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Research Article
Study on Good Agriculture Practice (GAP) for Pineapple Cultivation in Labuhan Batu Regency, North Sumatra Province, Indonesia

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Abstract

Background and Objective: The phenomenon of applying good agricultural practice (GAP) for pineapple in cultivation that is not as recommended and the yield of pineapple production is not optimal requires further studies that focus on the application of GAP pineapple as recommended. For the sustainability of pineapple cultivation in Labuhan Batu Regency, it is necessary to research how to apply the GAP component of pineapple cultivation. **Materials and Methods:** The method of analyzing the level of application of the GAP component using percentages and the method of influencing factors using multiple linear regression. **Results:** To get pineapple according to consumer preferences in the research area, it takes the level of application of GAP with a score of 24 or 72.72% with the category of moderate application level. The factors that positively influence the level of application of the pineapple GAP component in Labuhan Batu Regency are the number of farm workers in the family, the employment status of the farmer and the length of formal education of the farmer and the income of pineapple cultivation. **Conclusion:** There is no need for a high level of application of the GAP component to increase the income of pineapple farmers on peatland types.

Key words: Application, cultivation, good agriculture practice (GAP), component, pineapple, production, Labuhan Batu Regency

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Good Agricultural Practice (GAPs) includes agricultural techniques which environmentally conscious, are not harmful to human and animal health, target the protection of natural resources and provide traceability and food security. These kinds of production techniques, it is aimed at agricultural production which is socially viable, economically profitable and sustainable[1]. According to Brar and Danyluk[2], the implementation of good agricultural practices and other food safety systems provides a proactive approach to addressing concerns thoroughly. Reinforced by the opinion of a study from Schmit *et al*.[3], Good agricultural practices (GAPs) training programs were developed to provide to fruit and vegetable growers on how to reduce food safety risks on the farm. These programs have been enhanced over the years due, in part, to increasing buyer and regulatory requirements. Adopt good agricultural practices to improve on-farm processing yields, as well as to generate additional revenue from the sale of other products[4].

According to a study conducted the combination of pineapple fruit that consumers like, is a fruit with a sweet taste, large size, strong taste, soft and smooth texture and yellowish-green colour[5]. This can be considered in determining the target market and marketing strategy for pineapple in Labuhan Batu District, North Sumatra Province. Supported by the study results of study[6], to increase broad consumer awareness and valuation of GAP, it is important to provide GAP information according to the requirements of consumers. Pineapple (*Ananas comosus*), is an important tropical non-climacteric fruit with high commercial potential[7].

Problems of production, productivity and pineapple quality can be solved by implementing good farming techniques, GAP and the technical guidelines for cultivation specified in the SOP (standard operating procedure). This is supported by the results of study[8], the implementation of good agricultural practices (GAP), from irrigation water to the tomato packaging process, enhances the safety of fresh produce and its value throughout the food chain. The same thing according to the previous studies[9], the inability of farmers to comply with global good agricultural practice (GlobalGAP) standards has led to food safety issues harmful to human health and sustainable agriculture. This increase in production is achieved through improving seed quality, planting patterns by increasing the population of each hectare, regulating fruit production through fertilization stimulation (forcing), controlling plant pest organisms (OPT) by the principles of integrated pest control (IPC), as well as harvest and harvest handling. Proper post-harvest. This will be analyzed in the research area, namely Labuhan Batu Regency, North Sumatra Province, Indonesia.

The factors that influence the application of the GAP cultivation component can be divided into the farmer's factor (personality variable) and the socio-economic condition factor (socio-economic variable). The factor (personality variable) is formal education and cultivation experience, while the factor (socio-economic variable) is income from pineapple cultivation, the number of farm workers in the family and the employment status of the farmer).

This study aimed to measure the level of application of the GAP (good agricultural practice) component applied by farmers to pineapple cultivation in Labuhan Batu Regency. Next, analyze the factors that influence the level of application of the GAP component in pineapple cultivation in Labuhan Batu Regency.

MATERIALS AND METHODS

Place and time of research: The study was carried out in Panai Tengah Subdistrict, Pasar Tiga Village and Bilah Hilir Subdistrict, Sei Kasih Village, Labuhan Batu Regency. Research time March-June 2021.

