



# Feasibility Study of Citronella Agribusiness

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**Abstract.** Kedungrandu Village, Patikraja District, is one of the villages in Banyumas Regency where there is a citronella cultivation and there is a small-scale distillery in the village. This study aims to analyze the income and feasibility level of citronella farming in Banyumas Regency. The research was collected in 2021. The quantitative research method was carried out by survey where the sample was taken by census. The respondents collect in this study is 40 farmers. Data analysis with economic feasibility of citronella cultivation. The results showed that the citronella commodity is the base commodity of Patikraja District compared to other areas in Banyumas Regency. The partnership pattern of citronella farming with the processing industry is an agribusiness operational partnership, where farmers play a role in providing raw materials and partner companies provide production inputs (seedlings). The cost of production of citronella farming in the research location is Rp. 1,321/kg. Citronella farming is feasible to cultivate, it can be seen from the value of the R/C ratio which is worth more than 1.

**Keywords:** citronella farming · economic feasibility · revenue

## 1 Introduction

The Citronella (*Cymbopogon nardus*) is one type of essential oil plant that is classified as having developed from the distillation of the leaves, which is obtained by fragrant citronella oil which in the world of trade is known as Citronella Oil [1]. Indonesian citronella oil in the world market is known as Citronella Oil of Java [2]. Citronella can be an alternative that can be used for development on dry land and sub-optimal land [3–5]. The nature of its ease of being able and easy to grow in various conditions is characterized by its special morphological characters such as long fibrous roots and clumps that are easy to grow such as weeds, long and pointed leaves that require relatively less water and are able to adapt in several conditions so that this plant has economic value prospect that deserve to be taken into account [6, 7].

The main problem of Indonesia's essential oil commodities in the international market is the quality and instability of supply [8]. This is mainly because most essential oil production businesses are still run very simply, both in plant cultivation and in product processing [9, 10]. In addition, the efficiency and effectiveness of essential oil agribusiness is still relatively low [11]. Indonesia as one of the essential oil exporting countries

[12]. Indonesia continues to strive to develop the production, quality and added value of essential oils and their derivatives as well as their competitiveness which will continue to strengthen [11, 12].

Indonesia is also an export commodity that is worth US \$ 500 million per year [13]. Essential oil received considerable attention from the Indonesian government [12]. Until now Indonesia has only produced nine types of essential oils, namely: clove oil, memento oil, patchouli oil, vetiver oil, nutmeg oil, eucalyptus oil and citronella oil [11]. These nine types of essential oils contain some of the most prominent types of oils in Indonesia, namely: nutmeg oil, patchouli oil, clove oil and citronella oil [14]. Citronella oil is a commodity in the agribusiness sector that has a good market and strong competitiveness in foreign markets [15].

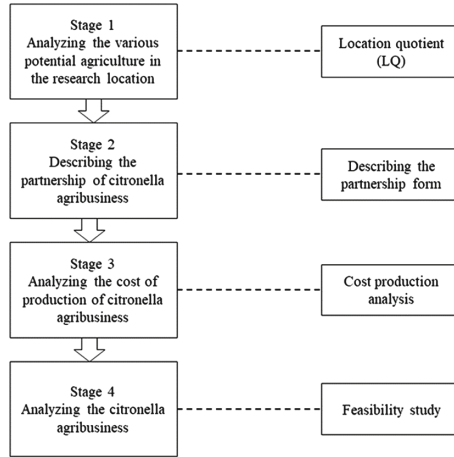
One of the districts in Central Java that has high potential to develop citronella oil is Banyumas Regency. Banyumas Regency is a potential area for cultivation and development of citronella oil. In this district there is an essential oil processing plant capable of exporting 3,000 tons per year [12]. Generally citronella in this place is grown on plantation lands, both on people's plantations and on government property. One of the plantation lands planted with citronella plants is in Kedungrandu Village, Patikraja District.

Kedungrandu Village has the largest community plantation land in Patikraja District, which is 33.5 hectares [16]. Of the land area an area of 3.6 hectares is cultivated with citronella plants and the rest is a lot of vacant land. The land is plantation land belonging to the Class II Correctional Center (Bapas) of Purwokerto which is managed and collaborated with PT Dewara Nusa Jaya. The plantation land has been planted with citronella and each year it can be harvested 3 times from the same land. In terms of production, citronella plantations in Kedungrandu Village per 1 hectare can produce as much as 10 tons of wet leaves, and increase in the second year to 15 tons to 20 tons per harvest. In addition, in the following year citronella fields can also be harvested 4 times a year. The problem in research location are; 1) bargaining power of farmers towards existing partnerships is very weak; and 2) the interest of farmers in cultivating citronella is not too much but the potential of the area to support the development of citronella commodities.

