efficiency (TE) is more than or equal to 70 percent, whereas farming will be categorized as technically inefficient, if the value of technical efficiency (TE) is less than 70 percent. To determine the estimated factors affecting the technical efficiency of paddys' farming in Indonesia, the equation:

$$\mu = d_0 + d_1Z_1 + d_2Z_2 + d_3D_{KP} + d_4D_{KK} + d_5D_{BS} \quad (3)$$

Where:

μ = the effect of technically inefficient
d_0 = constant
$d_{1...}d_5$ = coeficient parameters
Z_1 = age (years)
Z_2 = education (years)
D_{KP} = *dummy* of participating in agricultural extension
(1 = have attended agricultural extension and 0 = have not attended agricultural extension)
D_{KK} = *dummy* of membership of farmers group
(1 = member of farmers group, dan 0 = not a member of farmers group)
D_{BS} = *dummy* certified seeds
(1 = certified seeds, dan 0 = non-certified seeds)

Estimates of technical efficiency and the factors that influence the technical efficiency of paddys' farming in Indonesia were analyzed using *frontier 4.1* and *Microsoft Excel*.

RESULTS AND DISCUSSION

Paddy is the one of commodities that is focused to be developed by government because it has a large contribution to the agricultural sector in Indonesia. Paddy's farming in Indonesia has different characteristics according to regional conditions and the potential of each region. The characteristics of paddy's farming with using certified seeds and non-certified seeds have a several differences, including harvested land size, the production of paddy, and the amount of inputs used such as chemical fertilizers, seeds, and labor. The characteristics of paddys' farming in this study are explained based on the data that obtained from 2014 Paddy (SPD 2014).

Harvested land size based on survey data information in the SPD 2014 is defined as the area of the paddy plant which is taken after the plants are old enough. The average of harvested land size of paddy's farming with certified seeds is smaller than paddy's farming with non-

certified seeds. This is because, paddy's farming with non-certified seeds is dominated by farmers that located in outside Java. They tend to have a wider average harvested land size than farmers in Java. The average of harvested land size with non-certified seeds is 0,5 hectares, while average of harvested land size with certified seeds is 0,43 hectares. The average of paddy's production with certified seeds is 4,5 tonnes/ha/planting season, while the average production of paddy's production with non-certified seeds is 3,6 tonnes/ha/planting season. The average of paddy's production in the study is still below the paddy's potential that can be achieved, which is 6-7 tonnes/ha (Bahasoan, 2013).

The average of amount of chemical fertilizers used in paddy's farming with certified seeds (439,37 kg/ha/planting season) was more than the chemical fertilizers used in paddy's farming with non-certified seeds (330,32 kg/ha/planting season). This is because farmers that farming with certified seeds predominantly use Ciherang and IR64 varieties, which are inbred seed or superior varieties (VUB). Meanwhile, farmers that farming with non-certified seeds mostly use inbred seeds and local seeds (such as Bagendit, Pandan Wangi, Anak Daro, and others). Balitbang Pertanian (2007), seeds with VUB and hybrids are generally required more fertilizer, while seeds with local varieties. Seeds with local varieties are required less fertilizer because they are less responsive to fertilization.

