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Factors influencing GAP implementation on Robusta Coffee Farms in the Mountains of Indonesia

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ABSTRACT

Robusta coffee is one of the plantation commodities that popular at home and abroad also as the biggest coffee product from Indonesia. This research aims to analyze the assessment of the level and influence factors of GAP implementation on coffee farmers in the Raung Argopuro Mountains region of Indonesia. The research was carried out in Bondowoso and Jember districts as one of the largest coffee producing centers in East Java with the coffee planting area located in the production forest area owned by Perhutani. The research data uses primary data from the results of assessing the level of GAP implementation among coffee farmer group members using an assessment model that refers to the 2014 RI Minister of Agriculture Regulation through actual assessments and in-depth interviews regarding implementation in the field. The method for determining and collecting data samples was carried out deliberately based on a multi-cluster random sampling model on members of a farmer group of 300 Robusta coffee farmers, divided into 150 coffee farmers in Bondowoso district and 150 coffee farmers in Jember district. Descriptive data analysis was used to see the level of GAP implementation by coffee farmers and logit model regression analysis was used to see the factors that influence the level of GAP implementation by coffee farmers in the research area. The research results show that the level of GAP implementation is divided into high and low implementation. The variables age, number of family members, land area and price variables are variables that have a positive and significant impact.

Key words: GAP; Coffee farmer; Level and factors GAP; Robusta coffee.

1 INTRODUCTION

Coffee (Coffea sp) is one of the plantation crop commodities that has quite an important role in the economy of Indonesia. Most of the coffee plantation area in Indonesia (98%) is smallholder plantations reaching 1.221.141 ha, large state plantations (1%) reaching 14.503 ha and the other (1%) are large private plantations reaching 9.714 ha. The highest coffee production center in Indonesia is South Sumatra with total production of 191.081 tonnes, Lampung 117.111 tonnes, North Sumatra 74.922 tonnes, Aceh 72.652 tonnes, East Java 69.157 tonnes and Bengkulu 62.567 tonnes (DIRECTORATE GENERAL OF PLANTATION. 2021). Coffee commodities from Indonesia have advantages in the international market with a variety of products produced. Coffee is a plantation commodity with the second highest export volume among other plantation commodities, so coffee is the third largest export commodity with great potential after the petroleum and natural gas sectors (Alexander; Nadapdap, 2019).

The development and marketing of coffee commodities continues to be carried out by transforming of traditional culture into an industrial crop culture. The low production of coffee in Indonesia is caused by 1) Cultural factors of coffee farmers (*Peasant Coffea*), namely the culture that forms coffee farmers are still conventionally based on land area and labor, not oriented and based on technology; 2) The market demand factor is export standard and is rather difficult to implement, resulting in low productivity and low sales results and 3) Factors involving limited technology, supporting facilities and inadequate development of coffee farmers (Zakki, 2020).

Land management that does not pay attention to the principles of soil and water conservation contributes significantly to land damage, which often occurs in smallholder plantation areas that are mostly managed conventionally. Of the 26.8 million ha of national plantation area, 65% is smallholder plantation land predominantly located on sloping topography with an average plant age of over 25 years. Conventional management methods that encourage erosion land degradation and the aging of plants result in crop production tending to continue to decline, so that it is far below the productivity of private and state plantations (Hafif, 2019).

Robusta coffee is one of the plantation commodities that is popular both at home and abroad. The coffee commodity has high economic value and Indonesia is known as one of the world's coffee centers with several coffee products from Indonesia that are very popular and popular with consumers abroad. The high interest of domestic and foreign consumers in coffee has encouraged the growth of coffee agro-industry, both small and large scale (Banuwa et al., 2022).

