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Is it More Profitable to Sell Ground Coffee?: Differential Cost Analysis of Robusta Coffee Farms in Tanggamus District

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Abstract

Robusta coffee is a superior commodity from Tanggamus District which has promising market opportunities.The research was conducted in one of the Robusta coffee centers in Tanggamus District, in Argopeni and Datarajan village, Sumberejo and Ulubelu sub-district. The purposes of this research were (1) to determine the income and profits of grade 4 coffee farmers in Robusta coffee plantations in Tanggamus Regency, (2) to find out the best decision for farmers in continuing process of grade 4 coffee into ground coffee. The sampling technique of this research used purposive from 68 coffee farmers. The techniques of data collection were structured interviews using questionnaires and direct observation. Farm business analysis was used to determine the income and profits of coffee bean farmers, differential analysis was used for the best decision to sell coffee beans or to process them into ground coffee. The results of the study showed that coffee farm bussiness of the grade 4 coffee coffee beans earned Rp24,532,081/ year and earned a profit of Rp10,503,837/1.390 kg/year farmers are better if they continue the production process from the grade 4 coffee into ground coffee. The further processing of ground coffee earned profit of Rp33,002,568/year.

Keywords: Differential analysis, income, profit, Robusta coffee

INTRODUCTION

Coffee is one of the export commodities that plays an important role in the national economy. Coffee is one of the plantations that has long been cultivated in Indonesia. Apart from being a source of people's income, it is also a source of employment and a source of foreign exchange income. Coffee is the second most important export commodity in global trade after petroleum (Saragih, 2016).

The centers of coffee production in Indonesia, Sumatra, Java and Sulawesi have a large percentage of coffee area at the national level, compared to other islands. This is certainly inseparable role of the provinces in Sumatra, such as Lampung, South Sumatra, and Bengkulu, which are the main Robusta coffee producing regions in Indonesia (PDIP, 2016). This coffee is generally sold in the form of seeds to be exported abroad. While a small portion of coffee beans are processed into ground coffee which is served as a drink. The ground coffee has good prospects because the consumption of coffee tends to increase from time to time. Furthermore, the price of ground coffee tends to be stable

and the rate of price increase is equivalent to inflation (Riwayati *et al*., 2016).

The high and low income of coffee farmers is influenced by the production of coffee beans, the selling price and the costs production that are spent during the process of production (Amisan *et al*., 2017). Joachim & Djuwendah (2018) said that the costs production and income of coffee farming received by farmers depends on the area of land that they manage.

Every year the income of coffee farmers is uncertain, depending on the climate and production of the coffee. Amir *et al.* (2017) states that the income of coffee farmers per year can be said to be low, this is due to several influencing factors, such us the selling price of coffee is low and the weather is uncertain which causing the coffee production is not optimal. Therefore, it is necessary to increase the income of farmers by conducting research on using differential cost analysis to make a decision whether farmers should sell coffee from the grade 4 coffee or sell the coffee after processing them into ground coffee. Grade 4 coffee robusta is coffee beans that have fulfilled the quality requirements based on the value of the defect system. There are two types, namely, grade 4a, the number of defects is 45-60, grade 4b is the number of defects 61-80 (Rukmana, 2014). Ground coffee is widely produced by the community both in small and large industries which are done manually or mechanically. The process of making ground coffee starts from the roasting process and ends with a reduction in size, where the roasting of coffee aims to develop the taste, aroma, color, and moisture content (Syah *et al*., 2013).

This research was supported by the research of Yurhaya & Rauf (2016) which found that ground coffee has good market prospects and opportunities. Ground coffee has great added value in increasing income for those who manage it. The research conducted by Hariyati (2014) stated that farmers have a high motivation to process coffee beans into ground coffee.

Resvita (2016) stated that processing coffee beans into ground coffee needs to be done as an effort to restore and to improve the economy of coffee farmers. Processed ground coffee provides a promising business opportunity because it is inseparable from the hobby of the people who like to consume coffee with a distinctive taste, aroma, and have its own benefits for coffee lovers. Aklimawati *et al*. (2014) explained that the grade 4 coffee consisted of several forms, namely large, medium, and small. The uniformity of seed size is one of the general quality criteria that consumers consider to buy coffee beans. Grade 4 robusta coffee is supported by a process which makes a fairly good flavor. Making grade 1 quality on grade 4 of Robusta coffee is done through sorting by removing broken seeds, coffee skin, black seeds, cocoa beans, and perforated seeds.

