JALOW
Journal of Agribusiness and Local Wisdom

COMPARATIVE ANALYSIS OF PRODUCTION INPUT USE IN GRANOLA AND CIPANAS POTATO FARMING ON PRODUCTION IN KAYU ARO BARAT DISTRICT, KERINCI REGENCY

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ABSTRACT

This study aims to (1) analyze the general picture of granola potato farming compared to Cipanas potato farming in Kayu Aro Barat District, Kerinci Regency, and (2) analyze the comparison of production inputs between granola potato farming and Cipanas potato farming on production. The analysis used multiple linear regression with a slope dummy. The study was conducted in Kebun Baru, Gunung Labu, and Giri Mulyo Villages. The results show that potato farming activities begin with land preparation, seed planting, fertilization, pest control, and harvesting. Production inputs that significantly affect production are land area, seeds, organic fertilizer, SP 36, and urea. Seeds and medicines are more responsive to granola, while land area, fertilizer, and labor are more responsive to Cipanas. The granola variety produces significantly higher production than Cipanas.
Keywords: Dummy Slope, Production Input, Cipanas Potato, Granola Potato, Potato Farming

INTRODUCTION

Agriculture is a key sector supporting Indonesian incomes, given that the majority of the population works as farmers. This sector comprises several subsectors, including food crops, plantations, horticulture, forestry, livestock, fisheries, and agricultural services. Horticulture is a crucial subsector due to its high economic value, health benefits, and income potential for both farmers and non-farmers. Horticultural commodities, such as fruits, vegetables, biopharmaceuticals, and ornamental plants, provide a source of nutrition in the form of calories, fiber, vitamins, minerals, and antioxidants. In 2023, vegetable production in Indonesia reached 14,607,750 tons.

Potatoes (Solanum tuberosum L.) are a leading horticultural commodity with high commercial value and potential for development in various regions, including Jambi Province. Potatoes can be processed into various food products and serve as a healthy food substitute. The success of potato cultivation in Jambi is supported by suitable climatic conditions. Previous research has shown that production inputs, such as land area and fertilizer type, significantly influence potato production, for both the Granola and Cipanas varieties. The use and allocation of production inputs are crucial because they are considered determinants of increased productivity and technical efficiency in farming (Nainggolan et al., 2024).

Optimizing the use of production inputs is key to increasing yields and efficiency in potato farming. Effectiveness is achieved when farmers allocate resources appropriately, while efficiency is achieved when the resulting output exceeds the input used. Differences in input response and quantity among potato varieties result in variations in production yields. Therefore, this study is crucial to analyze the comparative use of production inputs between the Granola and Cipanas potato varieties in Kayu Aro Barat District, Kerinci Regency, to determine the most productive and feasible varieties for development based on the effectiveness and efficiency of their production inputs.

RESEARCH METHOD

Scope of Research

This research was conducted from January 2025 to February 2025 in Kebun Baru, Gunung Labu, and Giri Mulyo villages, as samples cultivating potato farming. The scope and limitations of this research are to analyze and describe the general overview of granola and cipanas potato farming and to compare the production inputs of granola and cipanas potatoes in Kayu Aro Barat District.

Data Sources

The data used are primary and secondary data. Primary data were obtained through interviews and questionnaires, while secondary data were obtained from research reports, the Central Bureau of Statistics, relevant government agencies, and other information sources. The methods used in collecting primary data were observation by direct field visits and interviews by asking questions orally or using written questionnaires to respondents.

Method

The population of potato farmers in this study was 2,018 people, with 300 farmers in Kebun Baru, 675 in Gunung Labu, and 1,043 in Giri Mulyo. The sample was taken using purposive sampling. The purposive sampling was carried out by meeting farmers in the field and selecting respondents who met the criteria, namely farmers who planted granola and cipanas potato varieties. In this study, the number of respondents obtained was 95 farmers, consisting of 55 granola potato farmers and 40 cipanas potato farmers.

Data Analysis Method

The data analysis methods used in this study are descriptive and quantitative analysis. Descriptive analysis is used to describe and explain the general overview of granola and cipanas potato farming. Quantitative analysis is used to answer the second research problem regarding the comparison of production input use between granola and cipanas potato farming in the study area.