Three provinces in Indonesia have been the export base for coffee beans, namely East Java, North Sumatra and DKI Jakarta, which is a mapping of coffee bean export areas that need to be maintained in the context of sustainable coffee bean exports (Amrulloh et al., 2021). The development of

coffee agribusiness in the southern region of East Java has enormous potential, and has provided greater prosperity for coffee farmers (Soetriono et al., 2021). The increasing world population dictates the need for a stable food supply. Production of crops in quantities and volumes that suit society's needs is the most important task of the agricultural economic sector in every country in the world. Agricultural crop yields are influenced by several abiotic and biotic factors, including the role of climate in the last few decades, which has continued to increase significantly (Kaminskiy et al., 2023).

Meanwhile, the reasons for the emergence of standard sustainability criteria in coffee production are due to the factors; lack of attention to environmental damage factors around coffee producing areas, the main focus of the coffee industry is potential economic risks and economic benefits, and the development of the coffee industry has caused environmental degradation in several countries develop (Pavlovskaia, 2014).

Good Agriculture Practice (GAP) is a model for implementing good agricultural crop cultivation using environmentally friendly high technology and providing sustainable socio-economic value. Adoption of production process certification that aims to obtain products that are safe for consumption, environmentally friendly, safe for field workers and provide economic incentives for farmers, such as Good Agriculture Practice/GAP procedures, needs to be initiated so that Indonesian agriculture does not lag behind other countries (Sudaryanto et al., 2018).

Referring to the background of the existing problems, research was conducted with the title Factors Influencing GAP Implementation on Robusta Coffee Farms in the Mountains of Indonesia and the aim of this research to analyze the assessment of the level and influence factors of GAP implementation on coffee farmers in the Raung Argopuro Mountains region of Indonesia. This research may pertain to the unique challenges coffee farmers encounter in the Raung Argopuro Mountains region of Indonesia and to explore the impact of implementing Good Agriculture Practice (GAP) on the productivity and sustainability of coffee farming in the future.

2 MATERIAL AND METHODS

This research was carried out in Bondowoso and Jember districts, which are one of the largest coffee producing centers in East Java with coffee planting areas located in the production forest area owned by Perhutani in the Mount Raung and Argopuro areas. The research data uses primary data from the results of assessing the level of implementation of GAP among members of coffee farmer groups with an assessment model that refers to the 2014 Indonesian Minister of Agriculture Regulation (NOMOR 49/Permentan/OT.140/4/2014) concerning coffee GAP through actual assessments and related in-depth interviews, implementation under field conditions. The analysis of the main assessment components in this research starting from land preparation, planting shade plants, seeding, making planting holes, planting, plant maintenance including fertilizing, watering, controlling pests and diseases, pruning, making rorak, harvesting and post-harvest handling of coffee.

The method for determining and collecting data samples was carried out deliberately based on a multi-cluster random sampling model among members of coffee farming groups that had been determined in the research area. Sampling was carried out on 300 robusta coffee farmers, divided into 150 coffee farmers in the Bondowoso district and 150 coffee farmers in the Jember district who were the targets for assessing the level of GAP implementation by tabulating data on the implementation of coffee cultivation from preparation to harvest and post-harvest.

Descriptive data analysis was used to see the level of GAP implementation with criteria if the farmer total score is below the comparison value than it is low category and on the contrary. The Formula for descriptive the level of GAP implementation is following the Equation 1:

$$Y = X_1 + X_2 \ldots\ldots + X_n \ldots. \quad (1)$$

where:

Y = Level of GAP implementation

$X_1 \ldots . X_n$ = number of farmer (1, 2, 3.…n)

The average number of total GAP values is used as a comparison for the total value of each farmer's GAP. If the number of farmers' X values is above the average value then it is said that implementation is high and on the contrary. Next, logit model regression analysis (Herlina, 2019) was used to look at the factors that influence the level of GAP implementation by coffee farmers in the research area using the formula Equation 2:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e_i \ldots. \quad (2)$$

Information:

Y = Level of GAP implementation

β_0 = Constant (intercept)

$\beta_1 - \beta_5$ = Regression coefficient

X_1 = Age (year)

X_2 = Education (year)

X_3 = Family members (amount)

X_4 = Land area (hectare)

X_5 = Price (US$)

e = Error

3 RESULTS

Based on the tabulation of research data on 300 respondent coffee farmers, there are two groups of results for

the level of GAP implementation among coffee farmers in the Raung and Argopuro mountain areas which are divided into high levels of GAP implementation and low GAP implementation. The range of GAP values varies from the lowest value of 56.99 and the highest value of 89.25 with an average GAP value of 70.95 and a threshold comparison value of 70.95. The value components for the level of application of coffee GAP in the research area vary from each GAP component starting from land preparation, seeding, planting, fertilizing, pruning, controlling pests and diseases to harvesting and post-harvest processing.

