

Farmers' decision analysis to select certified palm oil seedlings in Lampung, Indonesia

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Abstract. This research aimed to analyse (1) decision making process of certified and uncertified palm oil seedlings and (2) factors that influence farmer decision to select certified and uncertified palm oil seedlings. This research was conducted in some districts in Lampung, such as Mesuji, Central Lampung, Tulang Bawang, North Lampung, Way Kanan and South Lampung. The respondents consisted of 30 farmers using certified seeds and 30 farmers using uncertified seeds. The study was conducted from January to May 2017. In addition, factors that influence farmer decision was analysed by logistic regression model. The results showed that decision making on the use of certified or uncertified palm seeds by farmers through the stages: introduction of problems or needs, searching of information, alternative evaluation, purchasing decisions, and post-purchase behaviour. Factors that significantly influence farmer's decision to use certified seeds were land area, seeds price, external influenced, and farmers' perception.

Keywords: certified, decision, palm oil, seedling

1. Introduction

Plantations are all activities of natural resource management, human resources, production facilities, tools and machinery, cultivation, harvesting, processing, marketing, and managing to achieve prosperity for plantation and community (UU RI No. 18, 2004). In maintenance estates play an important role; while in agroforestry and silviculture, plants tend to be allowed to grow according to natural conditions. Due to its intensive nature, plantations almost always apply the way of monoculture cultivation.

Palm oil (*Elaeis*) is one of the plants that produce cooking oil, industrial oil, and fuel (biodiesel). Palm oil grows as a cultivated plant spread in tropical climates even near subtropics in Asia, South America and Africa [8]. Palm oil is the second most successful agricultural product in Indonesia after rice. Palm oil is also the largest agricultural export commodity in Indonesia. The world's palm oil demand has grown rapidly in recent decades with current palm oil production estimated at more than 45 million tonnes. Indonesia is one of the largest producers and exporters of palm oil in the world, with more than 18 million tonnes of palm oil production per year [5].

Palm oil is one of the leading plantation crops of Lampung which has increased in terms of the area. The centre of palm oil plantation of Lampung is located in Mesuji and Central Lampung. According to Statistic Indonesia (2015), Central Lampung has the second largest palm oil plantation area in Lampung with an area of 29.180 ha. Information on the area of palm oil plantations in each district in Lampung can be seen in Figure 1.



By the vast area of palm oil, the needed for quality palm seeds to produce quality production as well. Palm oil seed quality can be proven by using a certificate of seeds, commonly called certified seeds. Currently the use of certified seeds at the farm level is still very low. Causes of low levels of use of seeds such as the price of quality seeds / certified is still considered more expensive than regular seeds (uncertified), thus causing poor perception of farmers to certified seeds. Meanwhile, the use of certified seeds will be very beneficial for farmers. In addition to rapid production, quality of production is also better because it has been tested previously. Therefore, it is necessary to carry out the seedling of certified seeds. Before doing the logging, it is necessary to see perceptions and factors affecting farmers in the selection of palm oil seedlings.