To answer the objective regarding the comparison of production input use between granola and cipanas potato varieties on potato production, multiple linear regression analysis with dummy slope variables was used. The purpose of using dummy slope regression is to predict the value of the dependent variable, i.e., potato production (Y), with independent variables: land area (X1), seed (X2), organic fertilizer (X3), SP-36 (X4), urea (X5), pesticides (X6), labor (X7), and Variety (D). In practice, D = 1 for the granola variety and D = 0 for the cipanas variety. The form of the multiple linear regression equation with dummy slope variables is as follows:

$$Y = \beta 0 + (\beta 1+dx1)x1 + (\beta 2+dx2)x2 + (\beta 3+dx3)x3 + (\beta 4+dx4)x4 + (\beta 5+dx5)x5 + (\beta 6+dx6)x6 + (\beta 7+dx7)x7 + \varepsilon$$

Description:

Y	: potato production (kg)
x_1	: land area (ha)
x_2	: seed (kg)
x_3	: organic fertilizer (kg)
x_4	: SP-36 fertilizer (kg)
x_5	: urea fertilizer (kg)
x_6	: pesticides (ml)
x_7	: labor (workdays)
α	: constant
β1, β2,…β6	: marginal production
D	: D = 1 for granola variety, D = 0 for cipanas variety
E	: error term

RESULTS AND DISCUSSION

General Overview of Granola Potato and Cipanas Potato Farming in the Research Area

a. Land Area

Land area is one factor that can influence production levels. Nearly all granola potato and Cipanas potato farmers owned their own land. The common unit of land area used in the research location is the andong (horse-drawn carriage), with one andong measuring 20 x 20 m, or 400 square meters. Land use for granola potato and Cipanas potato farming in Kayu Aro Barat District in 2025 can be seen in Table 1.

Table 1. Distribution of Respondents Based on Land Area for Granola Potato and Cipanas Potato Farming in 2025

Land Area (ha)	Granola Potatoes		Cipanas Potatoes	
	Frequency (Persons)	Percentage (%)	Frequency (Persons)	Percentage (%)
0,2	14	25,46	10	25,00
0,3	10	18,18	5	12,50
0,4	9	16,37	8	20,00
0,5	13	23,64	9	22,50
0,6	3	5,45	4	10,00
0,7	3	5,45	4	10,00
0,8	3	5,45	0	0,00
Amount	55	100	40	100

Source: Primary Data Processing Results, 2025

Referring to Table 1, the most dominant land area for granola potato farming and Cipanas potato farming is in the range of 0.2 ha, in granola potato farming there are 14 respondents with a percentage of 25.46%, while in Cipanas potato farming there are 10 respondents with a percentage of 25.00%. The average land area use in the study area is 0.41 ha, while the average land area use in granola farming is 0.40 and in Cipanas farming is 0.41 ha. In other words, the average land area use in granola potato farming in this study is greater than the land area use in the study of Nainggolan et al., (2022) which is 0.35 ha for granola potato farming. However, the average use of Cipanas potato farming land area in this study was smaller than the average use of Cipanas potato farming land area in Wahyuni's (2023) study of 0.69 ha.

b. Seeds

Respondent farmers in the research area used seeds of the Granola and Cipanas varieties from previous harvests. Seeds for planting were pre-screened, selecting healthy ones from pest- and disease-free plants. The amount of potato seeds used by respondent farmers varied depending on the area of land and the seed variety. A description of potato seed use in the study area can be seen in Table 2.

Table 2. Distribution of Respondents Based on Granola and Cipanas Potato Seed Use in 2025

Number of Seeds (kg)	Granola Potatoes		Cipanas Potatoes	
	Frequency (Persons)	Percentage (%)	Frequency (Persons)	Percentage (%)
280 - 454	24	43,64	10	25,00
455 - 629	8	14,55	8	20,00
630 - 804	14	25,45	11	27,50
805 - 979	3	5,45	6	15,00
980 - 1.154	3	5,45	1	2,50
1.155 - 1.329	2	3,64	3	7,50
1.330 - 1.504	1	1,82	1	2,50
Amount	55	100	40	100

Source: Primary Data Processing Results, 2025

Table 2 shows that the largest use of granola potato seeds was in the range of 280–454 kg with 24 respondents, namely 43.63%, while the highest use of Cipanas potatoes was in the range of 630–804 kg with 11 respondents, amounting to 27.50%. According to the book Potato Cultivation Technology in the Highlands and Medium (2022), the need for potato seeds per hectare ranges from 1,200–2,000 kg. However, the average use of granola and Cipanas potato seeds at the study site was only around 630 kg, namely 599 kg for granola and 672 kg for Cipanas, so it did not meet the recommendations. This condition resulted in low potato production obtained. In addition, the use of granola potato seeds in this study was lower than the results of the study by Adawiyah (2022) of 1,467 kg, and the use of Cipanas potato seeds was also smaller than the study by Wahyuni (2023) which reached 1,636 kg.

c. Fertilizer

The fertilizers generally used by respondent farmers were organic fertilizers, SP 36, and urea. Farmers applied fertilizer twice: base fertilization and follow-up fertilization. A description of organic fertilizer use in granola potato and Cipanas potato farming in the study area can be seen in Table 3.