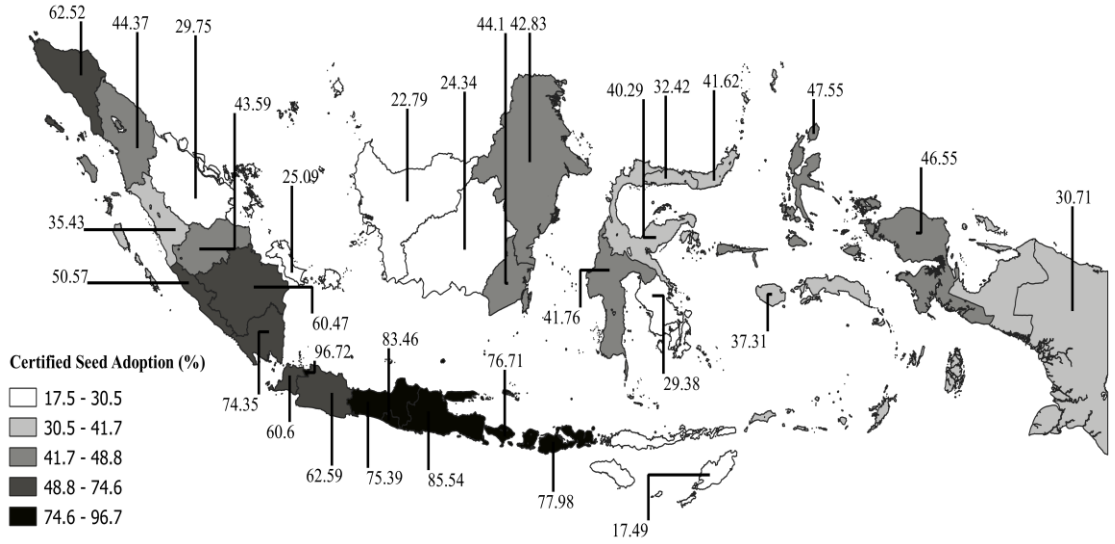

Figure 1. Adoption Rate of Certified Seed in Indonesia

The number of seeds in paddy's farming with certified seeds has an average of 50,78 kg/ha, which is less than the average of the number of seeds in paddy's farming with non-certified seeds, 52,79 kg/ha. The average of seeds in paddy's farming in both types is still above the recommendation that recommended by goverment, which is 25 kg/ha (Tinaprilla *et al*., 2013). Based on data, the largest average of seeds used is in Sulawesi 90 kg/ha/planting season, This may caused by high percentage of non-certified seed (see figure 1). Adoption rate of certified seed in Java is higher than outside of Java. This may be due technology invention is most assembled in Java. Beside, Java's education rate is higher than outside of Java. In addition, the average of seeds used in Kalimantan is less than Java, Sumatera, and Sulawesi. Meanwhile, the average of labor used in paddy's farming with certified seeds is 30,4 HOK, which is less than the average labor of labor used in paddy's farming with non-certified seeds, which is 35 HOK. This is because paddy's farming with certified seeds uses fewer seeds and has a narrower harvest area than paddy's farming with non-certified seeds.

The analysis of the Technical Efficiency of Paddy's Farming in Various Types of Main Sources of Paddy's Seeds in Indonesia

The level of technical efficiency in this study was analyzed using a production function *Cobb-Douglas stochastic frontier* model. Technical efficiency in paddy's farming is related to the managerial ability of farmers. The results of the technical efficiency analysis of paddy's farming in Indonesia showed in Table 1. Based on Table 1, the highest level of technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia is 0,965, which means that farmers have been able to produce 96,5 percent of the potential level of production that can be achieved. The lowest level of technical efficiency of paddy's farming in Indonesia is 0,010, which means that farmers have been able to produce 1 percent of the potential paddy's production that can be achieved, so that farmers still have the opportunity to increase their production from actual production by 99 percent with the combination of inputs used. The average of technical efficiency in paddy's farming in Indonesia is 0,656 or 65,6 percent, which means that farmers can still increase their production by 34,4 percent to obtain maximum production. In detail, it can be showed that the average of technical efficiency of paddy's farming with certified seeds is 0,692 and the average of technical efficiency of rice farming with non-certified seeds is 0,605. This value indicates that the average of technical efficiency with certified seeds is higher than the average of technical efficiency with non-certified seeds.

Table 1. The Distribution of Technical Efficiency of Paddy's Farming in Indonesia in 2014

Distribution of Technical Efficiency	Farmers (person)	Farmers that used certified seeds (person)	Farmers that used non-certified seeds (person)
< 50,00%	17.567 (22,4%)	7.778 (16,8%)	9.789 (30,3%)
50,01% – 70,00%	19.826 (25,3%)	10.528 (22,8%)	9.298 (28,8%)
70,01% – 80,00%	17.405 (22,2%)	10.771 (23,3%)	6.634 (20,5%)
80,01% – 90,00%	21.170 (27,0%)	15.202 (32,9%)	5.968 (18,5%)
> 90,00%	2.545 (3,2%)	1.923 (4,2%)	622 (1,9%)
The average of TE	0,656	0,692	0,605
The highest value of TE	0,965	0,963	0,965
The lowest value of TE	0,010	0,015	0,010
Total samples	78.513	46.202	32.311

Source : Data that processed from Data Survei Rumah Tangga Usaha Tanaman Padi (2014)

The average of technical efficiency in paddy's farming in Indonesia reflects that the skills of farmers in managing their farms still can be improved. The average of technical efficiency shows that there is an opportunity to increase the production of paddy by best practice. Paddy's farming in Indonesia with both used certified and non-certified seed can still be improved by optimizing the use of input and farm management.

