IDENTIFICATION OF SOCIO-ECONOMIC ASPECTS IN THE DECISION TO DISPOSE SUGARCANE FARMERS' RATOONS IN EAST JAVA

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ABSTRACT
The purpose of this study was to identify the socio-economic aspects that influence farmers' decisions to unload ratoons (ratoon plant cane). The research was conducted in Gondang Legi District, Malang Regency, East Java Province, which is one of the largest sugarcane plantation areas where there is a sugar factory. Data collection was carried out by in-depth interviews with 172 farmer respondents who were obtained using a non-proportional stratified random sampling method. To find out the socio-economic aspects, the probit regression analysis method is used which is a method to find out the relationship between the dependent variable and the independent variable in making decisions. Based on the results of the study, it was explained that the variable farming experience was significant and had a negative value with a marginal effect value of 0.0709, meaning that farmers experienced a decrease in attitude in deciding to unload ratoons by 0.709%. Furthermore, the number of family members is a significant variable with the acquisition of a marginal effect value of 0.037614 which means that by increasing the number of family members, sugarcane farmers tend to decide on ratoon plant cane activities by 3.7614%, while the use of reserved seeds is significant and negative with a marginal effect value of 0.045737. With a large number of reserved seeds, the probability of the decision to dismantle ratoons decreases by 4.5737%. For the variable land area, it has positive relationship where the value of the marginal effect is 0.1527412 with the addition of arable area; the tendency of farmers to decide to unload the ratoon is 15.27412%. Thus increasing productivity can be done by developing and assisting the right ratoon plant cane unloading activities, transparency of information and revitalization of sugar factories.

KEY WORDS
Sugarcane, Unloading ratoons, embroidery seeds, revitalization, yield, productivity, socio-economics.

Sugarcane (*Saccharum officinarum*) is one of the most important crops in the world because of its strategic nature and extraordinary use in everyday life in any country as well as for nutritional and even economic industrial purposes (Onuweme et al., 1991; Aulakh & Malhi, 2005; Eggleston, G., & Lima, 2015; Sulaiman et al., 2015; Carrillo-Bermejo et al., 2020; Pompelli et al., 2022). This plant has a long duration and is the main source of granulated sugar and other accompanying products (Islamet al., 2019). It has a sucrose content of 10–18% and fiber content of 10–15%. bright. Very sensitive to temperatures below 15°C because it causes very slow growth and growth can stop when the temperature exceeds 35°C. The optimal temperature range for sugarcane growth is 20-30°C. There are many factors that affect sugarcane production such as the choice of sugarcane varieties, climatic and soil conditions and availability of water (Deressa et al., 2005; Abdel-Rahman & Ahmed, 2008; Srivastava & Rai, 2012; Leal et al., 2013; Biggs et al., 2013; Marin et al., 2013; Zhao & Li, 2015; Bocca & Rodrigues, 2016; Ravi S Gurjar *etal.*, 2017; Bordonal et al., 2018).

Indonesia has the right resources and climate for sugar cane because sugarcane is a tropical plant so it can grow widely in various regions. According to the USDA in Pusdatin (2018); Estrada et al., (2018); Mahdi et al., (2023) Indonesia is in 6th place as a sugar supplying country in the world after Brazil, this is shown in the following table:

Table 1 – Countries that Provide Granular Sugar 2014-2018

No	Negara	Ketersediaan (000 Ton)					Rata2	Share (%)	Kumulatif (%)
		2014	2015	2016	2017	2018			
1	India	26,500	26,800	25,500	26,500	27,500	26,560	15.45	15.45
2	Uni Eropa	18,700	18,700	18,750	18,800	18,800	18,750	10.91	26.36
3	Cina	15,600	15,800	15,600	15,700	15,800	15,700	9.13	35.50
4	Amerika Serikat	10,785	10,779	10,979	10,930	11,045	10,904	6.34	41.84
5	Brazil	11,400	10,500	10,550	10,600	10,670	10,744	6.25	48.09
6	Indonesia	5,400	5,600	6,323	6,378	6,670	6,074	3.53	51.62
7	Rusia	5,700	5,867	5,942	6,077	5,945	5,906	3.44	55.06
8	Pakistan	4,600	4,800	5,100	5,300	5,500	5,060	2.94	58.01
9	Meksiko	4,638	4,703	4,769	4,512	4,678	4,660	2.71	60.72
10	Mesir	2,900	2,930	2,950	3,050	3,100	2,986	1.74	62.45
	Negara lain	61,839	63,005	64,545	66,155	67,126	64,534	37.55	100.00
	Total Dunia	168,062	169,484	171,008	174,002	176,834	171,878	100.00	

Source: http://apps.fas.usda/psdonline/diolah

Based on the table above, there are 5 countries that have an average supply of sugar above 5%, namely India, the European Union, China, the United States and Brazil.

