Analysis of Gayo Arabica Coffee Farmers Cultivation in Permata Distict, Benar Meriah Regency, NAD Province

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Abstract. Permata District, Benar Meriah Regency is one of the largest coffee producers in Bener Meriah. However, the quantity and quality of Gayo coffee produced is still low. For this reason, this paper analyzes changes in the cultivation practice of Gayo coffee farmers and analyzes the perceptions and levels of adoption of GAP cultivation and identifies the factors that influence the level of adoption of GAP Gayo Arabica coffee cultivation in Permata District. This research was conducted with a qualitative method, prioritizing data collection with participatory observation and in-depth interviews. The results showed that the cultivation and maintenance of coffee was not optimal, (seed selection, fertilization, and pruning were still not in accordance with the GAP of coffee plants).

Keywords: Gayo Arabica Coffee; Coffee farmers cultivation, and GAP (Good Agricultural Practices.

1 Background

Coffee (Coffea spp. L.) is one of the important commodities for the economy in Indonesia. Coffee is an Indonesian export commodity, which is one of the leading commodities of Indonesian plantations after palm oil, rubber and cocoa with a higher number of coffee exports compared to domestic consumption. The largest Indonesian coffee export market is the United States (USA), which reached a total export of 67.32 thousand tons or a share of 16.24 percent with a total export value of US$ 269.94 million. The next export destination country that contributed significantly was Germany with a market share of 10.28 percent or 47.63 thousand tons or a total export value of US$ 90.19 million. Five Indonesian coffee market countries with shares above 5 percent, one of which is Japan [1].

Another benefit of coffee is the increase in income generating for coffee farmers. Various studies have shown that coffee cultivation can increase income generating for coffee farmers. One of the studies examined the effect of capital and land area on the income of coffee farmers in Lewa Jadi Village, Bandar District, Bener Meriah Regency. The results of the research conducted indicate that the capital variable has a positive and significant effect on the income of coffee farmers in Lewa Jadi Village, Bandar District, Bener Meriah Regency. And the variable of land area has a positive and significant effect on the income of coffee farmers in Lewa Jadi Village, Bandar District, Bener Meriah Regency [2].

Other research shows that Arabica coffee farming can provide decent income to farmers in Bener Meriah Regency. In connection with this, it is necessary to make efforts to handle the

Arabica coffee bean market faster and shorter through the establishment of business entities such as cooperatives as marketing institutions, which is accompanied by efforts to improve the quality of these products through more perfect post-harvest handling [3].

Coffee is also beneficial for health, as research conducted by Zulkifly, S.et.al. that coffee is useful for preventing Alzheimer's disease. The active substance in coffee, namely caffeine, is known to act as an antagonist of A2A receptors and inhibition of -Amyloid production, which is one of the pathologies of Alzheimer's disease. Consumption of coffee about 3-5 cups per day can reduce the risk of Alzheimer's [4]. Other benefits The coffee plant (Coffea spp.L) is a plant with various benefits. For this reason, an effective planting medium is needed to support the optimal growth of coffee seedlings. One of the planting media that can be used for coffee breeding is coffee husk waste from the rest of the coffee plant production that has been composted because it is considered to have a c-organic content of 43.3%, nitrogen content of 2.98%, phosphorus 0.18% and potassium 2. ,26% which can be used for coffee plant seeds [5]. Another benefit of coffee because it contains caffeine which is one of the psychoactives used to reduce fatigue and also eliminate sleepiness.

Indonesia is also the number 4 coffee producer in the world after Brazil, Vietnam and Colombia. Indonesia's coffee productivity is still below that of Brazil and Vietnam. The low productivity of Indonesian coffee is caused by several things. Research conducted by [6] shows the factors that affect the low quantity and quality of productivity, namely the absence of optimal coffee treatment by taking into account the coffee phenology phase, as well as the impact of variability and climate change. Other studies reveal that increasing the productivity and quality of coffee can be done by paying attention to coffee cultivation techniques, from planting to maintenance. The technique of pruning coffee branches is good and correct with pruning of turning branches, pruning of water branches, pruning of hair branches, pruning of diseased branches, and pruning of production branches. Pruning coffee branches plays an important role in increasing coffee fruit production, and controlling pests and diseases [7] .