The number of coffee farmers in the high GAP implementation category was 160 farmers (53.33%) and 140 coffee farmers in the low GAP implementation category (46.66%). A brief overview of the number of GAP implementation levels for coffee farmers is presented in the following image.

Factors that influence the level of GAP implementation by coffee farmers are age, education, land, member family and price. The results of the analysis of factors that influence the level of implementation of GAP for coffee farmers are presented in the following table.

4 DISCUSSIONS

4.1 Level of Implementation of the Coffee GAP

Based on Figure 1 and the tabulation of research data on 300 respondent coffee farmers, there are two groups of results for the level of GAP implementation among coffee farmers in the Raung and Argopuro mountain areas which are divided into high levels of GAP implementation and low GAP implementation results from the results of the GAP assessment based on the 2014 RI Minister of Agriculture Regulation. The range of GAP values varies from the lowest value of 56.99 and the highest value of 89.25 with an average GAP value of 70.95 and a threshold comparison value of 70.95. The value components for the level of application of coffee GAP in the research area vary from each GAP component starting from land preparation, seeding, planting, fertilizing, pruning, controlling pests and diseases to harvesting and post-harvest processing. The results of assessing the level of GAP implementation of coffee farmers are divided into two levels, namely high level of GAP implementation and low GAP implementation.

The number of coffee farmers in the high GAP implementation category was 160 farmers (53.33%) and 140 coffee farmers in the low GAP implementation category (46.66%). Generally, farmers in the research area who have low GAP implementation scores from total range between from 56.99 to 70.94 are farmers who do not carry out land preparation properly starting from clearing the land, making planting holes, fertilizing, using quality seeds, planting shade trees, pruning, harvesting, post-harvesting according to predetermined standards and all about inadequate knowledge also limited funds. Meanwhile, farmers with high GAP implementation score from 70.95 to 89.25 stay need to continue to make improvements in their coffee GAP implementation because there are several components with low value in the low GAP implementation level category which will continue to decrease in value if business improvements are not carried out in accordance with GAP standards.

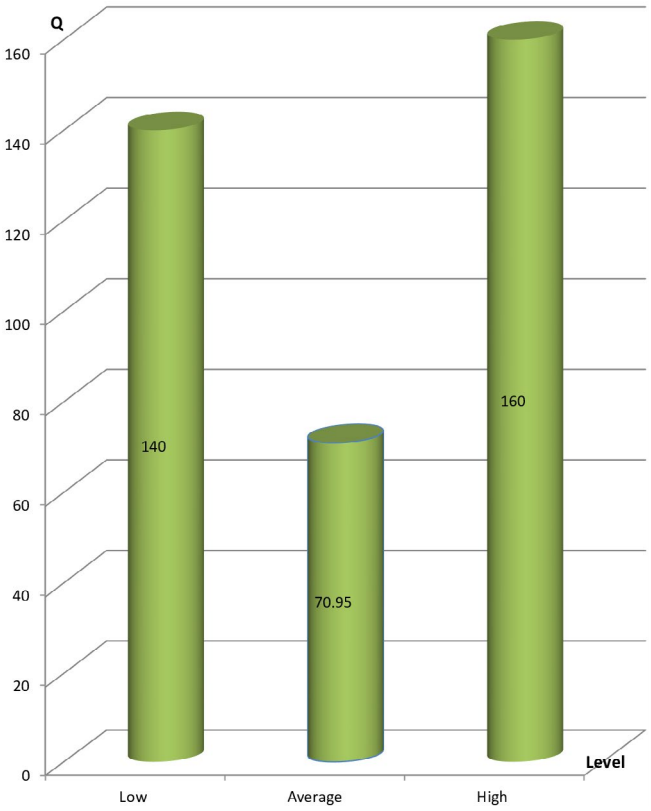

Figure 1: Number of high and low level GAP farmers.

