Socio-cultural-based coffee management in Karo Regency

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Abstract. Specialty coffee is the one which is referred to specific coffee due to its high quality and its production process which has been certified. The objective of this study was to analyze how far the coffee plant cultivation was redeveloped in Karo Regency, why the Karonese farmers did not grow specialty coffee and what socio-cultural factors influenced it. The result of the research showed that coffee growers in Karo Regency grew coffee because they followed the market trend, the rising price of coffee. However, they still grow coffee traditionally such as preparing seedlings by themselves, not doing fertilizing and trimming, not planting shade trees, selling their coffee in the form of coffee green beans and cherries since they need cash quickly and coffee high price. They do not dry, process, roast, store, and standardize the coffee powder packaging. It is recommended that the coffee growers in Karo Regency change the pattern of cultivation and post-harvesting to keep coffee productivity and price high and sustainable.

1. Introduction

Coffee began to be planted in Indonesia in the 17th century or in about 1646 when the Dutch brought mocca Arabica coffee seedlings from Arabia. Coffee planting was originated from the year of 1696 when Adrian van Ommen came to Batavia and brought Arabica coffee seedlings. They were finally developed in Jakarta and various islands in Indonesia [1].

Today, coffee plants have been developed as an export commodity in which the value of its foreign exchange ranks the third after rubber and oil palm. So far, coffee has become one of the plantation’s reliable commodities which produce foreign exchange, become farmers’ source of income, produce industrial raw material, and create employment so that it has social function which employs people who live in the area [2].

The data from the Directorate General of Plantation in 2006 revealed that of the area of 1,308,732 hectares, 96% was owned by smallholders while the remaining 4.10% was cultivated in the form of big plantations with the export volume of 413,500 tons and the total production of 743,409 tons. Today, the average level of productivity is 792 kg dry seeds per year. The level of productivity in coffee plants in Indonesia is low, compared with the other countries which are the main coffee producers like Vietnam (1,540 kg/hectare/year), Colombia (1,220 kg/hectare/year), and Brazil (1,000 kg/hectare/year) [3].

In 1999, Indonesian coffee plants faced hardships since the plants were old, the quality of production was bad, and the price declined so that coffee plantations were neglected which eventually caused its productivity to become lower. Coffee growers cut off and demolished their coffee trees to be changed to other plants, or most of the coffee plantations were neglected. In consequence, Indonesian coffee production was continuously declining and its competitiveness became weak [4].
Coffee plants in North Sumatera Province are dominated by Arabica coffee. Karo Regency ranks the fifth in the coffee plant area and production. The regency which has the widest area of coffee plants is North Tapanuli with the area of 13,995 hectares, followed by Humbang Hasundutan with the area of 11,296 hectares, Dairi with the area of 10,507 hectares, Simalungun with the area of 7,561 hectares, and Karo with the area of 6,213 hectares. Meanwhile, the regency which has the biggest coffee production is North Tapanuli with the total number of 13,995 tons, followed by Simalungun with the total number of 9,900 tons, Dairi with the total number of 8,621 tons, Humbang Hasundutan with the total number of 6,187 tons, and Karo with the total number of 4,823 tons [5].

In the past Karo farmers planted coffee only as hedgerows or alternating plants between citrus and vegetables as the main crop. Nowadays, orange growers in Karo Regency change their plants to coffee. Some factors which cause them to plant coffee trees instead of oranges, among others, are: the orange cost of production is high, there are a lot of pests in orange plants, and the price of oranges declines during harvest time. The area of coffee plants in Karo Regency increases each year. The data from the preliminary survey in Barus Jahe Sub-district revealed that the area of coffee plants was 50 hectares in 2006, 76 hectares in 2007, 95 hectares in 2008, 118 hectares in 2009, 125 hectares in 2010, and 150 hectares in 2011 [5]. The shift of many growers from orange to coffee aroused a new problem. Those who are used to grow oranges or other plants begin to grow coffee in which they are not familiar with. Consequently, the management of coffee plantation becomes a problem in Karo Regency. While the Karo district government does not have specific policies and programs to increase the productivity of coffee plants.