There are 4 types of coffee plants in Indonesia, namely Robusta, Arabica, Liberica and Exelsa. The largest type of coffee in Indonesia is Robusta, after that is Arabica, Liberica and Exelsa. This paper focuses on Arabica coffee plants. Arabica coffee plants in Indonesia grow from Aceh, North Sumatra, West Sumatra, Kerinci, Bengkulu, West Java, Central Java, East Java, Bali, Toraja, East Nusa Tenggara and Papua.

The area of land for coffee production in Indonesia is estimated at around 1.3 million hectares, spread over North Sumatra, Java and Sulawesi. Robusta coffee is widely grown by farmers in South Sumatra, Lampung and East Java, while Arabica coffee is widely grown by farmers in Aceh, North Sumatra, South Sulawesi, Bali and Flores [8].

Arabica coffee production centers are located in the provinces of Aceh, North Sumatra, South Sulawesi, West Sumatra, and West Java [9]. One of the centers of coffee production in Indonesia that exports a lot of coffee abroad known as Gayo Arabica coffee is Central Aceh District, which has now become three districts namely Central Aceh District, Gayo Lues and Bener Meriah. One of the sub-districts that has the 2nd largest coffee plant area in Bener Meriah Regency is Permata District.

Factors that affect the low productivity of coffee in Indonesia include coffee in the Gayo highlands as revealed by [10] because plant maintenance is not optimal, soil fertility decreases, human resources are lacking, farmer institutions are weak, coffee is old, mixed varieties, processing coffee cherries are not uniform and the marketing chain is too long. [11] on the analysis of the production function and efficiency of smallholder coffee farming in Central Aceh states that, to increase production, one of them is by rejuvenating plants and using superior seeds and changing the way of cultivation that develops in the community.

Other factors that affect the low physical quality of beans and coffee taste are post-harvest processing of coffee, namely red fruit picking, pulper process, fermentation, drying, huller process and coffee storage. However, in practice Good Agriculture Practices (GAP) and post-harvest processing require strong and responsive farmer institutions and community-centred farmer empowerment efforts. In other words, empowerment is an effort to give autonomy, authority, and trust to each individual in an organization, and to encourage them to be creative in order to complete their tasks as well as possible [12]. This means that in order for farmers to implement GAP and good post-harvest processing, strong institutions are needed, which begins with empowering farmers who are able to change the mindset of coffee farmers.

Problem Formulation

How are the changes in the cultivation practices of Gayo coffee farmers, views and levels of adoption of GAP cultivation and the factors that influence the level of adoption of GAP Gayo Arabica coffee cultivation.

2 Literature Review

2.1 Indonesia as a Coffee Producer and Exporter

In general, there are two types of coffee that are known and grown in Indonesian coffee plantations, namely Robusta Coffee and Arabica Coffee. Robusta coffee is widely grown by farmers in South Sumatra, Lampung and East Java, while Arabica coffee is widely grown by farmers in Aceh, North Sumatra, South Sulawesi, Bali and Flores [8]. Indonesia is the fourth largest coffee exporter in the world after Brazil, Vietnam and Colombia. The projected results of coffee production in 2020 will reach 692,906 tons [12]. The decline in Indonesian coffee bean production is due to the age of the plant being more than 25 years old [13]. Other factors that influence the low productivity of coffee in Indonesia include coffee in the Gayo highlands (Central Aceh District, Gayo Lues and Bener Meriah) as revealed by [10] because maintenance is not optimal, soil fertility decreases, lack of human resources, weak institutions, coffee are old, the varieties are mixed, the processing of coffee cherries is not uniform and the marketing chain is too long.

2.2 Coffee Cultivation

Research conducted by [14]; [15] show that coffee farmers in Karo still apply non-standard coffee planting patterns and non-standard post-harvest processing as well. The productivity of coffee plants ranges from 4 - 4.5 kilograms of cherries/tree/year. Other studies have shown that altitude affects the physical quality of beans and coffee taste. Geographical Indications of Gayo Arabica at different growing heights. The results showed that the physical quality of the beans and the taste of coffee were preferable at higher elevations compared to places with low masl [16]. [11] in Central Aceh states that the land area has exceeded the efficiency point, so as to increase production by rejuvenating plants and using superior seeds. Solutions to increase production, change the way of cultivation that develops in the community. The results showed that the farmers' assessment of the GAP innovation of Gayo Arabica coffee cultivation recommended in Atu Lintang District, Central Aceh Regency, was

positive. The adoption rate of planting high-yielding varieties and making rorak holes is in the medium category. Koker pruning, protective planting, soil loosening are in the high category, while organic fertilization is in the very low category [17].