Determination of research location: Selection of Central Panai District of Pasar Tiga Village and Bilah Hilir District of Sei Kasih Village Labuhan Batu District purposive sampling because the location is a centre of pineapple production in Labuhan Batu Regency.

Methods of determining samples: The number of samples taken amounted to 60 samples of pineapple farmers, consisting of 30 farmers in the Central Panai District of Pasar Tiga Village and 30 farmers in The Lower Bar District of Sei Kasih Village. Sampling with snowball sampling technique.

Data collection methods: Data collection is done through direct interviews with pineapple farmers using questionnaires that have been prepared in advance. The data collected include farmer characteristics and GAP components reflected in 11 indicators.

Data analysis methods

Analysis of the level of application of gap components in pineapple cultivation: The data used in this analysis was qualitative. The results of direct interviews with farmers were tittered through the scoring method with a list of determinants (impact points) components. The determining

factor component used in scoring the level of application of GAP pineapple components in Labuhan Batu Regency based on standard operational procedure pineapple cultivation Subang Bandung regency in 2008. Each GAP component is spelled out into a specific indicator, where the maximum value of each component is 3 and the lowest value is 1. Value 3 is given if the GAP component is applied as recommended in GAP. Value 2 is given if the GAP component is not as recommended and one of the GAP components is not performed. The list of determining components of the level of GAP pineapple cultivation in Labuhan Batu Regency in Table 1.

Statistical analysis: The way calculation of the overall application rate of GAP components carried out by each sample farmer is done by summing up the value of each of the determinants above. Calculating the percentage (%) application rate of each GAP component is as follows[10]:

$$\text{GAP}(\%) = \frac{\text{Actual weight}}{\text{Maximum weight}} \times 100\%$$

Where:

GAP (%) = Percentage of GAP implementation rate
Actual weight = Sum of the weight of each sample in the component
Maximum weight = Maximum weight obtained from the entire sample on the component

$$I = \frac{r}{k}$$

Where:

I = Class interval
r = Range (largest difference in value by smallest)
k = Number of class intervals

Table 1: List of components (GAP) pineapple cultivation along with weights

GAP components	Value/weight
Location of pineapple land	
Not knowing the pH of the soil, temperature, rainfall and soil type	1
Soil pH 3-4.5, type of peat soil	2
Soil pH 5-6, temperature 21-27°C, rainfall 3000 mm year^{-1}, alluvial soil andosol, reddish-brown or red-brown regosol	3
Seed	
Seedlings do not come from official nurseries	1
Seedlings come from other farmers	2
Healthy seedlings with normal growth derived from healthy parent plants based on their size and come from officially certified nurseries	3
Land preparation (cleaning)	
We are not doing the cleaning of shrubs and annoying branches	1
Do land cleaning but do not tidy up annoying plant branches	2
Land free of large rocks, shrubs and branches can interfere with plant growth	3
Land preparation (salting)	
Do not pay attention to the distance of the planting hole	1
Flood distance every 1 m there are three planting holes	2
Distance of the planting hole is one groove: The distance in rows 35-50 cm and the distance between rows 80-100 cm, while when the planting pattern is double (2 grooves): The distance in rows 35-50 cm and the distance between the closest rows is equal to the distance in rows	3
Land preparation (using a bed system)	
Do not make a bed	1
Making a bed but wide and high is not by the sop recommendations	2
Bedded and by the condition of the land	3
Bed size is made with a width of 1.2 m, a height of 25-30 cm and a length according to land conditions, while the distance between beds is made 50-60 cm	
Planting	
Do not do planting according to the sop of pineapple	1
Seedlings are planted as deep as 5-10 cm but do not dye using a pesticide solution	2
Seedling planting can grow optimally according to SOP	3
Seedlings, before planting, are dipped in a pesticide solution for ±1 min, the base of the stem is about 5-10 cm	
Seedlings are planted as deep as 5-10 cm depending on the size of the seedling class (±the length of the seedling section)	
Seedlings that have been prepared are planted in one seedling in each hole	
Soil is pressed around the base of one seedling in each hole	
Do darkening until the ground is moist and wet	
Do embroidery maximum of one month after planting	
Plant rejuvenation is carried out for a maximum of 5 years	

