



Financial Feasibility and Farmers' Response to Citronella Grass Farming and Processing in Simawang Village, Tanah Datar District

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ABSTRACT

Simawang village has been experiencing a drought since the 2000s due to the uncertainty of the seasonal pattern. All paddy fields in the village depend on rain for irrigation. Consequently, paddy farming activities were also disrupted. Some farmers leave their rice fields unplanted, and approximately 60 ha of rice fields in Simawang village have turned into abandoned land. In 2014, the farmers started to plant citronella grass on that abandoned land, and in 2017, they already had a citronella oil distiller. This paper discusses the financial feasibility of citronella grass farming and processing and analyzes the farmers' response to those activities. The research found that citronella grass farming and processing in Simawang village is feasible to be implemented. It can be seen from the NPV, IRR, and B/C ratio values of Rp. 218.438.869, 33,2% and 2,1, respectively. Moreover, the farming and processing payback period is two years and 11 months. The cognitive and affective responses of the farmers to farming and processing are good; meanwhile, the cognitive response is poor. Despite the farmers having good knowledge about farming and processing citronella grass and agreeing that those activities could benefit them economically and environmentally, most have not yet practiced the activities due to land ownership issues.

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1. INTRODUCTION

West Sumatra is one of the essential oil producers in Indonesia. This province has the advantage of fertile land; therefore, it can produce various agricultural commodities, including crucial oil-producing plants. There are at least 12 types of essential oil-producing plants that grow properly in West Sumatra provinces, such as cinnamon, fragrant root, sandalwood, *kemukus*, patchouli, *cananga*, nutmeg, cloves, citronella grass, and eucalyptus. These plants flourished long ago in West Sumatra, even before the introduction of cocoa and oil palm.

One region that has been introduced to citronella grass, one of the essential oil-producing plants, is Simawang village in the district of Tanah Datar. Years ago, this village was well

known as one of the rice producers in the Tanah Datar district. However, in the last 10 years, this region has been experiencing a drought due to the change and uncertainty of wet and dry months due to climate change. (Febriamansyah, Refdinal, Yusmarni, & Hanum, 2012). Consequently, some farmers leave their paddy fields unplanted. In 2008, paddy fields decreased sharply from 245 ha to 185 ha. Therefore, approximately 60 ha of paddy fields have been turned into unplanted and abandoned land. The land is ideal for planting citronella grass based on nutrient content and suitable land analysis.

In 2014, citronella grass was introduced to the farmers in Simawang village. This plant is expected to contribute to the farmers' welfare and land rehabilitation. Later in 2017, a

citronella oil distiller was installed with a capacity of 250 kg of raw citronella grass. The distiller installation supposedly could encourage the farmers to plant more citronella grass on their abandoned land so that it could increase their income. The previous research conducted by (Febriamansyah, Refdinal, Yusmarni, & Hanum, 2012) stated that by unplanted their paddy fields, their income decreased by 35 % but on the other hand, their working time allocation increased significantly from 150,5 person-days per year to 279 person-days per year. Moreover, the volatile oil content test found that the citronella oil yield of Simawang village is relatively high, 0,7% - 0,9%. This result indicates that the productivity of citronella oil will be pretty high, whereas a one-time distillation process of 250 kg citronella grass could produce 1,75 kg – 2,25 kg citronella oil.

Introducing citronella grass and the distiller installation could impact farmers and the community economically when they respond positively to those activities and intend to keep practicing them. Measuring and analyzing the farmers' response can provide information that can be used for development planning in the future. This study will explore the feasibility of citronella farming and processing and measure the farmers' response to those activities.

2. METHODS

The study employed a survey method, and the data were collected from 30 farmers, who consisted of members of the Koto Indah farmers group, non-members who live near citronella grass plantings, and those who planted citronella grass themselves. Generally, this study used descriptive qualitative and quantitative research methods to answer the research objectives.

Quantitative research method used to analyze the financial feasibility, and the data were analyzed using investment criteria assessment, which consists of Net present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (B/C), and Pay Back Period. The data analyzed are costs and benefits, which are calculated in ha during the productive period. Meanwhile, the qualitative research was used to measure the farmers' response. The farmers' responses are differentiated into three groups, namely cognitive, affective, and conative.

3. RESULTS AND DISCUSSION

3.1. Overview of Simawang Village

Administratively, Simawang village is a part of the Rambatan sub-district of the Tanah Datar district. This region has a population of 9.000 people, which consists of 1.952 families. Simawang village is divided into eight sub-villages, which are Koto Gadang, Darek, Baduih, Padang Data, Ombilin, Batulimbak, Pincuran, Tujuh, and Piliang Bendang, with a total area of 5.400 ha. The village is situated on the west side of Singkarak Lake, on the backside of Bukit Barisan hill. The backside of Bukit Barisan hill is the rain shadow area, with the characteristic that the area is relatively drier than the other side.