[18] conducted a study which showed that the added value due to the processing of coffee pumpkin seeds into green coffee beans in Central Aceh Regency was higher than that of green coffee beans in Bener Meriah Regency, which was Rp. 26,738/kg with a ratio of 37.14%. Likewise, post-harvest processing that has been given counseling can produce high-value green coffee products [19].

3   Research Methods

The research was conducted in Permata District, Bener Meriah Regency. The research was conducted using qualitative methods with strengthening of data collection by in-depth interviews, participatory observations, interviews and FGDs as well as conducting questionnaire surveys to farmers. Data analysis techniques in qualitative research are carried out during data collection, and after completing data collection within a certain period

4   Discussion

The land planted with coffee varies from flat to steep, with an area ranging from 3 chains to 3 hectares. There are farmers who have one stretch of land, but there are also lands that are separated from each other. The number of coffee trees is usually 1600 stems/ha with a distance of 1.5 to 2.5 meters. Farmers have different distances from one tree to another. for various reasons. Less than 1.5 m distance was made because the farmer lacked land to make a wider distance between trees while some others made the distance between the trees 2 m on the grounds that their fields were large and so that they could be harvested easily, because the distance between trees was more flexible. The age of coffee also varies from 1.5 years to 25 years for cherry pickers..

Coffee farmers in Permata District do not believe in the seeds they get from the aid. They make their own seeds with the reason that the quality is more maintained because they see firsthand the process of selecting the seeds. Even if there are some farmers who receive seed assistance from the government, in the end the seeds are not planted. The harvest period for the Ateng Super coffee variety ranges from 1.5 years to 2.5 years, while the Borbor variety coffee is 2.5 years to 3 years.

Coffee farmers in Permata District agreed and agreed to use shade in their coffee plantations. Shade trees are usually avocado (Persea americana) trees and lamtoro (Leucaena leucocephala) trees. The distance between the shade plants with each other is approximately 10 meters. The produce from lamtoro (Leucaena leucocephala) is rarely taken by coffee farmers, but the results of the avocado (Persea americana) trees are usually taken to be eaten or sold. A small number of farmers mix their coffee plants with other crops, but not in the same area. Mixed coffee plants are chili (Capsicum frutescens), tomatoes (Solanum lycopersicum syn. Lycopersicum esculentumplants), potatoes (Solanum tuberosum), turmeric (Curcuma longa Linn. syn. Curcuma domestica Valand, ginger (Zingiber Officinale) Var Rubrum Rhizoma). Basically, most of the farmers grow coffee only (monoculture).

The coffee varieties grown are Arabica Ateng Super and Borbor, East Timor. The difference between ateng and borbon varieties is in the shape of the tree and the leaves. Borbon has more branches and is longer than ateng, so that the fruit produced from the borbon tree is more. However, boron takes up more land and takes longer to harvest. Ateng can be harvested at the age of 1.5 years while Ateng 2.5-3 years.

Some farmers do not take care of their coffee plantations by letting them naturally so that the harvest period is longer. The reason for not taking care of their coffee gardens is the lack of money. Some farmers really care and routinely care for and pay attention to their coffee plantations so that they get fast and plentiful harvests. The yield of 1 hectare of coffee is about 1.08 tons of green beans per year.