In Tanggamus District, especially in the Sub-district of Ulubelu and Sumberejo coffee farmers sell coffee in the form of grade 4 coffee. In an effort to increase the income of coffee farmers, it is necessary to make a decision, which is farmers should sell coffee in the form of grade 4 coffee or in further process. Most of researches are usually stopedin the income of coffee beans and sells in the form of ground coffee. The novelty of this research wasthe farmers can be assisted in the decision to sell in the form of grade 4 coffee or in further processing. From the description above, a study will be carried out to determine the income and profits of grade 4 coffee farmers in robusta coffee plantations and to find out the best decision of farmers whether to continue processing grade 4 coffee into ground coffee.

MATERIALS AND METHODS

The basic method used in this research was descriptive analysis. This study also uses quantitative analysis which was differential accounting information. The determination of research location and sampling collectionused purposive technique. The number of respondents sampled were 68 farmers which sells grade 4 Robusta coffee. The coffee population at the research site used a spacing of 2.0 m x 2.5 m with a population of coffee trees about 2,000 tree/ha. The number of respondents in each village was determined using the Slovin formula.

The determination of the number of samples according to Soewadji (2012), can be done using the Slovin formula:

$$n = \frac{N}{1+Ne^2}$$

N = The number of respondents samples that are taken
n = Coffee population
e = Tolerance of inaccuracy (in percent, $\alpha = 10\%$)

$$n = \frac{220}{1+220\ (10\%)^2} = 68 \text{ coffee farmers}$$

There are 37 farmers in Datarajan Village, Ulubelu Sub-district, and 31 farmers in Argopeni Village, Sumberejo Sub-district. Village selection is based on the consideration that the village is producing Robusta coffee in Tanggamus Regency.

Production costs are divided into variable costs and fixed costs. Variable costs are costs for which the total amount will change in proportion to the volume of activities. Fixed costs are costs for which the total amount remains constant and not affected by the volume of activity.

To find out the total revenue in one period of coffee planting can be determined using the following formula:

$$TR = Q \times P$$

Information:
TR = Total Revenue (Rp)
Q = Total Production (Kg) / *Quantity*
P = Price (Rp)

To find out the income of farmers, the data analysis using analysis of farm income which calculated using this formulation:

$$I = TR - TC$$

Information:
I = The income of farming bussiness (income)
TR = Total revenue
TC = Total cost (Explicite cost)

Stages of differential cost analysis are by fiestly calculating the company production costs, by comparing production costs when selling direct grade 4 coffee or by further processing into ground coffee. Secoundly, by grouping the costs included in the production costs of farmers from grade 4 coffee coffee and processing ground coffee. Thirdly, by comparing each production cost by using alternative cost comparisons on direct grade 4 coffee or further processing into ground coffee.

RESULTS AND DISCUSSION

Respondents Description

Farmers' identity illustrates the characteristics of farmers who can influence the of farming's management. In this study the characteristics of respondents included age, education level, farming experience and number of family. Respondents who were taken in this study were farmers in Robusta coffee plantations that sell in the form of grade 4 coffee. Respondents description can be seen in Table 1.

Based on the results of the study most of respondents were between the ages of 20–40 years with the highest level of education at the junior secondary level. Age and level

Table 1. Respondents profile

	Description	Number (people)	Percentage, %
Age	20–40th years old	36	52.93
	41–50th years old	23	33.82
	51–60th years old	9	13.23
Education level	SD	18	26.47
	SLTP	27	39.70
	SLTA	19	27.93
	Sarjana	4	5.88
Farming experience	1–10 years	13	19.11
	11–20 years	40	58.82
	21–40 years	15	22.05
Number of family	2	6	10.16
	3–5	59	86.76
	>6	3	4.41

of education influence the success of a business. At productive age farmers will be more courageous in facing challenges. The level of education influences the mindset and ability to accept technology adoption which will increase the productivity in business and be able to increase the income.

The farming experience is the length of time someone has worked on farming industries. The farming experience of respondents was mostly between 11–20 years. The longer a farmer manages his farm, the more his experience which will influence his attitudes and actions infarming decision making.