1.1 Formula of the problems
Formula of the problems in the research was as follows:
1. What are the socio-economic and socio-cultural reasons that constitute a background for the practice of cultivating and processing in the post-harvesting of Arabica coffee by the coffee growers in Karo Regency?
2. How is the policy and the program made by the District Administration in developing Arabica coffee in Karo Regency?

2. Review of literature and method

2.1. Coffee, viewed from social, economic, ecological, and policy aspects
Coffee is the second most important exported commodity in the global trade after petroleum [6]. The interesting thing about coffee which is traded widely throughout the world is that, in reality, most of it is managed by small-scaled growers with the significant role of women [7]. Coffee is produced by more than 70 developing countries in which 45% of them supply 97% of the world’s coffee production. In 2011, Indonesia became the third main coffee producer all over the world after Brazil and Vietnam, followed by Colombia in the fourth position. These four countries produce about 59% of the world’s coffee production [8]. The Directorate General of Plantation indicated that the biggest Arabica coffee producer in 2010 and in (temporary figure) 2011 was North Sumatera Province, followed by Nangroe Aceh Darussalam (NAD), South Sulawesi, West Sumatera, NTT, Bali, Papua, and some other provinces [9].

Specialty coffee is coffee which taste combines special micro-geographical climate which produces unique taste. It was first introduced in 1978 by Erna Knutsen in the International Coffee Conference in France [10]. It refers to coffee which is different from the ordinary coffee because of its high quality or because the process of its production gets certification such as Organic, Fairtrade, Utz Certified, Rainforest Alliance, C.A.F.E. Practices, Common Code for the Coffee Community (4C), Bird Friendly, and Geographical Indication [11–12]. Arabica coffee is a high-ranking commodity in North Sumatera even though its productivity is relatively low. Nationally, the main obstacle in the coffee commodity in Indonesia is that its productivity and quality are low [13]. Amarta identifies that at least there are five kinds of problem in developing Arabica coffee in Simalungun Regency — low productivity, low product quality, limitation of access to market penetration, inadequate infrastructure, and regulation [14]. The
same condition is also undergone by coffee growers in the other regencies of North Sumatera Province, including Karo Regency.

The Indonesian government’s policy on coffee plantations is not optimal; therefore, a comprehensive policy is highly needed to extricate poverty and unemployment [15]. Government’s program in agriculture and agribusiness affects productivity through resource allocation [16]. A study conducted in Nepal revealed that there was a gap between policy and implementation in the field which caused the quality of coffee in Nepal was under the international standard [17]. Therefore, the implementation of policy is needed to be made by the government so that coffee growers can increase the quality of smallholders’ coffee. Many policies and programs of the Ministry of Agriculture will help coffee growers to increase their productivity.

2.2. Coffee cultivation and post-harvesting
Coffee cultivation is closely related to suitable land. Research on feasible land has been done by Simanjuntak, Marbun, and Sembiring (2015) [18]. It is about land which is feasible for Arabica coffee and Robusta coffee plants in SilimaPungga-pungga Sub-district, Dairi Regency. The result of their research shows that the class of land potential to be planted with Robusta coffee in SilimaPungga-pungga Subdistrict is somewhat feasible (S2) with its inhibiting factor of humidity (wa) and cannot be improved. A research done by Zahriyah [19] in Pasrujambe Sub-district, Lumajang Regency, which has the volcanic type of land shows that the area grows Robusta coffee plants that have economic value. A research related to land condition is also done by Wahyuni et al. [20] which state that the best and unique taste is determined by the altitude, climate, and the processing of organic Arabica coffee seedlings which produce the best and unique taste when it is done in semi wash processing.

The research related to seedlings has been done by Susilawati and Robiartini [21] on the growth of Robusta coffee seedlings (Coffea canephoraprieeer) in compost media of river mud. This research shows that river mud compost is potential as the medium mixture of the growth of coffee seedlings.