Based on Coelli *et al*. (2005), farming are called technically efficient if the technical efficiency's value is more than or equal to 70 percent, while farming has a technical efficiency's value less than 70 percent, it is called inefficient category. The results of the analysis show that the average of technical efficiency's value of paddy's farming in Indonesia is 0,656 < 0,7, which means that overall paddy's farming in Indonesia was technically inefficient, however there is 52,4 percent of the sample paddy's farmers were technically efficient. Paddy's farming in Indonesia was technically inefficient because the use of production factors still unproportionately. In the case, in field found that the use of seeds is considered too excessive, it is suspected to be the cause of the inefficiency paddy's farming in Indonesia. These results are in line with Setiawan & Bowo (2015), where the rice farming in Grobogan is inefficient technically. Farmers use seeds too excessive because sometime they have to repeat the seeding in paddy nursery locations because the seeds stocked previously have been damaged by pests or by floods. In addition, the use of labor in paddy's farming in Indonesia is need to be reduced because the increasing of labor can reduce paddy's production.

The Factors that Influence the Technical Efficiency of Paddy's Farming in Various Types of Main Sources of Paddy's Seeds in Indonesia

The results of analysis indicate that there are still technical inefficiency factors in paddy's farming in various types of main sources of paddy's seeds in Indonesia. This is because there are socio-economic characteristics of farmers which are sources of technical inefficiency.

Table 2. The Estimation Results of Factors that Influence the Technical Inefficiency of Paddy's Farming on Various Types of Main Sources of Paddy's Seeds in Indonesia

Variables	Coeficient	Standard error	t-test
Constant	0,896	0,019	44,887
Age (Z_1)	-0,025	0,002	-14,037***
Education (Z_2)	-0,085	0,004	-19,549***
Dummy participate in agricultural extension (D_{KP})	-0,215	0,018	-11,942***
Dummy membership of farmers group (D_{KK})	0,014	0,015	0,976
Dummy certified seeds (D_{BS})	-1,256	0,044	-28,612***
Sigma-squared	1,765	0,062	28,631
Gamma	0,97	0,001	0,88 x 10^3

Source : Data that processed from Data Survei Rumah Tangga Usaha Tanaman Padi (2014)
Note : ***significant at 99%

Therefore, an analysis of the factors that influence the technical efficiency is carried out which aims to answer what are the significant factors that influence the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia. These will be analyzed by using a *stochastic frontier* with MLE methods (*Maximum Likelihood Estimation*). The analysis result of the factors that influence the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia can be seen in Table 2.

The sigma-squared value in table 2 shows that the sigma-squared value in paddy's farming is 1,765, which means it is more than zero (0). This shows that H_0 is rejected and H_1 is accepted, which means that there are technical inefficiency factors in paddy's farming in various types of main sources of paddy's seeds in Indonesia. The gamma value that is close to 1, which is 0,97. It indicates that the error term comes from the result of inefficiency (ui) and does not from the random error variable (vi). This value indicates that the frontier model is influenced by 97% of the technical inefficiency effect, while 3% is influenced by random error variables such as weather, pests, and etc.

The farmer age variable (Z_1) has a coefficient of -0,025 which means that an addition of one year of farmer age, it will decrease technical inefficiency by 0,025% or increase efficiency by 0,025%. The farmer age variable has a negative and significant influence on the technical inefficiency of paddy's farming in Indonesia. These results indicate that the increasing age of farmers can increase the level of technical efficiency. These results are in line with Murniati *et al*. (2014) dan Abas *et al*. (2018)'s studies that increasing the age of farmers will make farmers more experienced in their farming, so that farmers will be wiser in determining farming decisions and can use production factors more efficiently. So, the increasing of age can increase production and technical efficiency of paddy's farming.

The education variable (Z_2) has a coefficient of -0,085 which means if there is an addition of one year of education, it will decrease technical inefficiency by 0,085% or increase efficiency by 0,085%. The education variable has a negative and significant influence on the technical inefficiency of paddy's farming in Indonesia. The sample of farmers in Indonesia have studied just for 6 years or have graduated from elementary school (SD) or equivalent and their can classified as farmers that have low education. Therefore, if farmers take a higher level of education, it will increase their technical efficiency. These results are in line with Murniati *et al*. (2014), Bahasoan (2013), dan Kusnadi *et al*. (2011)'s studies, where the higher level of education will influence the willingness and ability of farmers to seek an information about the

use of production factors. So that farmers will be more efficient in managing their farming and can apply better cultivation techniques.