The average number of farmer families is between 3–5 people. The consequences of a large number of farmer families will also cause a large total expenditure.

Robusta Coffee Productivity

Robusta coffee production in a year has only one harvest season, which is between April and September. The average production and productivity of Robusta coffee can be seen in Table 2.

Tabel 2. The average land area, production and productivity of Robusta coffee/year

Description	Value
Land area (ha)	1.33
Coffee production (kg)	1,390
Productivity (kg/ha)	1,056

The average land area of Robusta coffee farmers is 1.33 ha, with this area of production farmers obtained 1.390 kg of grade 4 coffee. Grade 4 coffee is coffee that is still mixed with the skin, the seeds are not even, deform, and still have a fairly high moisture content. The productivity of Robusta coffee is 1,056 kg/ha. This result is still considered low because it is still below the standard potential of Robusta coffee productivity per year according to the Tanggamus Regency Plantation and Forestry Service.

Land area reflects how much the ability of farmers to manage the opportunities that will be achieved by farmers to choose the commodity to be cultivated. The land area of coffee farmer can be seen in Table 3.

The land area of Robusta coffee farmers is still littlebecause some farmers get inherited land and others from buying themselves. Another factor is due to the high price of plantation land which causes farmers to be unable to buy. The majority of farmers own 0.5–1 ha of land. Within the research area, the development of land is continued to be developed, especially the land in the forest areas. The forest service is developing land to increase farmers' income but without damaging protected forests. Farmers can use land in the forest area and cultivate coffee without having to damage the forest or felling trees without permission from the local government.

Table 3. Land area of respondent farmers

Land area, ha	Number of farmer, people	Percentage, %
0.5–1	40	58.82
1.5–2	26	38.23
3	2	2.94

Income Analysis Selling Grade 4 Coffee

There are several elements related to analyzing farming income, including production costs, production result and revenue. Implicit costs are costs that are not actually incurred by farmers. Implicit costs can be seen in the following Table 4.

Depreciation tools are tools used in farming such as sickles, machetes, hoes, saws, spray tanks, grass cutter, and ginjar. The cost of renting land on robusta coffee farming is the cost taken from the distribution of profits between the owner and the cultivator. Labor in the family are workers who carry out tasks in coffee farming such as picking, fertilizing, pruning and spraying. The number of family members involved in plantation activities is between 2–3 people. The cost of labors in the family is greater than the labors outside the family. This is because the family does a lot of farming for one season, while the workforces outside the family are usually only used at harvest, which is picking coffee fruit.

Explicit costs are costs that are actually spent by farmers. Explicit costs are spent for the costs of purchasing production facilities and infrastructure. The explicit cost of grade 4 coffee can be seen in the following Table 5.

The labors used by farmers in farming are picking labor and harvesting porters. The paid system uses HOK (daily workers) with a daily fee of Rp50,000,-/hok, while the fees for porters' services are depending on the distance between the plantation and the farmer's house. The farther the distance, the more the feespent by farmers. On explicit costs shows that the average cost incurred in farming is Rp4,999,169. These costs are labor which costs Rp1,571,485 consisting of fertilizing labor, picking labor, and spraying labor. The large amount of labor costs supported by research conducted by Puspita (2015) showed that the highest costs in Robusta coffee plantations are labor costs, by minimizing the workforce that farmers are expected to earn more income.

Farmers must pay a large transportation fee of Rp740,646 because the distance from the house to the plantation is on average quite far in the mountains.The amount of transportation costs is when the harvest season arrives, farmers go to the garden to pick coffee every day. The picking takes up to 2 months. The duration of picking is influenced by the weather because of the uncertain climate conditions in the mountainous regions. Fertilizer costs that must be spent on each farm are Rp750,662. Fertilizers used by farmers are chemical fertilizers and some farmers do not use fertilizers due to maintaining unspoiled soil conditions. Beside to maintaining fertile soil conditions, some farmers do not have the money to buy fertilizer. The cost of spraying herbicides is Rp401,471. All farmers at the research site use herbicides with various brands, this is done for weed control. Farmers have problems related to coffee plant disease, namely upas fungal disease that is difficult to overcome and it has not been found on how to treat this disease. For insect control there are only a few farmers who use pesticides. Insect that is often found in coffee plants are ants.