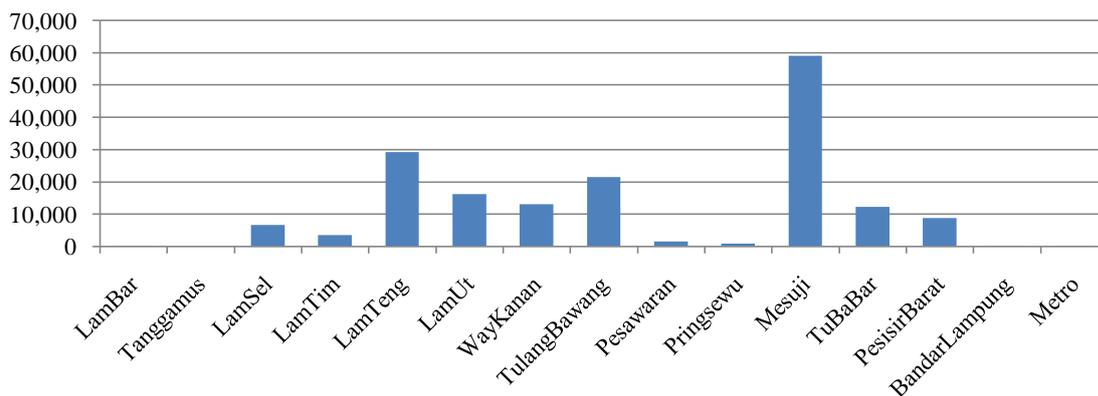


Figure 1 Palm oil plantation area in Lampung by district

2. Materials and Methods

This research was conducted at the centre of palm oil in Lampung, such as Mesuji, Central Lampung, Tulang Bawang, North Lampung, Way Kanan and South Lampung, where in each district were taken 10 farmers as respondents. The respondents consisted of 30 farmers using certified seeds and 30 farmers using uncertified seeds. The study was conducted from January to May 2017. Data analysis method used is quantitative analysis. Quantitative analysis is used to analyse the factors that influence the purchasing decision of farmers in choosing palm oil by using Logistic Regression method.

Farmers Decision Making Analysis

To know the factors that influence the farmers' decision of purchasing in selecting certified and uncertified palm seeds, quantitative analysis was done by using logistic regression model. Respondents in this study were categorized for the group of certified palm oil seedlings farmers and uncertified palm oil seed farmers. The factors that influence farmers' purchasing decisions in selecting certified and uncertified palm seedlings are suspected to be influenced by educational factors, age, farming experience, land area, seed price, external influence, perception, seed resistance to plant pests and diseases, and seed access. The independent variables of X will affect the dependent variable Y. The dependent variable Y has two possible values of 1 and 0. The value of Y denoted by 1 means the purchase decision of certified palm oil seedlings and 0 means the purchase decision of the uncertified palm oil seedlings. To know the relationship between independent variables with dependent variable, the model used is as follows:

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 D_1 + \beta_7 D_2 + \beta_8 D_3 + \beta_9 D_4 + e$$

That:

- Y_i = The decision to purchase palm oil seedlings
 $Y_i = 1$ means purchasing decision of certified palm oil seedlings
 $Y_i = 0$ means purchasing decision of uncertified palm oil seedlings
 α = Intercept
 X_1 = Education Factor (year)
 X_2 = Age (year)
 X_3 = Farming Experience (year)
 X_4 = Land Area (ha)
 X_5 = Seed Price (Rp/seed)
 D_1 = Dummy of external influenced (1=has influence; 0= doesn't have influence)
 D_2 = Dummy of farmers' perception (1=certified seed is better than uncertified seed, 0=uncertified seed is better than uncertified seed)
 D_3 = Dummy of seed resistance to plant pests and diseases (1=resist, 0=not resist)
 D_4 = Dummy of seed access (1=easy, 0=difficult)
 β_i = Parameter variables of X_i
 e = Error

3. Results and Discussions

3.1 Respondent Characteristic

Characteristics of respondents are the specific characteristics of a person such as age, education level, farming experience, land area, and land tenure status (Table 1). Asih (2009) reported that Sulawesi revealed the characteristics of age, education, and farming status affect farmers' skills in managing palm oil farming.

Palm oil farmer was either using certified seeds or uncertified dominated by farmers who are in the range of productive age is between 20 - 55 years. In general, productive people have a high spirit to develop their business, driven by high demand and able to make onion farming better compared with relatively older farmers.

The education level of both respondents who use certified seeds are dominated by undergraduate or diploma education, while respondents who use uncertified seeds are still dominated by junior high school. It means that most of the farmers are uncertified respondents have a standard level of formal education. It will certainly affect the level of courage to take decisions and risks in the management of palm oil farming. This is in accordance with the research of Emiriaet. al. (2014) which states that limited funds result in many farmers who didn't choose to go to school again and continue the work of their parents as farmers.

In palm oil farmers who use both certified and uncertified seedlings, have more experience of farming between 5-16 years. The farming experience shows that the length of farmers engaged in palm oil farming. The longer the farming experience, it can be concluded that the farmers have understood the cultivation techniques in the activities of farming.