Research related to the feasibility of citronella farming in Banyumas Regency needs special attention. In addition, the income of farmers who cultivate citronella plants also needs to be investigated. The purpose of the study are: 1) analyze the potential agriculture commodity in research location, 2) identified the partnership pattern of citronella agribusiness in research location, 3) analyze the cost of production of citronella agribusiness, and 4) analyzing the feasibility of citronella agribusiness.

## 2 Research Method

This research was conducted in Banyumas Regency, precisely in Kedungrandu Village, Patikraja District. The location was determined purposively, with the consideration that the location is a citronella -producing village and is a fostered village of the Faculty of Agriculture, Jenderal Soedirman University. The target of this research is the farmers who cultivate the citronella Kedungrandu, Patikraja District, Banyumas Regency. The



**Fig. 1.** Research diagram of citronella agribusiness.

time of the research was carried out in July-August 2021. The respondents were chosen deliberately, namely farmers who carried out citronella farming in 2020. The method of determining respondents was using the census method, meaning that all farmers were used as respondents in this study [17]. If the total population is less than 100 people, then the total number of samples is taken [18].

The method of analysis uses the calculation of income, B/C Ratio and R/C Ratio. Income is Farming income is the difference between total revenue and total cost measured in rupiah (Rp) [19]. The B/C ratio analysis is a comparison between the level of profit or income obtained with the total costs incurred [20]. R/C ratio is a comparison between total revenue and total cost [20].

This research was carried out in several stages. The stages carried out in this research are: 1) analyzing the potential of agricultural commodities at the research site, 2) identifying the partnership pattern of citronella agribusiness, 3) analyzing the production costs of citronella agribusiness, and 4) analyzing the feasibility of citronella agribusiness. The stages of this research are shown in Fig. 1.

$$LQ_{ij} = \frac{(X_{ij}/X_i)}{(X_j/X)} \quad (1)$$

where:

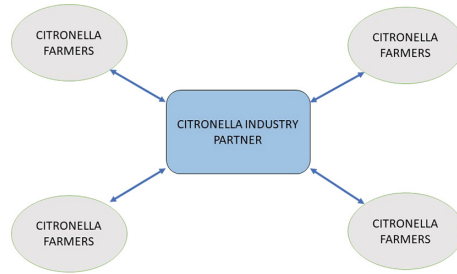
$LQ_{ij}$  = index of coefficient for research location of  $i$  village and  $j$  commodity (citronella).

$X_{ij}$  = number of production of for each  $j$  commodity in  $i$  village.

$X_i$  = total number of production in  $i$  village.

$X_j$  = total number of production for  $j$  commodity in the district.

$X$  = total number of production for all agricultural commodities in the district.



**Fig. 2.** Illustration of partnership pattern in citronella agribusiness in research location.

### 3 Result and Discussion

#### 3.1 Potential of Plantation Commodity Basis

Location Quotient (LQ) method used to see basic commodity and non-basic commodity from an area and can be used to identify potential commodities, which have comparative superiority in the locations. Assessment criteria to the determination of basic and non-basic level as follow: if index score of LQ is larger or equal than one ( $LQ > 1$ ), then, the sector is basic sector. In contrast, if index score of LQ is less than one ( $LQ < 1$ ), then the sector is non-basic commodities [21].

Research result to the potential plantation sector commodities basis with economic value in Banyumas Regency based on LQ calculation as well as seen from discussion result to the related Departments obtained that the potential commodities that suggested to be developed in Patikraja district are Citronella and Coconut; in Cilongok District are Coconut and Coffee beans; in Somagede District are Coconut and Rubber; in Pekuncen District are Coffee beans and tea leaf; in Kedungbanteng District is Coconut and Cacao beans; in Kalibagor District are Coconut and Sugar cane; and in Rawalo District are Coconut and Tobbaco. Table 1 describe the result of LQ analysis in plantation sector commodities basis in Banyumas Regency.

#### 3.2 Partnership Pattern of Citronella Agribusiness

Citronella farming at the research location collaborates with the processing industry. The cooperation that exists between farmers and partners, namely the partner industry only plays a role in providing seeds to partner farmers. The supply of citronella seeds by partner industries is on a loan basis. Farmers must return the cost of procuring seed input by cutting the selling price of citronella to partner industries. The role of other partner industries is to provide market certainty for farmers.