Fertilizing is needed for the processing of coffee plants. Rosniawati et al. [22] did their research on the use of organic waste as planting media and the application of cattle urine in Arabica coffee (Coffea arabica) seedbed. This research shows that compost fertilizer has a significant influence on the growth of coffee plants. Soil media, coffee husk compost (2:1 or 3:1), and rabbit urine have a significant influence on plant height, stem diameter, and the number of leaves. Another research done by Rubiyo et al. [23] is on the use of goat dung as organic fertilizer for Robusta coffee in Bali. A research done by Dewantara et al. [24] is on the response to the growth of Robusta coffee seedlings toward various plant media and liquid organic fertilizer. The result of their research shows that the treatment on various plant media has a significant influence on increasing the variable of total observation of leaf area, dry crown weight, and ratio of root crown weight.

Qualified coffee seedlings cannot be separated from the use of shade trees because coffee seedlings are not able to adapt to high light intensity. Unsuitable level of shade trees in the phase of seedbed will produce the low quality of coffee seedlings [25]. A research done by Anita et al. [26] indicates that shade trees will increase the number of leaves, dry weight, and leaf area.

The factor which influences the quality of coffee beans is coffee bean storage. Ross et al. [27] point out that there is a change of sensor during the storage of coffee beans caused by the storage temperature which will change the coffee aroma.

2.3 Research method
The research was done in five sub-districts in Karo Regency. The research object was all Arabica coffee growers in Karo Regency, who understand about coffee cultivation, coffee traders, coffee shop owner around Berastagi and Kabanjahe such as Biji Hitam Coffee Shop, RM Coffee Shop, Juma Café dan Café Kahowa. The location of the survey for coffee growers was in Karo Regency which consists of Barus Jahe Sub-district in Barus Jahe Village and Barus Julu Village, Tiga Panah Sub-district in Sukambayak Village, Simpang Empat Sub-district in Lingga Julu Village, Merek Sub-district in Pancur Batu Village, and Payung Sub-district in Cimbang Village. The data were analyzed using qualitative method.
3. Results and discussion

The age of coffee plants was dominated by the age of six. The age of coffee plants in the research location did not include productive age since the productive age of coffee was under five years old. Most of the respondents have relatively wide agricultural land even though not all of the land was planted by coffee plants; it was mixed with other plants such as chilies, oranges, potatoes, cabbages, Chinese cabbages, white radish, and even clove trees. Most of the coffee plants in Karo Regency were secondary plants (not principal plants) and even used as hedges. The majority of the respondents have their coffee land. The topography of coffee plants was generally flat and the rest with moderate topography which means that it is not slope and flat.

Most of the coffee growers with the range of planting were not in order with the range of 2.5 m x 2 m, 2 m x 2 m, 1 m x 2 m, 4 m x 2 m, and 1 m x 1 m. The number of plants per hectare was on the average of 2,500 tons of green beans or 1.4 tons of ground coffee. In another calculation, the productivity of coffee plants in the research location was about 4 kilograms of cherries/stem/year which indicated that they were 4 x 2,500 stems/ha/year = 10,000 kg of cherries/ha/year = 4,000 kg husk/ha/year = 2,000 kg/ha/year of green beans/1,400 kg of coffee powder. This coffee productivity was relatively high, compared with the other areas in Indonesia which were on the average of 700-900 kg/coffee/ha/year.

Agricultural counselors suggest that every 1 ha of land contains 1,350 stems, but the coffee growers plant it with 1,600 until 2,500 stems. It is also suggested that they use certified seedlings provided by the Agriculture Agency, but most of them use seedlings obtained from their plantations. Since 2010, there have been millions of certified seedlings given to the growers by the Agriculture Agency and by other parties. Coffee variety planted is “sigararutang.” However, most of the farmers grow their coffee by getting the seedlings found under the coffee trees so that they are not qualified. There are no agricultural counselors or experts in coffee plantations who give information about good coffee seedlings to the coffee growers. In consequence, they do not get any sufficient information about qualified coffee seedlings.