Table 1. Characteristics of palm oil farmers in Lampung

No	Characteristic	Farmer who used certified seed		Farmer who used uncertified seed	
		Category	Percentage (%)	Category	Percentage (%)
1	Age (year)	30 – 55	83.33	30 – 45	66.67
2	Education Level	Undergraduate/ Diploma	33.33	JHS	56.67

3	Farming Experience (year)	9 – 16	50.00	5 – 8	70.00
4	Land Area (Ha)	1 – 15	100.00	0.5 – 1	83.33
5	Land Ownership	Own	100.00	Own	100.00

Land is a base in farming activities that acts as one of the capital in agriculture in addition to labor and capital. Respondents of palm oil farmers using certified seedlings in Lampung are generally classified into large-scale farmers with land concessions between 1-15 hectares, while palm oil farmers using uncertified seedlings are mostly classified into medium-sized farmers with land cultivation more than 0.5 - 1 hectare.

The land ownership status of farmers who use certified or uncertified seeds most of their land were their own land. The main reason farmers had their own land because palm oil is an annual plant with long economic life, so it will be more efficient if the land is a land of its own.

3.2 Decision Making Process

The decision-making process of farmers in using certified palm seeds or not through 5 stages, namely: the introduction of problems or needs, searching of information, alternative evaluation, purchasing decisions, and post-purchase behaviour.

Table 2. Indicators of problems or needs introduction

No	Description	Farmer who used certified seed		Farmer who used uncertified seed	
		Category	Percentage (%)	Category	Percentage (%)
1	Motivation of Palm Oil Farming				
	• Get the benefit	25	83.33	18	60.00
	• Heredity	2	6.67	10	33.33
	• Get the own needs	3	1.00	2	6.67
2	Motivation of seed using				
	• Affordable Price	-	-	24	80.00
	• Easy to get	-	-	5	16.67
	• Good Quality	30	100.00	1	3.33
3	Benefit that is found				
	• Production increasing	18	60.00	26	86.67
	• Quality increasing	10	33.33	4	13.33
	• Pests exposure reducing	2	6.67	-	-

Introduction of problems or needs. The process of using certified palm seeds didn't start when farmers begin to feel and recognize the needs for a seed product, and strive to meet those needs (Table 2). For some communities in Lampung Province, palm oil cultivation has become their main occupation. The motivation of farmers in palm oil cultivation is very diverse. In farmers who use certified seeds or not most or about 83.33 percent and 60.00 is to gain profit.

The need for palm oil seedlings was driven by several factors and it was influenced by the motivation of farmers in using seeds. The results showed that in farmers who use certified palm oil seedlings, the incidence of all farmers' motivation in using certified palm oil seeds because of good quality. Unlike farmers who use uncertified seedlings, the incidence of motivation is mostly (80.00 percent) of farmers in using uncertified palm oil seedlings because of their affordable price. The benefits that farmers are looking for in the use of seeds for certified seed farmers and not most (60.00 percent and

86.67 percent) are to increase the amount of production. According to Ancok (1997), the knowledge about the benefits of things will cause a person to be positive about it.

Searching of information. At this stage, the farmers would conduct information about the benefits and weaknesses of seeds that will be used in the farm. The acquisition of information will affect the perception of the farmer even his belief in the seeds, so that ultimately will affect the decision in the use of seeds. In trying to farm the farmers determine the type of seed that will be used. In addition to having their own knowledge, is also strongly influenced by other parties. Sources of interpersonal information commonly used by farmers to obtain information are fellow farmers or parents, extension officers, traders, and distributors.