The cost of stripping wet coffee into grade 4 coffee is Rp1,571,485. Efforts to strip the fruit skin are different in each region, namely in Ulubelu Sub-district, the cost of stripping wet and dry fruit skin into grade

Table 4. Implicit costs of grade 4 coffee/year

Cost	Farmer (Rp)	Ha (Rp)
- Cost of depreciation equipment	223,416	167,870
- Cost of renting land	10,889,387	8,182,081
- Labor cost in family	2,915,441	2,190,608
Total cost	14,028,244	10,540,559

Table 5. Explicit costs of the coffee beans/year

Cost	Farmer (Rp)	Ha (Rp)
- Labor outside the family costs	1,692,074	1,271,392
- Transportation costs	740,646	556,507
- Fertilizer costs	750,662	564,003
- Herbicide costs	401,471	301,657
- Pesticide costs	2,941	2,210
- Stripping fruit costs	1.218,507	915,564
- Sack packaging cost	192,868	144,917
Total explicit cost	4,999,169	3,756,250

4 coffee is for every one quintal of grade 4 coffee, it costs 3 kg of grade 4 coffee. In Sumberejo Sub-district, for every one quintal of coffee beans, it costs 5 kg grade 4 coffee. The greater costs in Sumberejo Sub-district is caused bythere are two types of stripping, which stripping wet skin and dry stripping. Stripping wet skin means that the coffee beans that are freshly picked are still wet, so that the beans are released from the fruit peel. The goal is that drying coffee beans will be faster. Dry stripping is stripping the coffee beans by grinding them, whether dry coffee which still in dry spindle or dry coffee after wet stripping.

The cost of harvesting equipment is the cost for purchasing gloves, raffia, and sacks. The average cost is Rp192,868/farmer/year. The number of purchases of sacks according to the production of the coffee beans. The more production, the more sacks will be used.

Farmer Revenue and Income

The revenue of robusta coffee farming was determined by the production. Prices at farm level for grade 4 coffee are Rp20,000-Rp22,000. The revenue of robusta coffee farming in Tanggamus Regency can be seen in the following Table 6.

Table 6. The average of grade 4 coffee revenue

Description	Grade 4 coffee	Price (Rp)	Revenue
Production (kg)/farmer	1,390	21,250	29,531,250
Production (kg/ha)	1,044	21,250	22,185,000

There are 3 kinds of sales of coffee products, namely:

- Farmers sell to collectors then collectors sell to coffee exporters
- Farmers sell to collectors and collectors sell to large traders then sell to coffee exporters.
- Farmers directly sell to large traders, then large traders sell to coffee exporters in the Capital of the Province in Bandar Lampung.

The revenue was the difference in the amount of production with the selling price. Production of grade 4 coffee is 1,390 kg/farmer/year with a selling price of Rp21,250/kg. The income obtained by grade 4 cofffee farmers is Rp29,531,250. Income from coffee beans is the main income for the family because farmers do not have other businesses so they depend on coffee farming. The family income is limitedby coffee farming because coffee plants can only be harvested once in one season.

The price of coffee in the District where research is conducted is relatively high for farmers because farmers do not sell out of

the sub-district. The farmers should get a price higher than the price they got by selling it within sub-district. Farmers are bound by collectors because farmers borrow capital for farming and daily needs. Therefore farmers must sell to collectors who provide loans for their farming capital so that farmers do not have a choice of prices other than those provided by the collectors.

The harvest month in the study area occurs from April to September in a year. Harvesting can occur 5-6 months with a time interval of picking every 10-14 days. Harvesting is done on coffee fruits that are dark green, red and yellow. This compund of dark green, red and yellow coffee fruits is what to be called bygrade 4coffee.

Table 7 shown the farmers earn Rp24,532,081 and have a profit of Rp10,503,837 from selling grade 4 coffee. In the table the costs are divided into farm and hectare because each farm has a different area with an average area of 1.3 ha and seen in the conditions in the field significantly, then it can be seen the amount of income and profits obtained. The cost of each hectare is used to provide information to investors who will open a business. Each investor requires information on the land area to find out the income and profit per hectare if he wants to invest. From the profits obtained per farm and per hectare, Robusta coffee farming is feasible because the profits are greater than the costs incurred.