Weeding weed is done manually in all over areas of the coffee plants. It is done by using machetes or chopping knives, hoes, or by pulling out with hands. It is intended to keep the plant areas clean and to decrease the competition in getting nutritive substances between coffee plants and the other unwanted plants in the plant areas. Weed is handled by herbicide, alternated by cleaning it off twice a year. Based on the observation, it was found that the coffee plants are not taken care seriously and the weed is not cleaned off. Their reason for not cleaning off the weed is that it takes a lot of money, and the coffee plants can survive even though the weeds is not weeded.
Fertilizing coffee plants is intended to provide sufficient nutritive substance for the plants so that they can grow and have optimal production. Even though the respondents stated that they left their coffee land neglected naturally, their knowledge of fertilizing is relatively good. They know the types of chemical fertilizers they use such as nitrogen fertilizer which is given with the dosage of 0-100 grams/plant, depending on the age of the plants, twice a year. They also give 100-200 grams of SP-36 fertilizer per plant, depending on the age of the plants, twice a year. They know about KCL fertilizer with the dosage of 100-200 grams/plant, depending on the age of the plants, twice a year even though, in reality, coffee plants are not usually given fertilizers since it is costly.

Coffee growers do not give shade trees in their coffee plants. They know about lamtoro trees which are good for being used as shade trees in coffee plants; but in reality, they do not implement it. Their reasons for not planting shade trees are that it will take extra energy, attention, time, and money to plant and look after them.

The reason why coffee growers do not trim their coffee plants is that they feel it is wrong to trim such trees with dense foliage. Another reason for not pruning because he did not know the benefits of pruning coffee plants, needed energy and costs as well as a lack of technical knowledge to cut them. Even though coffee plants need to be pruned to form plants that remain low. Pruning is also to facilitate maintenance and harvesting, effective use of nutrients by removing damaged branches and unproductive branches. In addition, pruning also aims to reduce pests and plant diseases, so that sunlight can reach the leaves to the fullest, so that the rate of photosynthesis is more maximal and stimulates more flower growth, as well as more productive branches that are formed.

The pests of coffee plants consist of fruit flies (cit-cit in Karonese), ants perkis in Karonese, snails and caterpillars (kati Mukmuk and ketadu in Karonese) inside the coffee stems. Some diseases in coffee plants are fruit rot, stem rot, leaf stain, and parasite (moss and brownish fungi). Coffee growers handle pests and plant diseases by spraying pesticides such as Drusban, Crucakron, and Talanet. They also use compost such as organic fertilizers. Some coffee growers do not take care of their coffee plants. They do not use pesticide to handle pests and diseases; sometimes they use composts for fertility or for increasing the number of cherries. Their reasons for not handling pests and diseases are that they are not able to do that and because they lack money.

3.1. Processing in the post-coffee harvesting
In summary, harvest and post-harvest coffee in Karo district begins with picking cherry, sorting, pulping, fermentation, washing, drying, hulling, drying, packaging and storage. The coffee growers say that they process their coffee production by themselves. The method of harvesting is done by picking a coffee cherry bunch one by one. Many of them hire wage earners or hired men (aron) to harvest coffee. Aron is the pattern of working together, sharing the burden, and rendering mutual assistance in the Karonese community in North Sumatera in doing something such as harvesting rice plants. As time passed, the meaning of Aron has gradually changed. Today, it is a hired man who works during the harvest time. For example, an owner of a wet rice field has to hire many arons to work in his wet rice field and to pay their wages according to their work time. Besides that, many of them come from outside of Karo Regency. Many arons in Berastagi, for example, come from Samosir and Sidikalang; some of them are Batak Toba, Javanese, and Nias.

Some arons get a daily payment of IDR 80,000/day without considering how many cherries they have picked. Usually, this kind of hired man will pick red cherry bunch without stalks. Some of them are paid according to the number of cherries they have picked. This kind of payment has some weaknesses: the hired men will pick the cherries randomly, without selecting the red ones. The cherries are usually mixed with the yellow or even the green ones; sometimes they are mixed with the stalks. The result is that the harvest is not qualified and the coffee plants are damaged. The mistake is usually not realized by the coffee growers.