Table 3. Indicators of searching information

No	Description	Farmer who used certified seed		Farmer who used uncertified seed	
		Category	Percentage (%)	Category	Percentage (%)
1	Own self	4	13.33	15	50.00
2	Farmer Group/ Friends/ Family	25	83.33	5	16.67
3	Seedling Seller	1	3.33	10	33.33

From Table 3 it can be seen that other farmers / farmer groups (83.33 percent) are the most influential sources of information for certified palm oil seedlings farmers. Farmers and farmer groups are the most reliable source of information for farmers, as they see for themselves the productivity of the seeds used. While the largest source of information the farmers users of palm oil seedlings are not certified, comes from self (56.67%). This is because the farmers are already feeling confident with the quality of seeds and affordable prices. This is consistent with Setiadi (2010) statement that information obtained by consumers is largely derived from commercial sources, but the most effective information comes from personal sources.

Table 4. Indicators of alternative evaluation

No	Description	Farmer who used certified seed		Farmer who used uncertified seed	
		Category	Percentage (%)	Category	Percentage (%)
1	Important Information				
	• Price	-		28	93.33
	• Productivity	13		-	-
	• Quality	17		2	6.67
2	Choosing Consideration				
	• Habbits	2	6.67	21	70.00
	• Following the other farmer	28	93.33	5	16.67
	• Have good market	-	-	4	13.33

Alternative evaluation. At this stage, farmers make the best consideration to be taken in meeting their needs by choosing certain criteria relevant to the wishes and needs to make a decision on the use of seeds. Based on Table 4, the seeds of palm oil that circulating in Lampung Province quite a lot of species and can be differentiated into certified seeds and not certified. Important information sought by farmers in the use of certified seeds is mostly due to quality (56.67 percent), while for seeds are not certified, mostly because of the price (93.33 percent). Factors considered by farmers to choose to use certified palm oil seedlings are mostly due to other farmers (93.33 percent), while the consideration

for farmers choosing to use uncertified palm oil seedlings is largely due to the habit that has been done (70.00 percent).

Purchasing decisions. At this stage, the farmer decides what seeds to use in his farm. According to Engel et al. (1994), purchase intentions are classified into two categories: planned purchases and unplanned purchases. The results showed that the farmers are certified seed users or do not purchase the seedlings mostly in a planned manner. Farmers make purchases of seedlings in a planned because it already has a schedule of palm oil planting that will be done at a certain time, so the need for seed stocks before planting time begins.

The use of seeds by farmers in Lampung, in addition to being determined by yourself, is also influenced by outsiders. The result of the research shows that for the farmers, the certified seedlings that are influential in the process of purchasing the seedlings are mostly other parties, whereas for the uncertified seed growers who are influential in the process of purchasing the seedlings are mostly self.

Table 5. Indicators of purchasing decisions

No	Description	Farmer who used certified seed		Farmer who used uncertified seed	
		Category	Percentage (%)	Category	Percentage (%)
1	Satisfaction of seed purchase				
	• Satisfied	30	100.00	18	60.00
	• Not satisfied	-	-	12	40.00
2	If the seed price rise				
	• Keep buying	30	100.00	10	33.33
	• Not buying	-	-	20	66.67
3	If the seed unavailable				
	• Find in another place	30	100.00	12	40.00
	• Buy another seed	-	-	18	60.00

Distance where the purchase of seedlings with farmers' residence in Lampung is relatively far away. In certified seed farmers, the spacing of seed purchases is more than 5 km (100.00 percent). This is because most of the farmers using certified palm seeds buy seedlings at the Palm Oil Breeding Centre located in Bandar Lampung. Similarly, in uncertified seed farmers, the proximity of most purchases is more than 5 km (60 percent).

Post-purchase behaviour. After the farmers of the respondents have used the seeds, there would be a change in assessing the results of their farming based on the appropriate facts in the field (Table 6). All farmers of respondents who use certified palm seeds are satisfied with the seeds they use. They claim that the seeds they use have good quality and also the products that are in accordance with the wishes of farmers. But unlike farmers who use uncertified seeds of palm oil seedlings, only 60.00 percent of farmers are satisfied with the seeds that are not certified because it is good quality. They have complaints because of poor seed quality and uneven growth. The higher the level of farmers' satisfaction in using a type of seed, the higher the farmer's desire to use the seeds. Positive responses of farmers to seedlings will affect the use of the next seed.