In Indonesia, granulated sugar is a strategic commodity after rice and one of the staple food needs. Therefore, granulated sugar is a source of calories in the structure of public consumption, in the form of solid sucrose which has a calorie content of 394 cal/100g (Directorate of Nutrition, 2018). Sugar does not contain other nutrients, but as part of carbohydrates, it functions as a source of energy for activities and maintains metabolic processes.

According to data from SUSENAS (2018); Wijaya, (2019); Samoggia et al., (2021); Choi et al., (2022) that sugar consumption in Indonesia is divided into direct food or household consumption, special consumption (hotels, restaurants, catering and hospitals), industrial consumption and household industrial consumption. In 2018 consumption of granulated sugar in households decreased by 1.75% or 6.83 kg/capita/year, while in 2019 it also decreased by 3.43% or 6.59/capita/year. For household industrial consumption in 2018 it was 483 thousand tons and 437 thousand tons in 2019. For special consumption, it was 882 thousand tons in 2018 and 851 thousand tons in 2019. Despite a decrease in demand, granulated sugar remains an indispensable sweetener. The total demand for national granulated sugar in 2019 reached 3.6 million tons - 3.7 million tons. Meanwhile, national sugar production increased by 19% in 2019 to 2.5 million tons from 2.1 million tons in 2018. In order to meet demand for public and industrial consumption, the government imported 3.6 million tons for industry and an additional 1.1 million tons.

The increase in imports in 2019 was due to the reduction in the area of sugar cane plantations from 425 ha to 413 ha followed by a decrease in the yield rate and the need to revitalize the sugar factory. Therefore, the government's efforts on the farm side continue to promote the ratoon unloading program. Unloading ratoons (ratoon plant cane) or replanting activities, namely replacing old cane plants that have been squeezed at least 3 times with new seeds using superior varieties that have been recommended. The purpose of unloading the ratoon (ratoon plant cane) is to increase sugarcane productivity and yield.

However, in general, farmers in Gondang Legi District have a tendency to be "reluctant" to unload ratoons, even though sugarcane crops that have been squeezed or harvested more than 4 times cause a decrease in sugarcane production, both in quality and quantity. As with the yield level or sugar content in sugar cane stalks, the best yield that has ever been achieved in this region is 12% but currently it continues to decrease to 4%, and the practice of keprasan or "ratooning" has been carried out in all countries cultivating sugarcane where keprasan (ratooning) occupies almost 50% of the total area (Sundra et al., 2008; Raju Gomathi, 2013). Like the conditions in the research area, farmers prefer to cultivate sugarcane by caring for ratoons or stitching activities, namely only replacing sugarcane seeds that cannot grow so that a new population is obtained. This activity was carried out specifically, namely pressing the stump first, and then embroidering, followed by

fertilizing. Caring for ratoons is carried out continuously without regard to the economic life of the plant.

The purpose of this study was to find out what factors influenced Gondang Legi sugar cane farmers to be willing to unload ratoons as an effort to increase productivity by analyzing social conditions from the perspective of individual farmers, cultivation system, information and economy including land capital and its constraints.

METHODS OF RESEARCH

This research was carried out purposively in 3 villages, namely the villages of Gondanglegi Kulon, Ganjaran and Sukorejo, Gondanglegi District, Malang Regency, East Java Province. The selection of this area was based on the consideration that the area has a large area of sugar cane plantations, the majority of the population is sugarcane farmers and in Malang Regency there are 2 sugar factories, namely the Krebet Sugar Factory and Kebon Agung. However, in the last few years, sugarcane productivity has fluctuated,

By using non-proportional stratified random sampling, it was found that the total sample in this study was 172 farmers. Based on the land area, the distribution is based on the level of keprasan, namely 27 farmers who do keprasan 3-4 times, 43 do keprasan 5-10 times and 102 do keprasan more than 10 times. Data collection was carried out using survey methods and depth interviews.

Using the probit analysis technique or the probit model is a model in which the dependent variable is analyzed with only two values. The main purpose of probability estimation is to determine the category by observing one particular characteristic. The nature of the probit model is a non-linear model, thus estimating with Maximum Liability (ML) for the interpretation of the coefficient values in the probit model and the estimator value is not biased, so it is interpreted directly because the probability value is based on the Z distribution. The probit model equation is as follows:

$$Y_{ij} = X'\beta + \varepsilon$$

Where: Y = depended variable; X = independent variable; β = coefficient parameter; ε = error term.