The dummy variable of participate in agricultural extension (Z_3) has a coefficient of -0,215 which means if farmer attend agricultural extension one time, it will decrease technical inefficiency by 0,215% or increase efficiency by 0,215%. The dummy variable of participate in agricultural extension has a negative and significant influence on the technical inefficiency of paddy's farming in Indonesia. It means that by participating in agricultural extension will increase the level of technical efficiency of paddy's farming. Field conditions showed that most farmers, as many as 73,76 percent of the sample farmers, did not attend agricultural extension about management of paddy's plantations in the past year. These agricultural extension is carried out about cultivation techniques, pest control, marketing, efforts to reduce yield loss (shrinkage) in harvest / post-harvest, and financial techniques / loan repayments. These agricultural extension is usually carried out by field agricultural instructures, pest controllers, and the relevant Agricultural Department or the government. The reason why farmers do not participate in agricultural extension because farmers do not receive an invitation, agricultural extension is not important, there are other farmer's activities, boredom, agricultural extension materials are not suitable, and lack of benefits of agricultural extension (Wedastra and Suarta, 2020). Therefore, participate in agricultural extension will be able to increase the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia. These results are in line with Murniati *et al*. (2014), Rivanda *et al*. (2015), and Prayoga (2010), where agricultural extension is one of the ways to convey technology, innovation, and new knowledge to farmers, so with a agricultural extension will improve the quality of resources and farmer's knowledge which can increase the technical efficiency of paddy's farming.

The dummy variable of membership of farmers group (Z_4) has a coefficient of 0,014 which means if farmer become member of farmers group, it will increase technical inefficiency by 0,014% or decrease efficiency by 0,014%. The dummy variable of membership of farmers group has a positive, so it means that joining a farmer group will be able to reduce the level of technical efficiency of their farming. This result in line with Abas *et al*. (2018), where participate in farmer groups which is thought to increase technical efficiency, actually decrease technical efficiency. This is in contrast to Bahasoan (2013) and Hestina *et al*. (2017)'s studies, where participate in farmer groups will increase the efficiency of the use of production inputs, increase the farmer's knowledge with non-formal education, improve the farmer's managerial abilities, increase the accessibility to new technologies and innovations, and increase the accessibility to credit and other assistance program that channeled through farmer groups. But participate in farmers group does not have significant influence on the technical inefficiency of paddy's farming in Indonesia. This is because conditions in the field show that only 53,84 percent of sample farmers have joined farmer groups, while 46,16 percent have not joined farmer groups.

The dummy variable of certified seeds (Z_5) has a coefficient of -1,256 which means if farmer use certified seeds, it will decrease technical inefficiency by 1,256% or increase efficiency by 1,256%. The dummy of certified seeds has a negative and significant influence on the technical inefficiency of paddy's farming in Indonesia. It means, farmers that use a certified seeds in farming will increase the technical efficiency of their farming or farmers that use a certified seeds will be more efficient than farmers that use a non-certified seeds. It can be seen from the results of the analysis of technical efficiency level, where farmers that use a certified seeds have an average technical efficiency's value is 0,692, this value greater than the average technical efficiency using non-certified seeds, which is 0,605. These results are in line with Baglan *et al*. (2020)'s study, where the certified seed adoption can enhance technical efficiency.

CONCLUSION

The average of technical efficiency of paddy's farming in Indonesia is 0,656 so it can be said that paddy's farming in Indonesia is not technically efficient. Paddy's farming in Indonesia was technically inefficient because the use of production factors still unproportionally in example the use of seeds and labor are too excessive.

The variables that significantly influence the technical efficiency of paddy's farming in the various types of main sources of paddy's seeds in Indonesia are age, education, dummy participation of agricultural extension, and dummy certified seeds. The four variables have a significant and positive influence on the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia. The variable of membership of farmer group does not have a significant influence on the technical efficiency of paddy's farming in various types of main sources of paddy's seeds in Indonesia.

Therefore, this study proposed that farmers in paddy's farming in Indonesia can increase the value of their technical efficiency by having higher levels of formal education, participating in empowerment and agricultural extension especially for farmers with productive age, and using certified seeds in their farming.

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