Table 3. Distribution of Respondents Based on Organic Fertilizer Use in Granola Potato and Cipanas Potato Farming in 2025

Amount of Organic Fertilizer (kg)	Granola Potatoes		Cipanas Potatoes	
	Frequency (Persons)	Percentage (%)	Frequency (Persons)	Percentage (%)
2.800 - 4.285	8	14,55	7	17,50
4.286 - 5.771	12	21,82	12	30,00
5.772 - 7.257	11	20,00	10	25,00
7.258 - 8.743	15	27,27	6	15,00
8.744 - 10.229	3	5,45	3	7,50
10.230 - 11.715	5	9,09	1	2,50
11.716 - 13.201	1	1,82	1	2,50
Amount	55	100	40	100

Source: Primary Data Processing Results, 2025

Table 3 shows that the percentage of respondents in granola potato farming who used the most organic fertilizer was in the range of 7,258–8,743 kg with 27.27% of 15 respondents, while for Cipanas potatoes the most was in the range of 4,286–5,771 kg at 30.00% with 12 respondents. According to the book Potato Cultivation Technology in Highlands and Medium (2022), the recommended use of organic fertilizer is 20,000–30,000 kg/ha. However, the average use of organic fertilizer on both varieties in this study was only 6,585 kg, with granola 6,783 kg and Cipanas 6,313 kg, so it did not meet the recommendation. Nevertheless, the use of organic fertilizer on granola potatoes in this study was higher than the study of Adawiyah (2022) which was 2,499 kg. The distribution of SP-36 fertilizer use in granola and Cipanas potato farming can be seen in Table 4.

Table 4. Distribution of Respondents Based on SP-36 Fertilizer Use in Granola and Cipanas Potato Farming in 2025

Amount of SP-36 Fertilizer (kg)	Granola Potatoes		Cipanas Potatoes	
	Frequency (Persons)	Percentage (%)	Frequency (Persons)	Percentage (%)
70-110	17	30,91	8	20,00
111-151	10	18,18	14	35,00
152-192	3	5,45	2	5,00
193-233	11	20,00	8	20,00
234-274	6	10,91	2	5,00
275-315	6	10,91	2	5,00
316-356	2	3,64	4	10,00
Amount	55	100	40	100

Source: Primary Data Processing Results, 2025

Table 4 shows that the percentage of respondents in granola potato farming who used the largest amount of SP-36 fertilizer was in the range of 70-110 kg, amounting to 30.91% with a total of 17 respondents. Meanwhile, the percentage of respondents in Cipanas potato farming who used the largest amount of SP-36 fertilizer was in the range of 111 to 151 kg amounting to 35.00% with 14 respondents. The dosage of SP 36 fertilizer use on potato plants according to the book Potato Cultivation Technology in the Highlands and Medium (2022) is around 300 kg. While the average use of SP-36 fertilizer in the study area was 174 kg, in granola potato farming the average use of SP 36 fertilizer was 173 kg while in Cipanas potato farming it was 176 kg. In other words, the use of SP 36 fertilizer in this study was still far from the recommended dosage. The average use of SP 36 fertilizer in this study is consistent with Wahyuni's (2023) study, which found that respondents averaged 176 kg of SP 36 fertilizer. The distribution of urea fertilizer use in granola potato and Cipanas potato farming can be seen in Table 5.

Table 5. Distribution of Respondents Based on Urea Fertilizer Use in Granola Potato and Cipanas Potato Farming in 2025

Amount of Urea Fertilizer (kg)	Granola Potatoes		Cipanas Potatoes	
	Frequency (Persons)	Percentage (%)	Frequency (Persons)	Percentage (%)
75-125	14	25,46	10	25,00
126-176	11	20,00	3	7,50
177-227	9	16,36	17	42,50
228-278	11	20,00	9	22,50
279-329	2	3,64	1	2,50
330-380	4	7,27	0	0,00
Amount	55	100	40	100