Most people in Simawang make their livelihoods in paddy farming. All paddy fields in this region use rain as irrigation because of the shortage of water resources and the region's location. Based on the 2015 data of the Raskin (Rice for people with low incomes) program receiver, a quarter of the Simawang population was the receiver of the program. The data imply that a quarter of the population lived in poverty.

3.2. Financial Feasibility Analysis

3.2.1. Assumption

Basic assumptions are required to simplify and clarify the calculation to analyze the financial feasibility. The basic assumptions used in this study are:

- The business period is 7 years. The business period is based on the productive period of citronella grass.
- The estimation of increased production is based on the previous research conducted by Daswir and Kusuma (2006)
- The age of citronella grass in Simawang village is 4 years
- The average weight of one clump of citronella grass is 4.5, with row spacing of 1x1 m.
- The output price used in this analysis is constant until the end of the business period. The price used is the price in 2017.
- The average yield of citronella oil is 0,7 %
- The discount rate used is 9%

3.2.2. Investment criteria

The assessment of investment criteria to analyze the financial aspect of a business consists of Net Present Value (NPV), Benefit-Cost ratio (B/C), Internal Rate of Return (IRR), and Payback Period (PP). The assessment result can be seen in Table 1.

Table1. The Calculation of Investment Criteria

Feasibility criteria	Value
Net present value (NPV) (Rp)	218.438.869
Benefit-cost ratio (B/C)	2,8
Internal rate of return (%)	33,2
Payback period	2 years 11 months
Conclusion	Feasible

The feasibility calculation showed that citronella farming and processing in Simawang village was feasible to be implemented. This result was due to the relatively high productivity and price of citronella grass and oil. One clump of citronella grass in the research area can produce approximately 7,5 kg of grass, and the highest oil yield was 0,9 percent (the average yield was 0,7 percent). This calculation used the constant output price (citronella oil) until the end of the business period, and the average price received by farmers in Tanah Datar and Solok districts in 2017 was Rp 155.000/ kg. Although the price is slightly lower than in 2018 (Rp 180.000 – Rp 200.000 per kg), these activities are still profitable and should be considered for development.

3.3. The Factors Affecting Farmers' Response

3.3.1. Internal factors

The internal factors analysed in this study are the age of the farmers, their formal and informal education, income, and the size of their families.

Table 2. Internal Factors Affecting The Farmers' Response

Variable	score	Respondent (people)	Percentage (%)
a. Age			
> 65	3	7	23,3
48 – 65	2	12	40,0
<48	1	11	36,7
b. Formal Education			
≥ Diploma	3	2	6,7
Middle school– high school	2	12	40,0
Not attending school – Elmt. school	1	16	53,3
c. Informal Education			
Attending > 1 training and	3	7	23,3
Attending = 1 training	2	12	40,0
None	1	11	36,7
d. Income			
> Rp 9000.000	3	0	0,0
Rp 5000.000 – Rp 9000.000	2	3	10,0
< Rp 5000.000	1	27	90,0
e. Number of family member			
> 5 orang	3	4	13,3
3 – 5 orang	2	10	33,3
< 3 orang	1	16	53,3

Table 2 shows that despite most of the farmer respondents being in the productive age, they have a low level of education. This could influence the farmers' way of thinking and productivity. Informal education is the training and counselling held by Universitas Andalas, extension agents, and Balittro. Most respondents have attended the training at least once, which could influence their way of thinking. Moreover, 90 % of respondents earned less than Rp 5000.000/month, and most have less than five family members. Income and the number of family members can influence the motivation of farmers to conduct their activities.

3.3.2. External factors

The external factors are those not under individual farmers' control when responding to a stimulus. The external factors analyzed in this study are the expected benefits, the time interval to obtain benefits, the sacrifice incurred to get the benefits, and the availability of land.

The expected benefits are the benefits that farmers could receive through additional income and land rehabilitation. Table 3 shows that the majority of respondents have a desire to earn those benefits. This is closely related to the condition of the majority of farmers' income, which is low, so they need other sources of revenue to improve their welfare.

In terms of time interval to obtain benefits, more than half of the respondents (57%) stated that citronella grass is faster than paddy. In the first year, citronella can be harvested twice; for the next 6 years, it can be harvested 3 times a year. Compared to paddy, the farmers can only harvest it once a year under the current conditions.

Regarding the sacrifice incurred to obtain benefits, most farmers (93%) stated that citronella grass farming requires less sacrifice than paddy farming. Citronella grass farming does not require significant costs, time, or effort. Moreover, the majority of farmers (97 percent) had the desire to cultivate citronella grass. However, only 57 percent have available land to be planted with citronella grass, while 40 percent do not have their land.