**Table 1.** The LQ result of plantation sector commodities basis in Banyumas Regency

No.	District	LQ value	Plantation sector commodities basis
1.	Patikraja	$\geq 1$	Citronella, Coconut
2.	Cilongok	$\geq 1$	Coconut, Coffee beans
3.	Somagede	$\geq 1$	Coconut, Rubber
4.	Pekuncen	$\geq 1$	Coffee beans, Tea leaf
5.	Kedungbanteng	$\geq 1$	Coconut, Cacao beans
6.	Kalibagor	$\geq 1$	Coconut, Sugar cane
7.	Rawalo	$\geq 1$	Coconut, Tobbaco

Source: Primary data.

The advantages obtained by farmers through this partnership pattern are: 1) the creation of interdependence and mutual benefit; 2) an increase in business; and 3) can encourage economic development. In addition to having advantages, this partnership pattern also has weaknesses. Weaknesses of this partnership pattern are: 1) Profit taking by partner companies that handle aspects of marketing and product processing is too large, so that small business groups feel that they are not fair; 2) Partner companies tend to be monopsony so as to reduce the profits obtained by small partner companies; and 3) There is no third party that has an effective role in solving the problem. One solution that can be taken in overcoming the problem of the KOA partnership pattern is by humanistic and familial settlement. The illustration of partnership between farmers and partner industries can be seen in Fig. 2.

### 3.3 Cost of Production of Citronella Farming

Leaf production in the first year reached 18 tons/ha. This production is higher than the potential production of Mahapengiri accession, which is 10–12 tons/ha [22], but lower than lemongrass cultivated in the Philippines which produces leaves as much as 25 tons/ha [23], in India with a yield of 20 tons/ha [24], and from the superior variety Serai Wangi 1 which is recommended to be developed in lowland areas according to Minister of Agriculture Decree no. 627/Kpts/TP/240/11/92, which is 46 tons/ha/year. In Table 2 it can be seen that the cost of production of citronella leaves is Rp. 1,321.00/kg which is higher than the cost of citronella which was developed in the Manoko area, which is Rp. 250.00 kg [25]. The costs incurred to produce citronella leaves consist of labor costs (34%), materials and equipment costs (23%) and land rent (43%). The largest proportion in the formation of the cost of citronella leaves is for land rent. Reducing the cost of plant seeds can be done by collaborating with essential oil refiners, thus the cost of producing citronella leaves can be reduced. Citronella farming through collaboration with essential oil refiners can reduce the cost of leaves to Rp758.59/kg.

**Table 2.** Average cost price of citronella farming per hectare of production in the research location

No.	Description	Unit	Quantity	Percentage (%)
I.	Fixed Cost			
1.	Equipment depreciation cost	Rp/years	2,293,333	9.65
2.	Land rent	Rp/years	1,800,000	7.57
II.	Variable cost			
1.	Seeds	Rp	13,650,000	57.42
2.	Fertilizer	Rp	0	
3.	Labour	Rp	6,030,000	25.36
III.	Total cost	Rp	23,773,333	-
IV.	Production	Kg	18,000	-
	Cost per kg	Rp	1,321	-

Source: Primary data.

**Table 3.** Group two citronella farmer

Number of respondent (people)	Land (M <sup>2</sup> )	Revenue (Rp)	B/C Ratio	R/C Ratio
12	3.579	298.702	0,97	2,0

Source: Primary data.

### 3.4 Analysis Economics Feasibility of Citronella Farming

The farmers who cultivate the citronella plant are divided into 3 groups such as group one is farmers who have not yet produced, group two is farmers early harvest, and group three farmers who have harvested four times.

Group one is farmers who have not been able to harvest, there are as many as 20 people. These farmers are those who have just tried to cultivate citronella in the land provided by the prison. So they have not received the results of their hard work planting the fragrant citronella. New farmers incur costs to cultivate the soil and plant care. For the cultivation of citronella, farmers are given seeds directly from PT Dewara Nusa Jaya. In addition to seeds, the company also provides free fertilizer. The fertilizer given is organic fertilizer. Giving as much fertilizer as containing nitrogen and phosphorus for each citronella plant in a pot for 10 days was able to show progress [10]. PT Dewara Nusa Jaya provides training and assistance to inmates' farmers so that they can return to earning income after leaving the correctional institution. When the harvest arrives, the results of the fragrant citronella are bought by PT Dewara Nusa Jaya for further distillation to take the fragrant citronella oil.

Group two is farmers who have only harvested once and received only one income. These farmers have been cultivating for 5 months on average. Farmers are given free seeds and fertilizers by the company, then the land and seeds are processed by the farmers themselves. When it can be harvested, the fragrant citronella is sold back to the company.