Table 1: Continue

GAP components	Value/weight
Land sanitation	
Not doing land sanitation	1
Do weeding only once during the land	2
Clean land so that optimal crop growth, weeding is done, chasing sapling shoots to set the maximum number of saplings two saplings in each clump (3 times during the land)	3
Fertilization	
Not fertilizing	1
Fertilizing but not under the pineapple SOP	2
Provision of fertilizer according to the recommended dose so that the plant can grow optimally	3
Basic fertilization of organic fertilizer 20-40 t ha^{-1} (1 kg $each^{-1}$ planting hole)	
First follow-up fertilizer is given three months after planting with a dose, urea 300, SP 36 100 and KCl 50 kg ha^{-1}	
Second follow-up fertilizer is given 7-10 months with a dose, urea 150, SP 36 0-50 and KCL 100-200 kg ha^{-1}	
Fertilization using tugal as deep as 5-10 cm then closed again by the ground	
Performing integrated pest control (IPC)	
No IPC	1
IPC is done naturally and chemically	2
IPC through the utilization of natural enemies	3
Stimulates flowering (*Forcing*)	
Not *forcing*	1
Doing *forcing*, using other ZPT	2
Using ZPT contains the active ingredients Etepon 480 PGR, Urea and water	3
Harvesting	
No harvesting	
Harvest is not age-appropriate and is done in the morning	1
Harvesting is done on time and in the right way	2
Harvesting a 20% maturity level (the colour on the base of the fruit is yellow and the base of the fruit stem has wrinkles)	3
Pineapple harvesting is done from 07.00-10.00	
Total maximum value	33
Total minimum value	11

Data from pineapple GAP research

From the equation, obtained the division of GAP application-level classes as follows: Low: 11.0-18.3, Medium: 18.4-25.7 and High: 25.8-33.1

Analysis of factors affecting GAP implementation rates: In this study, the multiple linear regression model was used to determine the level of application of GAP components in pineapple cultivation, with variables depending on the application rate of pineapple GAP components by farmers and independent variables of factors that allegedly affect the level of application of GAP components in pineapple cultivation is a regression model obtained from sample data or can also be called sample regression function.

Statistical analysis: The regression equation for the factors that affect the application of GAP components in pineapple cultivation is as follows:

$$Y = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\varepsilon$$

Where:

Y = Level of application of GAP components in pineapple cultivation (%)
b_0 = Constanta
X_1 = Pineapple cultivation income (Rp000/each month)
X_2 = The amount of farm lab
X_3 = Cultivation experience (years)
X_4 = Length of formal education of farmers (years)
X_5 = Dummy farmer's employment status (1 = main, 0 = side)
β_i = Conjecture coefficient of independent variable
ε = Error

RESULTS

Level of application of GAP components (good agricultural practice) applied by farmers to pineapple cultivation in Labuhan Batu Regency: The level of application of GAP (good agricultural practice) components in Labuhan Batu District of Central Panai District and Bilah Hilir District is in the moderate category of 71.16%, where the overall 60 sample farmers by 100% are at the level of application of moderate components.

In Table 2, the average application rate of pineapple GAP components on each GAP component by farmers was shown. Components of land preparation (cleaning), (salting) and harvesting components at high levels. This means that

Table 2: Average application rate of each GAP component in Labuhan Batu Regency

GAP components	Average deployment rate (%)
Location of pineapple land	66.67
Seed	66.67
Land preparation (cleaning)	100.00
Land preparation (paving)	88.89
Land preparation (using the Bedengan system)	67.22
Planting	66.67
Land sanitation	62.78
Fertilization	62.78
Conducting integrated pest control	34.44
Stimulates flowering (*Forcing*)	66.67
Harvest	100.00
Average total	71.16

Data from pineapple GAP research

Table 3: Distribution of application rate of GAP pineapple components in Labuhan Batu Regency

Deployment level	Skor	Number of farmers (people)	Percentage (%)
Low	11.0-18.3	0	0
Keep	18.4-25.7	60	100
High	25.8-33.1	0	0

Data from pineapple GAP research

Table 4: Factors that affect the level of application of pineapple GAP components in Labuhan Batu Regency