Table 3. External Factors Affecting The Farmers' Response

Variable	Interval	Respondent (people)	Percentage (%)
a. The expected benefits			
High	> 4,6 - 5,9	28	93
Mid	> 3,3 - 4,6	-	-
Low	2 - 3,3	2	7
b. Interval to obtain benefits			
Faster than paddy farming	3	17	57
same with paddy farming	2	4	13
Longer than paddy farming	1	9	30
c. The sacrifice incurred			
Higher than paddy farming	2 - 3,3	2	7
same with paddy farming	> 3,3 - 4,6	-	-
Less than paddy farming	> 4,6 - 5,9	28	93
d. The availability of land			
Own unplanted land and have desire to plant citronella grass	3	17	57
Do not own unplanted land and have desire to plant citronella grass	2	12	40
Do not own unplanted land and do not have desire to plant citronella grass	1	1	3

3.4. Farmers' Response

Response is a reaction or any behaviour that results from a stimulus. Responses can be classified into three groups, namely cognitive response (level of understanding), affective response (attitudes or interest), and conative response(action). The response of farmers in Nagari Simawang to the cultivation and processing of citronella grass is as follows:

3.4.1. Cognitive response

The cognitive response is the level of farmers' understanding of the cultivation and processing of citronella grass. The study found that the farmers' cognitive response was good, with a score of 14.3, which means most respondents have good knowledge regarding citronella grass. Fifty-two percent of farmers know the difference between citronella grass and lemongrass. They also learn about the output of citronella grass, derivative products that can be produced from it, and the cultivation technique of citronella grass. Moreover, more than half of the farmers know citronella grass's tangible and intangible benefits.

Furthermore, 13 percent of respondents do not know citronella grass. This is possibly due to the intensity of their attendance at the training/ counselling. Thirty-seven percent of respondents had never attended the training and counselling held by Universitas Andalas, extension agents, and Balitro from 2014 to 2018.

3.4.2. Affective response

The affective response is the farmer's attitude toward citronella grass cultivation and processing. The affective response of the farmers was in the category of good with a score of 13,9. The score implies that most of the farmers agreed that citronella grass cultivation and processing provide benefits for them both economically and environmentally. Moreover, citronella cultivation does not require high cost, effort, and working time. This plant can easily grow without overly complicated maintenance.

The majority of the respondents (63percent) had attended the training and counselling of citronella grass cultivation and processing; as a result, most of them know that the cultivation is not too complicated. The farmers only occasionally applied organic fertilizer and weeding when weeds have grown high. Furthermore, citronella grass of Simawang village can produce 4,5 - 7,5 kg of grass per clump. This means that for a one-time refining process, the farmers only need to harvest 44 clumps of citronella grass, producing 1,75 kg – 2,25 kg of oil.

3.4.3. Conative response

The conative response is the farmers' action in practicing the cultivation and processing of citronella grass. The farmers' conative response was low with a score of 2,4. This score indicates that most farmers have not practiced cultivation and processing. Only 17 percent of farmers practice the cultivation and processing of citronella grass. Regarding land ownership, 57 percent of the farmers have unplanted land that can be planted with citronella grass.

However, the research found that their conative response was low and they had not yet cultivated their land with citronella grass. There are two reasons for this condition: first, despite the probability of high crop failure, most farmers still expect that their paddy fields will still be able to produce, so they do not need to buy rice for the next few months. Secondly, the time lag between introducing citronella grass and installing the citronella oil distiller was relatively long. Consequently, farmers leave their crops unharvested or return them to rice or other crops.

In addition, the low conative response is that 40 percent of respondents do not have unplanted land, yet desire to cultivate citronella grass. Some parts of the unplanted land in Semarang village are owned by people who mostly do not live in the area (migrate or move to other places). So, to cultivate the land with citronella grass, they must pay rent or make a specific agreement with the land owner. As 90

percent of the farmers have low income, it will be difficult for them to do so.

4. CONCLUSIONS

As a result of the change and uncertainty of the season pattern, approximately 60 ha of paddy fields in Semarang village have turned into unplanted land. In 2014, citronella grass was introduced to the farmers to provide economic and environmental benefits. A financial feasibility analysis found that citronella grass farming and processing in Simawang village is feasible. This result was due to the relatively high productivity and price of citronella grass and oil.

In addition, this study measures the farmers' response to citronella farming and processing. The finding showed that farmers' cognitive and affective reactions to citronella grass farming and processing are good; meanwhile, the conative response is poor. Although the farmers have good knowledge about farming and processing citronella grass and agree that those activities could benefit them economically and environmentally, most of them have not yet practiced the activities due to land ownership issues.

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