The low level of farmer adoption in implementing GAP coffee is due to a lack of knowledge about good coffee cultivation, small coffee farming areas, low business capital, poor harvest and post-harvest handling, conventional farming methods which are still used due to the habits of coffee farmers' families and neighbors other. This condition is in line with research results stating that one of the reasons for the low level of GAP adoption by coffee farmers is seen from the ability of farmers to carry out the coffee GAP component stages at the land preparation stage, such as not using protective plants, uncertified seeds, haphazard harvesting or harvesting at the same time as red fruit, yellow and green in addition to other factors such as farming experience and area of cultivated land which are related to financing (Kansrini; Febrimeli; Mulyani, 2020). Furthermore, the motivation of members of smallholder farmer groups around production

forests is in the high category for cultivating coffee plants and the implementation of the coffee GAP is classified as low due to the size of the planting hole not meeting standards, shade not following the recommendations, and harvesting not being completely red (Yusifa; Sudarko, 2022).

The results of assessing the high level of GAP implementation among coffee farmers in the research area do not mean that it is good and can increase production in line with expectations because several basic components in the GAP factor are actually not all fulfilled *according to the* coffee GAP standards, especially in terms of land preparation and providing quality seeds as a step early to obtain coffee plants with high production. Harvesting and post-harvest handling methods were not carried out as recommended due to limited knowledge and business capital, so harvesting was done in one harvest and immediately selling the harvest without post-harvest handling to get cash directly to meet daily living needs.

The stage of clearing the land, making planting holes was not in accordance with the recommendations, seeding was not carried out by making beds and using seeds as recommended. In line with research results which state that seeds are one of the basic input needs in agricultural production. Although the presence of new varieties is quite important in agricultural production, limited production results are not only caused by seed quality. Physical constraints such as land degradation and water availability, global climate change, socio-economic constraints such as market organization (distribution systems), land availability, land ownership systems, and increasing population also play an important role. However, in any situation, seeds are a low-cost input compared to other external inputs such as pesticides, which can increase crop production to meet ever-changing needs (Ilyas, 2012).

Planting activities carried out at the end of the rainy season, fertilization not in the appropriate dosage and without compost are a series of production activities that fall into the low value category in field implementation for reasons of being expensive and limited funds. In line with research results which state that robusta coffee plant production cannot reach its maximum potential if the amount of fertilizer applied is small or low and can be a limiting factor in the balance of soil nutrients. Fertilizer management over the last 10 years in sustainable robusta coffee production in the era of climate change in Vietnam and Indonesia shows that adopting integrated fertilizer management practices, increasing farmer awareness about sustainable agricultural practices and introducing policies to encourage agricultural diversification practices is one option to increase farming profits. coffee while ensuring environmentally friendly crop management practices (Byrareddy et al., 2019). It was further stated that the application of chicken manure to coffee plants pruned using different techniques could increase soil respiration and soil pH levels. Pruning management and application of organic fertilizer promotes coffee plant growth by increasing the soil's ability to hold more water and nutrient availability as well as increasing the growth and activity of soil microbes. The addition of organic fertilizer can increase soil microbial activity. The availability of soil nutrients influences soil respiration by indirectly influencing plant growth and soil microbial activity associated with an important role in increasing fertility and productivity, as well as nutrient cycling. Technical challenges in managing organic fertilizer on soil microbial activity are related to soil properties, type of organic fertilizer, recommended dosage, and time and method of fertilization (Azizah et al., 2023). Soil can support maximum agricultural production if it has a high level of moisture and C/N ratio. Optimal N, P and K contents can stimulate plant growth and productivity. Another side effect is that it can cause pest and disease attacks. Soil and fertilizer are important things that must be studied to achieve good results in soil quality and crop yields (Mehdaoui et al., 2022).