Variables	Coefficient	t	Significance	VIF
Constant	65.146	36.174	0.000	
Pineapple cultivation income	0.001[a]	5.747	0.000	1.968
Number of farm labor in the family	3.938[a]	6.595	0.000	2.089
Cultivation experience	-0.440	-2.768	0.008	2.741
Long time of formal education of farmers	0.139[b]	1.311	0.196	1.541
Dummy farmer's employment status	0.163	0.226	0.822	2.645

[a]Significant at the level 1 %: 0.01, [b]Significant at the level 20%: 0.2 and data from pineapple GAP research

most farmers are at a moderate level but farmers still apply GAP components at low levels. This indicated that there are still GAP components that are not applied. The distribution of the overall application rate of pineapple components by each sample farmer is done by summing the weight of the determining factors of the GAP component application rate indicated in Table 3.

Table 2 shows that the GAP component has not been applied optimally, the components of the GAP application level are classified as moderate, namely the location of pineapple land, seedlings used, bed system, planting, land sanitation, fertilization, performing integrated pest control (IPC) and *forcing*. However, the land preparation cleaning, salting and harvesting components have filled the pineapple GAP. This can be optimized if there is a government program by holding an SLPTT (Integrated Plant Processing Field School) or the like to change the behaviour of farmers in pineapple cultivation by GAP (good agricultural practice).

Factors that affect the level of application of GAP components (good agricultural practice) pineapple cultivation in Labuhan Batu Regency: The parameters of the alleged model of factors affecting the rate of application of the pineapple GAP component can be seen in Table 4. Based on Table 4, the model of factors affecting the application level of pineapple GAP components in Labuhan Batu Regency has qualified the Ordinary Least Square (OLS) model, namely, conducting autocorrelation and normality, multicollinearity and heteroskedasticity tests to the model.

Furthermore, the multicollinearity test is conducted to see the absence of relationships between independent variables, one of which is the value of VIF (Variance Inflation Factor) (Table 4). That VIF value of pineapple cultivation income variables, the number of farm labour in the family, cultivation experience, the length of formal education of farmers, *dummy* employment status <10, indicates the absence of symptoms of multicollinearity in the model. To test the existence or absence of heteroscedastic in the model, the Glejser test can be performed, resulting in a signed value >0.05 for each independent variable, which means there are no symptoms of heteroscedasticity in the model.

Descriptive statistics regarding the factors that influence the level of application of the pineapple GAP component in Labuhan Batu Regency in 2021 are presented in Table 5. Then results of multiple regression analysis in the form of table ANOVA in Table 6.

Table 5: Descriptive statistics of factors affecting the level of application of pineapple GAP components in Labuhan Batu Regency, 2021

Factors affecting the application rate of gap pineapple components	Minimum	Maximum	Mean (average)	Standard deviation
Pineapple cultivation income	128.000	6.412.000	1,408.300	1,509.945
Number of farm labor in the family	1	2	1.63	0.48
Cultivation experience	5	10	7.21	2.09
Old formal education	6	17	8.11	2.34
			Yes	No
Dummy farmer's employment status (main: Yes, side: No)			43	17

Data from pineapple GAP research

Table 6: Results of multiple regression analysis in the form of table ANOVA

ANOVA[a]

Model		Sum of squares	df	Mean square	F	Significance
1	Regression	174.284	5	34.857	14.653	0.000[b]
	Residual	128.454	54	2.379		
	Total	302.738	59			

[a]Dependent variable: Level of application of GAP components in pineapple cultivation, [b]Predictors: (Constant), dummy employment status of farmers, number of farm labour in the family, length of formal education of farmers, the income of pineapple cultivation, cultivation experience, The data source of output SPSS version 25

Table 7: Output results of parameters of model parameters factors that affect the application rate of GAP pineapple

Model summary

					Change statistics					
Model	R	R^2	Adjusted R^2	Std. error of the estimate	R^2 change	F change	df1	df2	Sig. F change	Durbin-Watson
1	0.759[a]	0.576	0.536	1.54233	0.576	14.653	5	54	0.000	1.832