Source: Primary Data Processing Results, 2025

Based on Table 5, the percentage of respondents in granola potato farming who used the largest amount of urea fertilizer was in the range of 75 to 125 kg, which was 25.46% with a total of 14 respondents. Meanwhile, the number of respondents in Cipanas potato farming who used the largest amount of urea fertilizer was in the range of 177 to 227 kg, as many as 17 respondents with a percentage of 42.50%. Based on the book Potato Cultivation Technology in the Highlands and Medium (2022), the dosage of urea fertilizer used on potato plants was around 300 kg. Meanwhile, the average use of urea fertilizer in the study area was 204 kg. Meanwhile, in granola potato farming, the average use of urea fertilizer was 212 kg, while the average use of urea fertilizer in Cipanas potato farming was 194 kg. In other words, the use of urea fertilizer in this study did not comply with the recommended dosage. Furthermore, the average use of urea fertilizer in this study was greater than the average use of urea fertilizer in the study by Nainggolan et al., (2022), which was 88 kg.

d. Pest and Disease Control

Pest and disease control for granola potato and Cipanas potato farming in the research area was carried out 15-20 times during one planting season. Spraying was usually carried out after the potato plants were 20 days old until just before harvest. The spraying intensity was based on the severity of pest and disease attacks on the potato plants, weeds, high rainfall, and farmer capacity. The average use of medicines in granola potato and Cipanas potato farming in this study was 7,275 ml. In granola potato farming, the average use of medicines was 6,683 ml, while in Cipanas potato farming it was 8,090 ml. In other words, the average use of medicines in granola potato and Cipanas potato farming in this study differed from the average use of medicines in the study by Edison et al., (2004), which was 7,500 ml.

e. Labor

Labor use in granola potato and Cipanas potato farming activities begins with land preparation and continues through harvesting. Labor use in this study is measured in man-days (HOK), assuming 1 HOK equals 8 hours. The average labor use in granola potato and Cipanas potato farming can be seen in Table 6.

Table 6. Average Labor Use in Granola Potato and Cipanas Potato Farming in 2025

Activity	Potato Granola				Potato Cipanas			
	Labor (people)	Working days	Working hours	HOK	Labor (people)	Working days	Working hours	HOK
Land Preparation	4,02	4,00	6,00	12,05	4,10	4,00	6,00	12,30
Planting	4,95	1,00	6,00	3,71	5,03	1,00	6,00	3,77
Fertilization	1,87	1,00	1,84	0,43	1,98	1,00	1,95	0,48
Pest Control	1,04	19,75	1,00	2,56	1,05	20,00	1,00	2,63
Harvesting	11,75	1,00	6,00	8,81	11,85	1,00	6,00	8,89
Amount	23,63	26,75	20,84	27,56	24.01	27	20,95	28,06

Source: Primary Data Processing Results, 2025

Table 6 shows potato farming activities in the research area during one planting season, starting from land preparation to harvesting. The largest average labor use (HOK) in granola potato farming and Cipanas potato farming is in land preparation activities. Land preparation activities in potato farming require more labor (HOK) than other activities, this is because the process involves various stages starting from clearing the land of weeds, then making beds and digging planting holes for potato seeds and fertilizer holes. Potato farming activities in this study were carried out manually using human labor, thus requiring more human labor. Based on Table 6, the average labor use (HOK) between granola potato farming activities and Cipanas potato farming activities is not significantly different. This is based on the findings of this study that the use of the number of labor in granola potato farming and Cipanas potato farming is not much different or almost the same.

f. Production

Production is the end result of economic activity utilizing several inputs. The production inputs used in granola potato and Cipanas potato farming include land area, seeds, organic fertilizer, SP-36, urea, pesticides, labor, and varieties. The production of granola potato and Cipanas potato farming in the study area can be seen in Table 7.

Table 7. Production of Granola Potato and Cipanas Potato Farming in 2025

Production (kg)	Kentang Granola		Kentang Cipanas	
	Frekuensi (Orang)	Persentase (%)	Frekuensi (Orang)	Persentase (%)
3.000 - 5.142	14	25,46	11	27,50
5.143 - 7.285	10	18,18	12	30,00
7.286 - 9.428	9	16,37	9	22,50
9.429 - 11.571	13	23,64	4	10,00
11.572 - 13.714	3	5,45	4	10,00
13.715 - 15.857	3	5,45	0	0,00
15.858 - 18.000	3	5,45	0	0,00
Jumlah	55	100	40	100