The state of consumers in buying a product is strongly influenced by the price of the product itself. The results showed that if the price of certified palm oil seeds increased, then all farmers will still buy the seeds. This is because the farmers have been very confident with the quality is guaranteed. Unlike farmers who use seeds are not certified. If the price of palm oil seedlings is not certified increases, then most farmers (66.67 percent) will not buy the seeds.

The decision on the use of a seed type is also strongly influenced by the availability of seeds. The results show that if the certified seeds to be used are not available in the field, then all certified seed

farmers will find the seeds elsewhere. It means that both local and imported seed farmers have a high degree of loyalty to the seeds they normally use, so that if the seeds are unavailable in the field they will look elsewhere. Unlike farmers who use seeds are uncertified. If uncertified palm oil seedlings are not available in the field, most (60.00 percent) of farmers will look for another varieties.

3.3 Factors of Affecting Decision Making

Logistic regression analysis was used to determine the factors that influence the decision of farmers in using certified palm seeds and not. The response variable (Y) in this analysis is categorical, where the palm oil farmers using certified seeds are rated 1 and the palm oil farmers using the uncertified palm oil seeds are rated 0. Based on the previous literature and on the considerations at the study sites, there are nine variables free ones. The nine independent variables are education, age, farming experience, land area, seed price, external influenced, farmer perception, seed resistance to pests and diseases, and seed access.

To see the accuracy of the model used Nagelkerke R square value of 0.943. This value indicates that the ability of independent variables in explaining the dependent variable is 0.943 or 94.3 percent while the rest of 5.7 percent is explained by other variables outside the model. To test the significance of the model in the model, a model goodness-of-fit test was performed using the Hosmer-Lemeshow (H-L) method. The result from the model with the H-L test is 1,229 and the p-value or significance is 0.998. The p-value value is greater than the 5 percent, so it can be concluded that the logistic model is feasible to use because it is able to explain or predict the farmer's decision in using the palm oil seeds.

Table 6. The result of logistic regression analysis

No	Variable	B	S.E	Wald	df	Sig.	Exp (B)
1	Education	0.114*	2.029	1.484	1	0.072	1.104
2	Age	-0.804	8.243	6.058	1	0.213	0.670
3	Farming Experience	0.052	1.721	0.472	1	0.172	0.005
4	Land Area	0.364**	9.779	1.601	1	0.001	20.137
5	Seeds Price	-0.513**	0.758	2.733	1	0.027	1.001
6	External Influenced	0.276**	1.610	4.508	1	0.001	29.944
7	Farmers' Perception	0.441**	1.864	4.224	1	0.001	1.859
8	Seed resistance to pests and diseases	0.057**	1.817	4.139	1	0.017	2.398
9	Seeds Access	-0.545	1.022	1.134	1	0.065	0.010

Note: ** = $\alpha = 5\%$; * = $\alpha = 10\%$

The result of logistic regression model estimation at 95% confidence level ($\alpha = 5\%$) there are five variables that give real effect to farmer decision in using certified palm seeds. These variables are the land area, seeds price, external influenced, and farmers' perception, than the endurance of seeds against pests and diseases. Four other variables: age, farming experience, education level, and seeds access have no real effect. The results of data processing to see the independent variables that significantly affect the dependent variable by using logistic regression are presented in Table 6.

Land Area. Land area has a significance value of 0.001, so this variable has a significant effect on the decision of farmers using certified palm seeds. Variable land area has a positive coefficient value, this means that the opportunity of farmers using certified palm seeds is positively related to land area, so

the more land owned by farmers, the possibility of farmers using certified palm seeds will be greater. The value of odds ratio on variable land area is 20,137 meaning that every existence of increase of land area equal to 1 hectare hence opportunity of farmer to use local onion seeds equal to 20,137 times (*ceteris paribus*). The average certified palm oil farmer has a land area of 3.16 hectares, while farmers who use uncertified palm oil seeds have an average land area of 0.80 hectares.