[a]Predictors: (constant), dummy employment status of farmers, number of farm labour in the family, length of formal education of farmers, the income of pineapple cultivation, cultivation experience, [b]Dependent Variable: Level of application of GAP components in pineapple cultivation and the data source of output SPSS version 25

The correlation autotest was conducted by looking at Durbin Watson (DW) scores. Based on the results of data processing factors that affect the application rate of GAP components, DW values of 1.832 (Table 7) were obtained, namely, the value of dU<DW<(4-dU) means 1.7671<1.832<(4-1.7671) = 1.7671<1.832<2.2329 so that it can be concluded that the regression model does not experience auto correlation, this is highly expected. Based on the normality test, it can be concluded that the data used in the formulation of the model of factors that affect the level of application of GAP components in Labuhan Batu Regency has spread normally because the *skewness* ratio and *kurtosis* ratio were between -2 and +2 which indicated that the data spreads normally. This model's *skewness* and *kurtosis* ratios were -1.489 and 1.879, respectively.

DISCUSSION

Based on the results of interviews with sample farmers, the percentage of GAP components in the form of land locations is 66.67 per cent with peatland conditions that are pH 3-4.5, which is the condition of the research site. However, as recommended, GAP pineapple is soil pH 5-6, alluvial soil and osol, red-brown or red-brown regosol. The state of peat soil at the research site is by the opinion of some literature, among others[11], pineapples can flower at six months of age after planting in tropical lowland areas and harvest faster but pineapples grown at an altitude of 750 m above sea level begin to flower at the age of 11-12 months. The next[12] Pineapples grow well on three types of freshwater peat soil, brackish peat and alluvial and adaptive soils in peatlands so that pineapples can be selected as alternative crops to be developed in peatlands in the future.

From the results of interviews with sample farmers, the percentage of GAP components in the form of seedlings came from other farmers, which amounted to 66.67%. This is not by the recommendations of GAP, which is a healthy seedling with normal growth, comes from a healthy parent plant based on its size and comes from an officially certified nursery. Farmers who choose to use seeds from other farmers are easy to get and have affordable prices that range from IDR 500-1,000. The seeds planted by farmers in Central Panai District and Bilah Hilir District are derived from the parent saplings.

The GAP component in the form of land preparation (cleaning) in this study obtained application by 100%. The results of interviews with farmers at the research site were the implementation of land preparation (cleaning) carried out so that the land is free from large rocks, shrubs and branches that can interfere with crop growth. This is following the gap component of pineapple.

At the research site of Central Panai District of Pasar Tiga Village, pineapple plants are only a small percentage of sample farmers not paying attention to the distance of planting holes, farmers do salting with a planting distance of 3 plants every 1 m. Conversely, in the District of Bilah Hilir Sei Kasih Village farmers apply gap components, namely the distance of planting holes in one groove: Rows 35-50 cm and the distance between rows 80-100 cm. Farmers do this to get larger pineapples. Gap's flood component in the study was 88.89%.

Following the literature[13] In the technical instructions of pineapple cultivation, the planting distance on a one-row planting pattern is the distance in rows of 35-50 cm and the distance between rows 80-100.GAP component of land preparation using a bed system has a moderate percentage of 67.22%. The function of beds was to facilitate the disposal of rainwater, facilitate the soaking of rainwater and watering of water into the soil and facilitate the process of plant maintenance. The reason farmers make beds but the width and height are not following the gap of pineapples is that the land they plant is not a puddle area, so they believe that a makeshift bed is following the needs of the plant. The advice recommended by GAP is a bed that is patterned and follows land conditions. The size of bed was made with a width of 1-2 m, a height of 25-40 cm and the length according to land conditions.

The application rate of the fertilization GAP component is 66.67%. This showed that farmers in the research area have not fully applied gap components as recommended, namely seedlings before planting dipped in pesticide solution for ±1 min the base of the stem is about 5-10 cm. Furthermore, the seedlings were planted as deep as 5-10 cm (depending on the size of the seedling class). Plant rejuvenation is carried out for a maximum of 5 years. Farmers at the research site generally plant seedlings as deep as 5-10 cm but do not dye. They were using a pesticide solution. The reason farmers do plant in this way is that they follow other farmers.