Source: Primary Data Processing Results, 2025

Based on Table 7, the frequency of respondents for the largest granola potato farming business in the research area is in the production range of 3,000 – 5,142 kg, there are 17 respondents with a percentage of 25.46%. Meanwhile, the frequency of respondents for the largest cipanas potato farming business is in the production range of 5,143 – 7,285 kg at 30.00%, namely 12 respondents. The average production of granola potato farming and cipanas potato farming is 7,868 kg, with granola at 8,509 kg and cipanas potatoes at 6,988 kg. This finding shows that there is a difference in production between granola potato farming and cipanas potato farming. In other words, the difference in production between granola potato farming and cipanas potato farming of both varieties, in this study is consistent with the research of Fatikasari et al., (2024) which stated that there is a difference in the production of granola potato farming with cipanas varieties, with granola potato farming production being higher than cipanas potato farming. Furthermore, the average production of granola potato farming in this study is greater than the research of Nainggolan et al., (2022) which is an average of 6,815 kg, but the average production of granola potato farming in this study is different from the research of Adawiyah (2022) of 10,469 kg. Meanwhile, the average production of cipanas potato farming in this study is less than the research of Silalahi (2023) of 14,213 kg and also very different from the research of Wahyuni (2023) of 10,417 kg.

Comparative Analysis of Input Use for Granola and Cipanas Potato Farming in the Research Area

The analysis was conducted to determine the comparative impact of input use on production between Granola and Cipanas potato farming. This analysis used a multiple linear regression model with a dummy slope (interaction variable). In this study, data were analyzed using SPSS Statistics 23. The production inputs used in this study were land area (X1), seeds (X2), organic fertilizer (X3), SP-36 (X4), urea (X5), pesticides (X6), labor (X7), and variety (D). For a more detailed explanation of the potato farming production regression model in this study, see Table 8.

Table 8. Regression Results of Production Input Use for Granola and Cipanas Farming in Kayu Aro Barat District

Variable	Coefficient	Std-Error	Sig.
Constant	-343,129	102,967	0,001
Land Area (X1)	541,020	220,521	0,016
Seedlings (X2)	1,532	0,516	0,004
Organic Fertilizer (X3)	0,040	0,016	0,017
SP 36 Fertilizer (X4)	7,943	0,882	0,000
Urea (X5)	4,208	0,727	0,000
Medicines (X6)	0,171	0,101	0,095
Labor (X7)	8,291	28,353	0,771
Variety (D)	397,881	125,259	0,002
Dummy_X1	-473,602	255,542	0,068
Dummy_X2	5,369	0,609	0,000
Dummy_X3	-0,024	0,021	0,247
Dummy_X4	-7,354	1,322	0,000
Dummy_X5	-4,970	0,959	0,000
Dummy_X6	0,460	0,123	0,000
Dummy_X7	-15,616	30,959	0,615

Source: SPSS Processed Results

From the regression results, there are several inputs that affect potato production in Kayu Aro Barat District. In this study, these inputs include land area, seeds, organic fertilizer, SP 36 fertilizer, urea fertilizer, medicines, and labor as well as dummy slope variables (interaction variables). The coefficient value of the variety variable is 397.881, this means that the use of the granola variety (D = 1) will increase potato production by 397.881 kg compared to the cipanas variety (D = 0), after taking into account the influence of other variables in the model. While the significance level of the variety variable is 0.002 <α (0.05), In other words, the granola variety (D = 1) significantly produces higher potato production by 397.881 kg compared to the cipanas variety (D = 0), assuming other variables remain constant. From the regression results comparing the use of production inputs between the two varieties, production inputs such as seeds and medicines are more responsive to granola potato farming. Meanwhile, production inputs such as land area, organic fertilizer, SP 36 fertilizer, urea fertilizer, and labor are more responsive to Cipanas potato farming.

CONCLUSION

Based on the research results, the following conclusions can be drawn: Potato farming activities in the research area begin with land preparation, which involves weeding, applying basal fertilizer, tidying the beds, and applying mulch. After several days, potato seeds selected from the previous harvest are planted. Fertilization is carried out by applying fertilizer to holes approximately 10 cm from the seeds, and pest and disease spraying is carried out at an intensity of 15-20 times. The final stage is harvesting. The use of seed and pesticide inputs is more responsive to granola potato farming, while land area, organic fertilizer, SP 36 fertilizer, urea fertilizer, and labor are more responsive to cipanas potato farming. Meanwhile, the variety variable is positive and significant, indicating that granola potato farming produces significantly higher potato yields than the cipanas variety.

ACKNOWLEDGMENTS

On this occasion, the author would like to express his deepest gratitude to Prof. Dr. Ir. Saidin Nainggolan, M.Si as the first supervisor and Ir. Yusma Damayanti, M.Si. as the second supervisor who have patiently guided, given direction, encouragement and motivation to the author in this research.

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