This indicates that certified palm oil seedlings have larger land than farmers who use uncertified seedlings. Farmers who have narrower land have a tendency to maintain a pre-existing cropping pattern by using uncertified palm oil seedlings for reasons of the potential risks and uncertainties of production and marketing that may occur in certified palm oil seedlings. In general, smallholder farmers have a small farming capital, so their chances of using palm oil seedlings are uncertified because the purchase price of uncertified seeds are cheaper.

Seeds Price. Variable of seed price has significance value equal to 0,027, so this variable has significant effect to farmer decision using certified palm oil seedlings. The seed price variable has a negative coefficient value, it means that the chance of farmers using certified palm seedlings is negatively related to the price of seedlings; The higher the price of seeds, the possibility of farmers using certified palm seedlings will be smaller. The value of odds ratio on the variable of seed price is 1,001 which means that every increase of seed price is Rp 1, the farmer's chance to use certified palm seed oil decreases 1,001 times (*ceteris paribus*).

According to Schiffman and Kanuk (2008), Joni et al. (2001), price is one of several factors that influence consumers in the decision to buy seeds. Likewise with Theresia (2016) which states that one of the factors that influence the decision of farmers using rice seed is the price of seed. Based on the results, if the price of oil palm seeds is uncertified to increase, the farmers will tend to replace the seeds that will be used.

External Influence. The external influence variable has positive effect to farmer decision using certified palm oil seedlings. The external influence variable has positive coefficient value, it means that the chance of farmers using certified palm seedlings is positively related to the external influence, so the more external influence hence the chance of farmer use the certified seed will be bigger. The odds ratio value on external influence variables is 29.944 which means that if the external influence is large, then the chance of farmers using certified palm seeds is 29.944 times bigger than that of external influence (*ceteris paribus*).

Farmers' Perception. Variable of farmers' perceptions have positively affect the decision of farmers using certified palm seeds. Farmers' perceptions have positive coefficient value, it means that the opportunity of farmers using certified palm seedlings is positively related to the farmers' perception, so the higher farmers' perception to certified palm seeds, then the chance of farmers using certified seeds will be greater. The value of odds ratio on farmers' perception variable of 1,859 which means that if the farmer perception increase, then the opportunity of farmer use certified palm seeds is 1,859 times bigger than that small farmers' perception (*ceteris paribus*).

Seed resistance to pests and diseases. The seed resistance variable has a positive effect on the farmers' decision using certified palm oil seedlings. The seed resistance variable has a positive coefficient value, it means that the chance of farmers using certified palm seedlings is positively related to seed resistance, so the higher the seed resistance, the more chance the farmers use the certified seeds will be greater. The odds ratio value of the seed resistance variable is 2,398, which means that if the seed resistance increases, the chance of farmers using certified palm seeds is 2,398 times bigger than those with low seed resistance (*ceteris paribus*).

Other Variables. The result of logistic regression test shows that the age, farming experience, education level, and seed access have significance value greater than 0,05. It means that the variables have no significant effect to participate in determining farmers' opportunities in using certified palm oil seedlings.

Given the facts on the ground, the process of changing farmers' attitudes toward the use of local onion seeds is not influenced by the experience of farming but is influenced by evidence that has been seen in the surrounding environment. Farmers tend to observe and assess the results of other farmers who have previously used certified palm oil seedlings. After knowing the superiority of certified oil palm seeds compared to uncertified oil palm seedlings, they are only interested to use certified seeds.

4. Conclusions

Decision making on the use of certified or uncertified palm seeds by farmers through the stages: introduction of problems or needs, searching of information, alternative evaluation, purchasing decisions, and post-purchase behaviour. Differences in decision making between certified and certified palm seed farmers are not found in the motivation to use seeds, namely the motivation of certified seed farmers because of good quality, while the farmers are not certified because the price is affordable.

Factors that significantly influence farmer's decision to use certified seeds are land area, seeds price, external influenced, and farmers' perception. The seeds price has a negative and significant effect, while age, farming experience, education level, and seeds access have no real effect have a positive and significant effect on the farmer's decision to use certified palm oil seedlings.

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