Table 3 shows that average farmer have the revenue until Rp 298,702 in land cultivation 3579 m<sup>2</sup>. But farmers who have a land area of 2700 m<sup>2</sup> have income above Rp. 200,000, - with the benefits received are still below 1. This means that the benefits obtained from the cultivation of fragrant citronella farming have not been felt by farmers. Meanwhile, one farmer who owns 12,950 m<sup>2</sup> of land can already feel the benefits of citronella cultivation because the B/C Ratio is more than one. The R/C Ratio from group two is said to be feasible because the value reaches more than 1 for citronella farming.

The third group of farmers are citronella farmers who have harvested 4 times. In the first harvest stage, the average income of farmers is still low compared to the income in the second, third and fourth harvests. Likewise with the B/C value, the first harvest of 6 people has not received the perceived results, but the citronella farming that is being carried out is feasible to continue. Starting from the first harvest to the next harvest there is an increase and at the end of the harvest or harvest the four farmers receive income up to double that of the first harvest. The first harvest of citronella in the Philippines also showed an increase in income [9].

The results of citronella cultivation show good results for early cultivators. In addition to receiving land assistance from Pemasarakatan Kelas II (Bapas) of Purwokerto which was managed and collaborated with PT Dewara Nusa Jaya. Cultivators can receive sufficient yields to meet their daily needs. Judging from the feasibility of cultivating citronella from harvest once it is feasible to continue. Citronella cultivation is able to harvest 4 times a year, so when the harvest has reached 4 times, farmers will receive high income. Citronella plants have economic and financial feasibility supported by superior seeds, cultivation technology and distillation technology [3].

The implication of this citronella farming research is that this cultivation can be carried out on damaged or unutilized soil. In addition, farmers know that citronella cultivation can be done in the land around them and generate a decent income for their daily life. The assistance from the Pemasarakatan Kelas II (Bapas) of Purwokerto which was managed and collaborated with PT Dewara Nusa Jaya was able to encourage farmers to be active again after being released from prison. Cooperation with the citronella oil refinery, makes farmers not afraid to continue cultivation because the harvest can be sold immediately.

## 4 Conclusion

From the result we can conclude that the citronella commodity is the base commodity of Patikraja District compared to other areas in Banyumas Regency. The partnership pattern of citronella farming with the processing industry is an agribusiness operational partnership, where farmers play a role in providing raw materials and partner companies provide production inputs (seedlings). The cost of production of citronella farming in the research location is Rp. 1,321/kg.

Cultivation of citronella can be done on axle-resistant and marginal. Citronella can be harvested in one planting, reaching 4 seasons in one year. There are 3 groups of farmers who are categorized based on the number of harvests that have occurred, namely farmers who have not harvested, farmers who have harvested once and farmers who have harvested 4 times. The income obtained by the fragrant citronella farmers who have harvested 4 times reaches Rp. 1,258,167.

At the peak of the harvest. The R/C ratio reaches more than 1, which means that this citronella cultivation is feasible to continue. Meanwhile, farmers who only received the fragrant citronella harvest once received an income of Rp. 298,702 with an R/C ratio already above 1 or it was feasible even though it was only the first harvest. Farmers who have not harvested because they have just planted citronella.

**Acknowledgments.** We would like to thank LPPM Jenderal Soedirman University for providing research funding. This research is part of the funding for Institutional Research (RISIN) at Jenderal Soedirman University in 2021.

## Appendix 1

See Table 4.

**Table 4.** Result of R/C ratio, B/C ratio and revenue of citronella farmers in research location

No. Resp	Land (m <sup>2</sup> )	Harvest 1			Harvest 2			Harvest 3			Harvest 4		
		R*	B/C	R/C	R*	B/C	R/C	R*	B/C	R/C	R*	B/C	R/C
1	10,000	758,500	1.0	2.0	1,322,250	4.8	5.8	1,722,250	6.2	7.2	1,722,250	6.2	7.2
2	10,000	816,000	1.0	2.0	1,311,000	4.5	5.5	1,711,000	5.9	6.9	1,711,000	5.9	6.9
3	3,000	200,500	0.7	1.7	301,750	1.7	2.7	421,750	2.4	3.4	421,750	2.4	3.4
4	2,000	102,500	0.3	1.3	243,750	1.2	2.2	283,750	1.4	2.4	283,750	1.4	2.4
5	3,000	143,500	0.5	1.5	284,750	1.5	2.5	404,750	2.1	3.1	404,750	2.1	3.1
6	3,000	102,500	0.3	1.3	283,750	1.4	2.4	403,750	2.1	3.1	403,750	2.1	3.1
7	2,000	103,500	0.3	1.3	244,750	1.3	2.3	284,750	1.5	2.5	284,750	1.5	2.5
8	3,000	208,500	0.8	1.8	309,750	1.8	2.8	429,750	2.5	3.5	429,750	2.5	3.5

R\* = Revenue.

Source: Primary data.



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