Fertilizer is applied twice a year using chemical and organic fertilizers. Organic fertilizers commonly used by farmers are post-harvest coffee beans, rotting twigs and M16 liquid organic fertilizer. After the harvest season, farmers use organic because there are a lot of leftover coffee beans that can be used as organic fertilizer. As for the chemical fertilizers, chemical fertilizers urea, KCL and SP36 are used. The number of doses of chemical fertilizers used ranges from 1 to 20 sacks or sacks per year depending on the amount of land owned by the farmer. Farmers also use organic fertilizer from dry leaves that are around coffee trees. Farmers also use compost made from rotten cherry bark. Farmers clean sugar (nuisance plants) found in coffee plantations by clearing them every 3 months and spraying herbicides twice a year. All farmers do weeding or cleaning up nuisance plants, namely grass that grows around coffee trees. Weeding is done using a machine and spraying herbicides. Weeding using machines is done every 3 months while spraying herbicides 2-3 times a year. The types of herbicides used are gromoxon and sun up, sun up is usually used for old grass while gromoxon is for young grass. On average, farmers are satisfied with the results of spraying the herbicide because it makes work easier. However, its deficiency can damage the soil. Usually spraying herbicide grass poison in it at once in the contents of fertilizer, so that the spraying of poison as well as fertilizer application is done in 1 job. Farmers also carry out promotion or rejuvenation, namely by pruning twigs or branches and also shoot leaves. According to coffee farmers, only the Upas fungus they often find on the trunk of the coffee tree. Upas fungus itself causes coffee plants to dry out. Upas fungus usually attacks during the dry season. Upas mushroom comes from the Chinese petai tree which is used as a shade between the coffee trees. Upas fungus can spread between coffee trees through the wind. Upas mushroom handling is done by cutting branches affected by upas fungus. The decrease in production due to upas fungus ranges from 3-5%, including a little because it does not damage the fruit and does not attack many trees.

Pests that attack coffee plants, namely coffee caterpillars attack stems causing hollow stems, ants attack fruit causing black fruit but can still be harvested, rats eat coffee cherries during harvest season, wild boars damage trees, civets eat fruit, fleas attack young shoots and bebari (a type of fly carried by butterflies) suck the juice of the fruit. The dominant pests are coffee caterpillars and ants. Pest explosions occur usually during the rainy season or harvest season. Pest attacks occur every year and pest explosions have occurred in 2016. Estimates of the decline in coffee yields due to pest attacks ranged from 5-20% in 2016. The way to control caterpillars, ants, fleas and fleas is done by smoking, while wild boars, rats, and civets are handled by hunting them.

All farmers take care of their own coffee plantations starting from the process of planting, giving fertilizer, pruning to harvesting. However, during the harvest season, farmers who have large areas of land use external workers from Sigli and Lhouksemawe to help harvest.

The harvest season in Permata District is carried out 2 times a year during the rainy season. The first harvest is counted from around October, November and December. The second harvest is known as the Raya harvest from around March, April, and May. At this harvest, the harvest is more. However, there are farmers who have a longer harvest period because they have a very large coffee plantation. These farmers harvest from September to May. The fruit harvested is a fully ripe red fruit. Harvesting is usually done in installments, such as in the first month of harvest in March around 20% then increased again in April around 40% and then dropped back in May 20%.

Harvesting is done by picking one by one. The obstacle during harvesting is high rainfall. However, there are also those who lack manpower due to having large coffee plantations. On average, farmers sell coffee beans directly in the form of cherries to middlemen/toke. However, some are sold directly in the form of cherries and some are processed by themselves. The average harvest starts from 150-200 cans of cherries per 1 hectare at the time of the first harvest. Meanwhile, the yield during the Kudua harvest or during the main harvest is around 150-250 cans of cherries per 1 hectare depending on the care carried out by the farmers. So if the total average yield of farmers in 1 year is around 300-450 cans of cherries per 1 hectare. If processed into green beans, it ranges from 648-1.08 kg per year.

Coffee farmers' yields fluctuate and fluctuate without a pattern every year. But according to all farmers in 2019-2020. experienced a decline in crop yields, both farmers who have large gardens and small fields. The decline in crop yields was followed by very cheap cherry prices, namely Rp. 3,000 to Rp. 5,000, compared to now ranging from Rp. 14,000 to Rp. 17,000/kg cherry. According to farmers, low yields are not caused by bad weather. Farmers agree that coffee cultivation techniques are the most important factor in influencing crop yields. In fact, most farmers have increased yields during the dry season.

5   Conclusion

1. Based on the findings in the field, not all stages of farming according to GAP have been carried out by coffee farmers in Permata District, Bener Meriah Regency.
2. Stages of cultivation that are not in accordance with GAP are seed selection, care and fertilization and pruning. While the cultivation stage that has been practicing GAP is making shade trees on coffee plants

6   Suggestion

Coffee farmers in Permata Sub-district who have not implemented GAP in the process of farming, should practice GAP comprehensively.

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