Form and production pruning treatment, pruning shade, making roofs to collect water and litter resulting from pruning are not carried out for reasons of being expensive and impractical. This contrasts with research results which state that although robusta coffee farming is generally profitable for all farmers in drought years, current irrigation-based strategies need to be diversified or improved to increase climate resilience given projected changes in rainfall patterns around the world. Building resilience of robusta coffee farmers in facing climate change also implies a gradual adaptation process to become more varied in facing climate change conditions (Byrareddy et al., 2021). Efforts to increase the production and productivity of coffee plants must pay attention to the cultivation aspect, especially the cultivation aspect in the sub-aspects of pruning, fertilizing, applying fertilizer, controlling pests and diseases and varieties are the 5 important things that need to be considered. Farmers who implement GAP have higher production compared to coffee farmers who do not implement GAP (Ridwan et al., 2020).

4.2 Factors influencing the implementation of the Coffee GAP

The level of implementation of GAP coffee among coffee farmers is influenced by many independent variable factors. Meanwhile, the independent variables used as influential factors in this research use farmer age, education level, number of family members, land area and prices at the farmer level. The results of factor analysis of the influence of the independent variables: farmer age, number of family members, land area and coffee price have a significant effect on the level of GAP implementation with a significant value of <0.05 ($\alpha=5\%$). Meanwhile, the independent variable education has no significant effect on the implementation of GAP with a significant value of > 0.10. This indicates that every change

in the independent variables of farmer age, number of family members, farmer land area and farm level prices will be followed by changes in the dependent variable in the level of GAP implementation of coffee farmers.

Based on Table 1, the factor that influences the level of coffee GAP implementation is the farmer's age factor (X1) which indicates that every 1 year increase in farmer age will increase the opportunity for coffee farmers by 1.047 to implement GAP. Every increase in the number of 1 family member (X3) will increase the opportunity for coffee farmers by 0.608 to implement GAP. Every 1 hectare increase in land area (X4) will increase the opportunity for coffee farmers by 1.203 to implement GAP and every 0.064 US$ increase in price (X5) will increase prices at the farmer level by 1.208 times (approximately 1$=15.700 rupiah). Meanwhile, the education factor (X2) has no significant effect on the level of implementation of the coffee GAP. So the formula equation can be written:

$$Y = -5.916 + 0.046X_1 + -0.077X_2 + -0.498X_3 + 0.185X_4 + 0.189X_5$$

Table 1: Result analysis Variables data in the equation

Variables	Coefficient B	Wald	Sig (α=5%)	Exp (B)
X1	0.046	13.158	0.000	1.047
X2	-0.077	1.105	0.293	0.926
X3	-0.498	12.136	0.000	0.608
X4	0.185	5.501	0.019	1.203
X5	0.189	48.837	0.000	1.208
Intercept	-5.916	25.426	0.000	0.003

Age is an independent variable factor that has a significant effect on the level of GAP implementation. The age of coffee farmers in the research area is 18 years to 72 years with the average age of those working in the coffee farming sector being 46 years. The comparison of the number of working age coffee farmers >40 years is 186 farmers (62%) and coffee farmers aged <40 years is 114 farmers (38%). The number of people working in coffee farming is dominated by men with the number of farmers being 251 people (83.67%) of the total number of coffee farmers, while the number of female farmers is 49 people (16.33%). Based on the average age of coffee farmers, the average age of coffee farmers in the research area is in the productive age for work and creativity. In line with research results which state that age information contains a measure of the length of a person's life in years. Age can influence a person in making a decision. Age can also be a measure of the success of farming activities. Farmers who are of productive age will usually work better and more optimally than farmers who are of unproductive age (Gusti; Gayatri; Prasetyo, 2022).