Based on the equation, binaries are shown with Yij which have a value of 1 and 0 in this study where Y indicates the farmer's decision to unload the ratoon, namely 1 if the farmer is willing to unload the ratoon and 0 for farmers who do not unload the ratoon while the X variable is a socio-economic variable, namely age, sugarcane farming experience, number of family members, number of use of embroidery seeds and area of land controlled by farmers.
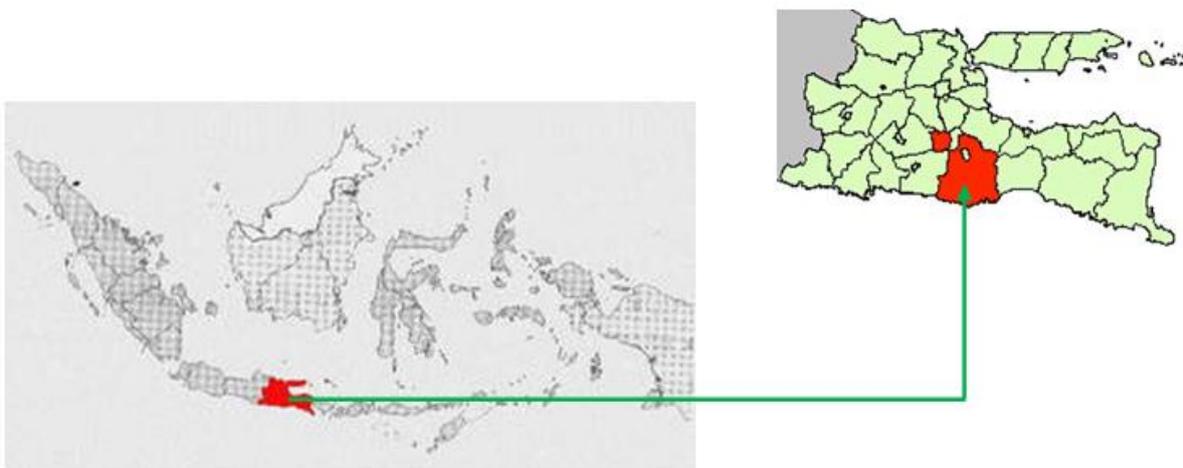

Figure 1 – Map of Gondang Legi District, Malang Regency, East Java

Table 2 – Variables Measurement

No	Variables	Measurement
1.	Farmer's decision (Y)	Farmers unload ratoons (1) and do not unload ratoons (0)
2.	Age of Farmer (X1)	Age of farmer (years)
3.	Farming experience (X2)	Length of time farmers have been cultivating sugar cane (years)
4.	Number of families (X3)	Number of family dependents (people)
5.	Number of use of embroidery seeds (X4)	The use of embroidery seeds to treat ratoon (ku)
6.	Land area (X5)	Sugarcane farming land tenure (ha)

RESULTS AND DISCUSSION

As a general description of the condition of sugarcane farmers in the study area, there are several characteristics of farmers which have been studied in 172 respondent farmers. Based on the age group, it was shown that the average age of sugarcane farmers in the study area was between 40-59 years or around 56.4%, which is categorized as productive age and the average number of family dependents is 4-6 people or 72.7% of the total respondent farmers. Meanwhile, 51.16% of experience in sugarcane farming has more than 19 years of experience, so that sugarcane farmers have been carrying out sugarcane farming for generations. For the number of uses of embroidery seeds, the average sugarcane farmer prepares seeds for embroidery of 1.84 quintals. And for land control most or 69.8% control land 0.01-1 ha.

Table 3 – Model Probit

Independent Variable	Coefficient	Std. Err.	Z	P > |z|	dy/dx
Age	.003123	.0027718	0.25	0.805	.000683
Sugarcane Farming Experience	-.0320285	.0029304	-2.39	* 0.017	-.007009
Number of Family Members	.1719138	.0217519	1.73	** 0.084	.037614
Number of Embroidery Seeds	-.2090346	. 022661	-2.02	* 0.044	-.045737
Land area	.6980827	.0655281	2.33	*0.020	.1527412
Number of Observations =172					
LR Chi^2 = 14,94					
Prob. > chi^2 = 0.0106					

*Source: Primary data processed, 2020. Description: * significant at α = 5%, ** significant at α =10%.*

Table 3 above shows the results of the probit regression analysis related to the factors that influence the decision of sugarcane farmers to unload ratoons. By looking at the changes in the independent variable or (X) and in the study the independent variables consisted of the age of the sugar cane farmer, farming experience, number of family members, number of embroidery seeds and land area. From the results of the analysis, the probit regression model for sugarcane farmers' decisions to unload ratoons is as follows:

$$Pr(z) = -1.462781 + 0,003 X_1 - 0,032 X_2 + 0,171 X_3 - 0,209 X_4 + 0,698 X_5 + \varepsilon$$

Based on the results of the probit analysis, it shows that Pr (z) is the probability of sugarcane farmers to unload ratoons. Furthermore, from the results of this analysis, the aspects that influence sugarcane farmers in the decision to unload ratoons are explained based on variables, namely the age variable does not significantly affect the decision to unload ratoons and has a marginal effect value of 0.00683 meaning that every farmer's age increases by one year, the probability change in decision making for unloading ratoons by 0.683%. The average age of sugarcane farmers in the study area is 50-59 years or 56.4% of the total respondent farmers.