The average percentage of application rate of GAP components in the form of land sanitation is moderate at 62.78%. Pineapple farmers at the research site tend to weed only once during farming. According to GAP weeding recommendations are done by chasing sapling shoots to set a maximum of 2 saplings in each clump three times during farming. According to Ya'acob *et al.*[14] weeding is an activity to clean the pineapple garden from weeds and competitor weeds. The purpose of weeding was to avoid water, nutrients and sunlight between weeds and pineapple plants.

The average percentage of GAP implementation rate on fertilization components is 62.78%. Fertilization carried out by farmers at the research site tends to use leaf fertilizer four months after planting and before *forcing.* The reason farmers fertilize in this way is that they follow other farmers who are considered to meet the criteria for fertilizing pineapple plants. While according to GAP, good fertilization is with the following rules, basic fertilization of organic fertilizer is 20-40 t ha^{-1} (1 kg per planting hole. Furthermore, the first follow-up fertilizer is given 3 months after planting with a dose, of urea 300, SP 36 100 and KCL 50 kg ha^{-1}. The second follow-up fertilizer is given 7-10 months with a dose, urea 150, SP 36 0-50 and KCL 100-200 kg ha^{-1}. Fertilization using tugal as deep as 5-10 cm then closed again by the ground.

The average GAP implementation rate in PHT components is quite low at 34.44%. Some aspects that cause low rates of application of PHT by farmers are that most farmers consider that pests in pineapple plants are only rats and millipedes (arthropods). According to Tanimola *et al.*[15], the most occurring plant-parasites nematodes were *Pratylenchus*, *Helicotylenchus*, *Meloidogyne*, *Scutellonema* and *Tylenchulus*. In Obio Akpor LGA, Helicotylenchus with RFOC 33.3% was the most occurring nematode pest, while Pratylenchus was the most important plant-parasitic nematode (RIV 33.8%).

The average percentage of application rate gap component forcing by 66.67%, meaning moderate. On average, farmers at the study site used carbbits and dissolved them into water. The results of the forced interview were conducted in the morning on pineapple plants aged 8-10 months. The reason farmers only use carbine is that the material is easy to get at an affordable price. However, as recommended, GAP *forcing* using ZPT, which contains the active ingredients etepon 480 PGR, Urea, water.

According to Espinosa *et al.*[16] Pineapple flowering is thought to be triggered by increased ethylene levels and artificial *forcing* of pineapple flowering is a common practice to promote flowering synchronisation. The GAP component in harvest processing at the research site is carried out according to gap pineapple which is 100% meaning high, it is done by farmers on time and in a way, namely by harvesting a maturity level of 20% (colour on the base of the fruit is yellow and the base of the fruit stem is wrinkled) and done harvesting pineapple at 07-10.00. The reason farmers do the harvesting is to get pineapples with a water content that is still high and looks fresh. This is following the literature[17]. Pineapple harvesting is usually done in the morning. The characteristics of pineapples that are ready to be harvested are open fruit crowns, shrinking fruit stalks, fruit eyes are flatter, the colour of the base of the yellow fruit and the aroma of pineapples is fragrant and distinctive.

Analysis of factors that affect the level of application of the GAP component aims to find out what factors affect the level of application of GAP itself. This is expected to be an input for farmers, agricultural extensionists and related governments in preparing appropriate and targeted agricultural programs and policies. The model of factors that affect the level of application of GAP components consists of one dependent variable, namely the percentage of the application rate of GAP components in pineapple cultivation applied by each farmer and five independent variables, namely pineapple cultivation income, the number of farm labour in the family, cultivation experience, the length of formal education of farmers and *dummy.* The status of the farmer's job. The parameters of the alleged model of factors affecting the rate of application of the pineapple GAP component can be seen in Table 4.

Descriptive statistics about factors that affect the level of pineapple GAP components in Labuhan Batu Regency in 2021 were found in Table 5.

Farmers from their pineapple cultivation activities obtain this income. Calculation of pineapple farming analysis at the research site for 1 ha of land area has a pineapple plant population of 6,250, with an average selling price of pineapples each fruit IDR 5.000, so that farmers' income is around IDR 2.137.500. Therefore, pineapple cultivation income can be the main source of capital in pineapple production. This showed that the higher the income of pineapple cultivation, the higher the farmers' desire to apply GAP components.