Education is an independent variable factor that has no significant effect on the level of GAP implementation of coffee farmers. Conditions in the field are known that coffee farmers in the research area have an elementary education level of 224 people (74.67%), junior high school of 39 people (13%), high school of 36 people (12%) and bachelor's degree of 1 person (0.33%). So that the possibility of adopting knowledge about GAP is also low. This level of education is one of the obstacles or weak levels of accelerated adoption of sustainable coffee production innovations. In line with research results which state that the benefits of knowledge about the role of pesticides in Good Agriculture Practice (GAP) are reasons for human health because pesticides can have a negative impact on human health if applied incorrectly and unwisely. The use of pesticides according to GAP aims to minimize the undesirable effects of pesticides. Mistakes that often occur in using pesticides that do not comply with GAP recommendations are (i) reading the instructions written on the label before use, (ii) never mixing with bare hands, (iii) wearing gloves and a mask during application, (iv) use tools to remove blockages, (v) never blow with your mouth to clear a blocked nozzle, and (vi) dispose of empty containers according to the instructions on the label (Istriningsih et al., 2022).

The land area factor has a significant effect on the level of GAP implementation by coffee farmers. This condition is in line with the development of coffee commodities in East Java which has four coffee producing centers with the largest area, namely Malang, Jember, Bondowoso and Banyuwangi, as reported by the East Java BPS that the largest coffee producing districts in East Java come from four districts, namely Malang, Jember, Bondowoso and Banyuwangi with coffee plantation areas of 20.600 hectares, 18.321 hectares, 18.289 and 17.856 hectares. (JATIM, 2023). Meanwhile, land development for agroforestry is very possible because the development of robusta coffee agroforestry in Bondowoso district, specifically in the Argopuro mountains is a good area for developing robusta coffee (Novita; Huda; Pradana, 2021). Robusta coffee development can also be carried out in Raung mountain areas (active Merapi) because active volcanic areas tend to have more minerals and nutrients due to volcanic activity which can enrich the soil with minerals and nutrients which are very important for soil fertility. However, the presence of chemicals can damage plants such as sulfur and sulfuric acid which can make the soil unsuitable for growing coffee plants. Meanwhile, mountain areas that are no longer active (Argopuro) tend to be more stable and do not have the risk of chemical hazards that can affect plant growth (Wihatma et al., 2023). The same thing was conveyed by the research results which stated that there were two variables that had a significant influence on robusta coffee farming, namely land area and number of coffee trees. These two variables have a positive influence on robusta coffee productivity, namely that every 1% increase in land area

will increase production by 147.09 kg of robusta coffee and a 1% increase in the number of trees will increase productivity by 0.224 kg of coffee (Ndiwa et al., 2022).

The meaning of implementing GAP actually refers to preserving nature by continuing to utilize natural potential in a sustainable manner. The gift of large and fertile land needs to be preserved so that the negative impacts of land processing can be reduced as much as possible, as research results show that the potential environmental impact of Robusta and Arabica coffee in coffee processing in Sukorejo Bondowoso is very significant due to the release of solid and liquid waste into In the environment. Robusta coffee has a greater environmental impact than processing Arabica coffee. Alternative recommendations to increase product efficiency are chemical processing of liquid waste, using solid waste as biogas and briquettes, and replacing gasoline with biofuel to reduce emissions (Harsono et al., 2021).

The negative impact of the low implementation of GAP is caused by the low knowledge and funds, so that is make action in the field low level category as is the case with Arabica coffee plants by farmers in South Tapanuli Regency, including: (1) Farmers' experience in managing Arabica coffee cultivation businesses is in the new category so they still don't know about GAP plants. Arabica coffee, (2) the land managed for cultivating Arabica coffee is included in the broad category so that it influences the financing of farming which is incurred as input costs for farming production (Kansrini; Febrimeli; Mulyani, 2020). So that many lands have decreased in fertility due to past modern agriculture, such as degraded land which is characterized by the loss of top soil or the top layer of soil due to erosion which is a threat to agricultural land productivity. Information regarding land sensitivity to erosion is very important in determining appropriate soil and water conservation techniques to avoid land degradation or damage. Building bund terraces is a soil and water conservation practice that has been carried out for a long time by local communities as an effort to control erosion (Auliyani, 2020). Soil erosion continues to be a threat to soil quality which impacts crop production and ecosystem use. Soil erosion caused by water and wind is a common phenomenon. Soil erosion caused by water, wind and tillage is recognized as the greatest threat to soil health and to the ecosystem services it provides in many regions of the world (Giambastiani et al., 2022).