This advantage can be increased if farmers do not only sell in the form ofgrade 4 coffee. Efforts to increase income are by processing coffee beans. The processing ofgrade 4 coffee will added value which can increase the income of the grade 4 coffee farmers. The processing that can be done by farmers is to add further process the grade 4 coffee into ground coffee. Listyati *et al.* (2017) study showed that robusta coffee farmers who sell their products in the form of processed beans provide good income, seen from the amount of income from cash income and total costs. Whereas according to Rofi (2018) the low income of coffee farmers is caused by two main factors which are low productivity and low prices. The low productivity of coffee produced is caused by not applying GAP, high pests, and diseases. Improvement of farmer prices through the improvement of product quality and improvement of sales distribution lines can be used as a strategy to increase coffee farmers' income.

Table 7. Income and profit of grade 4 coffee

Cost	Farmer (Rp)	Ha (Rp)
Implicit total costs	14,028,244	10,540,559
Explicit total costs	4,999,169	3,756,250
Revenue	29,531,250	22,185,000
Income	24,532,081	18,428,750
Profit	10,503,837	7,888,191

Differential Cost Analysis

Deferential cost analysis is a future cost that is expected to be different or affected by adifference decision making between various alternatives. Differential costs were used to determine for coffee beans farmers and ground coffee processing business so that they can make better decisions to go further process the grade 4 coffee into ground coffee or not.

To conduct processing coffee beans into coffee powder, farmers need an additional. Additional costs required are the cost of raw materials in the form of coffee beans. The coffee beans used are those that have been sorted, which are separated between seeds and dirt. Additional costs can be shown by the Table 8.

Table 8. The cost of raw materials for further processing of grade 4 coffee into ground coffee/farmer

Cost	Kg	Price (Rp/kg)	Rp
- Raw materials	1,390	21,250	29,537,500

In addition to raw materials, there are several additional costs used in the processing of ground coffee. Ground coffee is not given a mixture of other ingredients. The additional costs include tools, packaging, gas, and electricity which are the most important in the production of ground coffee. Other supporting costs are transportation cost that is used to deliver ground coffee products to consumers. The additional costs used in further processing of grade 4 coffee into ground coffee can bes hown by the Table 9.

Table 9. Cost details of further processing of grade 4 coffee into ground coffee/farmer

Costs	Rp
- Coffee grinder	3,933,333
- Transportation	1,269,999
- Packaging	8,256,600
- Electricity cost	1,000,000
- Gas costs	200,000
Total costs	14,659,932

The table explains the additional costs when processing further. The packaging that was used by these farmers was 250 grams. The cost is the total cost in all production of 1,390 kg of coffee beans/farmer/year with the use of other supporting costs in the amount of Rp5,203,332. Research by Hafizah *et al.* (2017) stated that the costs incurred for alternative processing are further higher than the alternatives to selling products directly, this can be seen in the differential cost difference between the two alternatives.

The labors that were used was the labors outside of family member. The labor in the tabulation processing amounted to 2 people in each production process. The labors that were used wasthe labors that expert in roasting. Because roasting is the determinant of taste and aroma in ground coffee. The fee system uses HOK (daily workers) with a daily wage of Rp50,000,-/hok. Labor costs are shown in the Table 10.

Table 10. Labor costs further process of grade 4 coffee into ground coffee/farmer

Costs	Rp
- Roasting labor	3,100,000
- Grinding labor	3,100,000
Total Costs	6,200,000

To find out the difference income of farmers if they sells in the form of grade 4 coffee and sells in the form of ground coffee can be seen in the differential cost analysis, income selling of grade 4 coffee or selling ground coffee. Differential analysis is shown in the Table 11.

One of the factors that influence decision making is differential costs. Differential costs include all costs to be incurred that are affected by decision making. Differential costs must be considered in decision making. In specific decision-making, the use of differential costs will be found in the problem of producing in the form of coffee beans or further processing in the form of ground coffee. Differential costs are used to determine whether an increase in income is accompanied by costs incurred. Differential cost analysis is the process of estimation or the consequences of alternative action actions that can be taken over by decision makers.