For the farming experience variable, it shows significant negative results, this condition shows an inverse relationship to the decision to unload the ratoon. Farmers with long experience tend not to unload ratoons. Based on observations, the distribution of respondent farmers is farmers who already have experience in farming for more than 19 years because they have cultivated sugar cane for generations and then they feel that there has not been a revitalization of the system at the sugar factory. The marginal effect value of the variable

farming experience is 0.0709, meaning that with increasing experience managing sugar cane farming; farmers experience a decrease in attitude in deciding to unload ratoons by 0.709%.

The socio-economic characteristics of sugarcane farmers that are significant for the decision to unload ratoons are the variable number of family members with a marginal effect value of 0.037614 which means that every time there is an addition of 1 person or person in the family. They think that by increasing the number of family members, they can help manage the sugar cane farming, especially the supply of labor in the family. This increase in the number of workers is very important for making further assessments of sugarcane farming planning, because based on surveys in the field the number of workers or sugarcane farming workers has been decreasing as indicated by the bringing in of farm laborers from outside the study area. This condition led to an increase in production costs while the yield and price of sugar tended to decrease, thus affecting the level of acceptance.

In the research area the use of embroidery seeds is one of the stages in the maintenance of sugarcane plants so that based on the results of the probit analysis it shows that the number of embroidery seeds used for treating ratoons (ratoon cane) has a significant negative value on the decision to unload ratoons so that with the increasing number of use of embroidery seeds, the probability of the decision to unload the ratoon decreased by 4.5737% based on the marginal effect value of 0.045737. On average, farmers in the research area are ratoon cane farmers who prefer ratooning. Embroidery seeds (reserve seeds) are usually taken from the stump of plants that grow well to replace sugarcane plants that cannot grow properly. Based on the results of observations using a continuous number of embroidery seeds will affect the level of sugarcane production and this stage is an option for farmers for sugar cane cultivation because it is considered to save production costs compared to unloading ratoons (ratoon plant cane). Based on Ramburan et al., (2012); Endah et.al (2016); Young, (2018); Zhang et al., (2020); et al., (2020); Prabowo et al., (2021); Jaiswal et al., (2022) The phenomenon of using the ratooning system or the practice of using ratooning for more than ten times has created another problem.

Land area is an important aspect in farming activities, the wider the land controlled by farmers, the higher the income. The results of the probit analysis show that the variable land area has a significant positive value on the decision to unload ratoons, meaning that it has a unidirectional relationship. The marginal effect value is 0.1527412 thus when there is an increase in the cultivated area of sugarcane farming, the tendency for farmers to decide to unload ratoons is 15.27412%. Sugarcane farmers in the research area have a land area ranging from 0.01 to 1 ha, because land ownership is a social status, so when farmers have excess income they will invest part of it to purchase land to increase sugarcane farming control which can trigger increased productivity which impacts income. In line with Goldemberg et al., (2008); Müller et al., (2008); Spiertz & Ewert, (2009); Altieri, (2009); Ajanovic, (2011); Hausman, (2012); Immerzeel et al., (2014); Popp et al., (2014); Hess (2016); Silalertruksa & Gheewala, (2018); Bordonal et al., (2018), that the availability of land will affect the level of sugarcane production because this condition will cause competition with food crops and natural ecosystems.

However, what farmers need to pay attention to is that if only land area is added without any changes in the stages of cultivation according to what is recommended, such as unloading ratoons (ratoon plant cane), then the level of sugarcane production will decrease in accordance with the law of production, namely that initially production increases due to additional land area, it will reduce the amount of production if you only add fixed variables.

CONCLUSION

Sugarcane farmers in the Gondang Legi area are mostly sugarcane farmers (ratooning) on dry land, and the socio-economic aspects that influence the decision to unload ratoons are farming experience, number of family members, number of embroidery seeds and land area. Steps that need to be taken so that sugarcane farmers are motivated to decide to dismantle the ratoon (ratoon plant cane) are increasing capital assistance and input subsidies, assisting sugarcane cultivation and revitalizing the sugar factory system.

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