The price variable factor (X_5) has a real and positive effect on the level of implementation of the coffee GAP. It is hoped that the implementation of Good Agriculture Practices (GAP) can be an effort to improve coffee farming. This is in accordance with research results which state that significant variables that influence the level of implementation of Good Agriculture Practices (GAP) in people's coffee farming are: (a) family responsibilities, (b) land area, (c) access to farming information, and (d) perception of coffee prices. Whether they realize it or not, by improving the quality of coffee, farmers will also increase the implementation of Good Agriculture Practices (GAP) (Wakhid; Suciati, 2020). This is in line with research results which state that trade in coffee commodities is a trade involving many countries as producers, industries, global chains, and as consumers. Consumers do not only base themselves on the quality of materials but usually symbolize quality and service as a manifestation of a sustainable lifestyle (Fitriani et al., 2021). It goes on to say that since the reform of the common agricultural policy in 2003, many efforts have been made in European countries to promote more environmentally friendly agriculture. GAEC (Good Agricultural and Environmental Conditions) was introduced as part of the Cross Compliance mechanism (Borrelli et al., 2016) to oblige farmers to manage their land sustainably. Agricultural knowledge and practices that have been implemented based on GAP during on-farm production and throughout the value chain of agricultural food products show various positive impacts such as building human resources, increasing agricultural productivity, increasing farmer income, reducing the use of chemical fertilizers and pesticides, and protecting natural resources. and the welfare of farmers and consumers (Kharel et al., 2022).

One of the requirements that must be met to be able to compete in international trade is GAP (Good Agriculture Practice) certification, which is a series of implementation of an agricultural production certification system using advanced technology that is environmentally friendly, sustainable and harvest production can be consumed safely, workers' welfare is taken into account and farming is What is done provides economic benefits for farmers, especially coffee farmers. In line with research results which state that 40.1 % of robusta coffee productivity is influenced by temperature (climate) variables, plant growth and cultivation techniques. Climate change can be anticipated with good plant cultivation techniques (Prasetyo et al., 2017). It is further said that the adoption of any agricultural technology or practice requires farmer awareness to do so, but different environmental factors and conditions can influence adoption and awareness among farmers to implement it (Joshi; Kalauni; Tiwari, 2019).

The GAP issued by the Ministry of Agriculture regulates the entire coffee production process from seeding to pest control in the care of coffee plants. It contains regulations on the use of pesticides and fertilizers for coffee plants, these regulations are made so that the production process becomes more environmentally friendly and reduces the impact of agricultural development activities which can cause pollution and reduce the quality of the environment (Adinandra; Pujianto, 2020).

5 CONCLUSIONS

The level of implementation of GAP among coffee farmers in the Mount Raung Argopuro area is divided into two levels, namely a high level of implementation of 160 farmers and a low level of implementation of 140 coffee farmers.

Factors that have a significant influence on the implementation of the coffee GAP are the variables age (X1), number of family (X3), land area (X4) and price (X5). Meanwhile, educational (X2) factors have no significant effect on the level of GAP implementation by coffee farmers.

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7 AUTHORS' CONTRIBUTION

Conceptual idea: Amrulloh, A.; Methodology design: Amrulloh, A; Hani, E.S.; Hariyati, Y. Data collections: Amrulloh, A.; Hariyati, Y.; Data analysis and Interpretation: Amrulloh, A; Hariyati, Y.; Writing and editing: Amrulloh, A.; Harsono, S. S.; Soetriono.

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