The hypothesis tested was that pineapple cultivation income positively affected the level of application of the GAP pineapple component. Based on Table 5, the income factor of pineapple cultivation has been following the hypothesis that it has a positive effect on the rate of application of gap components with an α1%, meaning the level of trust to get the percentage of truth in this study is 99% for the income factor of pineapple cultivation.

The number of farm labour in the family shows the number of people from within the farming family who help carry out pineapple cultivation activities. The study results showed that the average sample farmer did not use agricultural labour in the family by 36.7% or 22 samples. At the same time, those who use agricultural labour in the family amounted to 63.3% or 38 samples.

The availability of farm labour in the family becomes one of the determining factors for farmers in applying GAP components. The application of GAP components requires slightly different skills than the non-implementation of components, which means that labour needs are increasing. It is expected that the more use of farm labour in the family, the higher the level of application of GAP components.

The results showed that the number of farm labourers in the family positively affected the application of GAP components. This was in line with the research conducted[18] researching the factors that influence the application of new superior varieties of seed technology in Nepal.

Virtuous experience shows how many years sample farmers are experienced in cultivating their pineapples. The data in Table 5 showed that the average sample farmer has 7.21 years of pineapple cultivation experience. Cultivation experience, on the one hand, shows that farmers have much knowledge in pineapple cultivation, where farmers can learn from farming experience. However, on the other hand, farmers who have long been virtuous pineapples tend to be closed to innovation, knowledge and new technologies.

The old factor of education is closely related to the ability of farmers to absorb knowledge about technology and the openness of farmers to new technological innovations. The hypothesis tested is that the length of formal education positively affects the application of gap components. The results of research in the field showed that the length of formal education had a positive and significant effect on the level of application of the pineapple GAP component in the Labuhan Batu Regency.

The results of research by Ironkwe *et al.*[19] show that the higher the education was taken by farmers, the higher their ability to adopt technology proportionally so that it will improve performance in pineapple resources.

The value of the alleged parameter of *dummy* variables of a farmer's employment status is 0.163 This is due to the sample farmer with the main job as a pineapple farmer having a greater outpouring of work time, so the focus compared to farmers who make cultivation a side job. The application of GAP components requires more time, including harvesting in the morning according to GAP recommendations and salting with a planting hole distance of 1 groove: The distance in rows 35-50 cm and the distance between rows 80-100 cm, while when the planting pattern is double (2 grooves): The distance in rows 35-50 cm and the distance between the closest rows is equal to the distance in rows. Farmers who make pineapple cultivation as a side generally have main jobs, such as civil servants, wood material makers, rubber farmers and traders.

However, if the five independent variables are used together in the model, it has a real effect on the level of application of the pineapple GAP component. The p-value in test F table ANOVA (Table 6), which is 0.000, where the value

is less than the value of α1% and α5%, this shows that together the factors that affect the level of application of gap components correlate to the application rate of the pineapple GAP component.

The limitation of this research is that it is still within the scope of good agriculture, pineapple cultivation has not yet reached marketing research. The implications of knowing the pineapple GAP can help make policies for local governments. Namely, with research recommendations, at a moderate level in the research area, the pineapple component of GAP has been able to produce pineapple according to market needs.

CONCLUSION

Overall, sample farmers have only applied the GAP Pineapple component at moderate levels. The action component is land clearing and harvest, while the lowest application is integrated pest control (PHT), with an application rate of 37.03%. Furthermore, the dominant factor that positively affects the level of application of GAP Pineapple components in Labuhan Batu Regency is the number of agricultural workers with a co-efficient value of 3,938.

SIGNIFICANCE STATEMENT

This is the first research that reports that the energy component of Good Agriculture Practice (GAP) Pineapple Cultivation in Labuhan Batu Regency of North Sumatra Province of Indonesia is in the moderate category with as core of 24 or 72.72%. Furthermore, factors that positively affect the level of application of pineapple GAP components in Labuhan Batu Regency are the number of agricultural labour in the family, the employment status of farmers, the length of formal education of farmer's pineapple cultivation income.

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