If the farmers sell in the form of grade 4 coffee, farmers can sell 1,390 kg. If it is processed into ground, it produces 1,112 kg of ground coffee. The production of coffee beans into ground coffee will experience shrinkage, every 1 kg of coffee beans will be 8 ounces of ground coffee or ounces of depreciation. The grade 4 coffee is sold at Rp21,250/kg, while ground coffee sold at a price of 75,000/kg. Hariance *et al.* (2015) in their study said that the coffee market still absorbs all coffee products and has not provided adequate price incentives for good quality coffee. The most fatal mistake that is commonly made by farmers is in the picking and handling post-harvest phase, resulting in low quality coffee.The huge price difference can be a consideration for farmers to conduct further processing coffee beans into ground coffee because it provides far greater profit. These results were supported by Atmaja *et al.* (2015) study which statesd that every processing of 1 kg of roasted coffee into coffee

Tabel 11. Income analysis of direct selling of grade 4 coffee or selling processed ground coffee/year

No	Information	Selling grade 4 coffee	Selling processed ground coffee
I	Production (Kg)	1,390	1,112
II	Price (Rp)	21,250	75,000
III	Revenue (Rp)	29,357,500	83,400,000
IV	Constant costs (Rp)		
	- Deapreciation of tools	223,416	3,933,333
	- Land rental costs	10,889,387	-
	- Labors whithin family	2,915,441	-
	- Transportation	740,646	1,269,999
	Total fixed costs	14,768,890	5,203,332
V	Variable Costs (Rp)		
	- Labors	1,692,074	6,200,000
	- Raw materials	-	29,537,500
	- Packaging	192,686	8,256,600
	- Electricity cost	-	1,000,000
	- Gas costs	-	200,000
	- Grinding costs	1.218,507	-
	- Fertilizers	750,662	-
	- Herbicide	401,471	-
	- Pesticide	2,941	-
	Total variable costs	4,258,341	45,194,100
	Total fixed costs and variables	19,027,231	50,397,432
VI	Profit (Rp)	10,503,837	33,002,568

powder will be increased by Rp4,845.00, which means that the tabulation process will provide additional income for farmers.

Farming requires costs to be incurred in the form of fertilizer costs, herbicide costs, pesticide costs, labor costs, milling costs, and transportation costs. Processed ground coffee requires raw materials such as coffee beans, packaging costs, transportation costs, labor costs, electricity and gas costs. Ground coffee uses special tools, namely coffee bean roasting equipment, and ground coffee milling equipment with a total fixed cost of Rp5,203,332. Total fixed costs and variable costs for coffee beans are Rp19,027,231 and in ground coffee Rp50,397,432.

The results of the comparison using differential costs can be seen from the alternative of producing grade 4 coffee or further processing into ground coffee. If the farmer sells in the form of grade 4 coffee, the farmer gets a profit of Rp10,503,837/year/1.390 kg coffee beans. When farmers further process coffee beans into ground coffee, the profits obtained by farmers are Rp33,002,568/year/1.112 kg ground coffee. It can be seen that the processing of ground coffee can increase income fo coffee beans farmers because further processing of ground coffee provides added value. To increase the profits. Farmers should optimize the processing of ground coffee, which can provide more profit. Some farmers believe that processing coffee beans into ground coffee will provide high profits. The obstacle faced when farmers do processing is the difficulty of marketing products because of conditions in the mountainous regions.

The right decision that can be taken by farmers from alternative direct selling or further processing is to choose further process into ground coffee because it gets a higher differential advantage compared to direct selling in the form of grade 4 coffee. The decision statement is supported by the research of Walalangi & Sondakh (2016) which stated that the most profitable alternative is an alternative to conduct further process for UD. Kayla Nuts got more profit when further processing the main material of Rp307,500/1.000 L

roasted peanuts compared to direct selling andthe profit can obtain in the amount of Rp220,000/1.000 L peanuts.

CONCLUSION

The results showed that price of grade 4 Robusta cofee Rp21.250/kg and ground cofee Rp75.000/kg. Coffee farming earned income Rp24,532,081/year and a profit of Rp10,503,837/year. Farmers are better if they continue the production process from coffee beans to ground coffee. Further processing of ground coffee can earn profit of Rp33,002,568. The best decision is to choose an alternative to further process of grade 4 coffee into ground coffee, because it will be more profitable and increase income for farmers.

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