Some coffee growers say that they pick red ripe cherries; some of them say that they pick yellowish red cherries or most of the cherries are red or even too ripe so that the cherries are blackish dark red, and some of the cherries have become dry. These data indicate that coffee growers are not disciplined in picking coffee cherries since some of them pick dark red-ripe cherries. They argue that the main obstacle in the harvest time is high rainfall which makes them difficult to harvest coffee, even though coffee
harvesting usually occurs during the rainy season. Another obstacle is the lack of hired men. Coffee growers prefer paying hired men on a daily basis to paying them based on the number of cherries they have picked. They sometimes complain about the imbalance between the earnings and the expense of paying the wages, let alone if it is not a big harvest. They also complain about the lack of equipment such as buckets for collecting cherries and ladders for picking cherries on tall trees since they do not trim the coffee plants which make them difficult to harvest.

In the post-harvest, wet and slimy green beans are peeled, fermented, washed cleanly, and dried in the sun on a clean, dry floor, using tarpaulin as the lining or using mats or drying racks until the green beans become half-dry or have a water content of about 30% to 40%. The drying is done in two to three days until the green beans become half-dry coffee beans. In the process of drying, green beans are stirred once in 1 to 2 hours to provide equal heat. The process of drying is also done to half-dry green beans (bean horn). The next step is that the green beans are peeled by using huller (machine) producing half-dry coffee grains called wet green beans which are dried in the sun on the drying racks or mats or tarpaulin within three days and turned over about once in 1 to 2 hours. The method of drying done by coffee growers does not meet the standard of drying green beans in the sun. The obstacles occur in drying green beans in the sun are lack of sunlight and high rainfall intensity. On the average, they dry up their green beans from two to eight hours although it depends on the weather. The drying is done until green beans become dry coffee beans with a water content of 12% (green bean). The green beans are then sorted to be grouped in the same amount and separated from broken, perforated, or incomplete beans. The green beans are then stored in new and clean sacks according to the groups of the result of the sorting to be processed further to become roasted beans or to be sold. Some coffee growers do not dry up their coffee because they directly sell the cherries.

Some coffee growers sell their coffee in the form of coffee husk, and others sell their coffee in the form of cherries, roasted beans, and green beans. These data indicate that most of the coffee growers process their coffee in the post-harvest in the form of coffee husk, compared with green beans and roasted beans. They tend to sell their coffee in the form of husk and cherry. Selling coffee husk will decrease the value-added for the coffee growers in getting high coffee selling price. Research conducted by Barlaman et al. [28] indicates that the treatment of fermentation process duration and the types of the container have the influence on SNI quality test, physical characteristics, and organoleptic properties of Arabica non-roasted and roasted coffee beans. Another research also indicates that the quality of coffee beans can be determined by their water content, physical quality, and taste. Water content is the important attribute and becomes an indicator for the quality, especially for coffee sellers and for those who roast coffee beans. The watercontent of Robusta coffee should be in the maximum of 11% for the stability in the process of storage. Even though the sensory evaluation tends to be subjective, the test of taste indicates the existence of the influence of semi-wet processing treatment on the quality of brewed coffee as coffee last product. In general, semi-wet processing treatment followed by selective picking in cherries can increase the physical quality and the taste of coffee [29]. The research result above emphasizes the importance for the coffee growers to process coffee beans in the post-harvesting to get the value-added of the selling price. The reason of the coffee growers for selling their coffee in the form of what has been mentioned above is that they can get cash quickly and high selling price because they do not have any hullers (processing machines), and because the cherries or green beans can be collected easily.

These data indicate that the coffee growers want to get cash quickly so that they do not want to process the coffee beans further; they do not have any hullers to process coffee husk to become green beans. They even do not have any roasting machines which process green beans to become roasted beans (ground coffee).

These data also indicate that roasting by using machines is seldom done by coffee growers since roasting machines are costly so that they roast green beans manually by using big frying pans and stoves. Another reason is that they want to get cash quickly by selling cherries or husk without spending any energy in roasting green beans.

Green beans are stored in a storage which is clean, not leaking, free from pests of other strong and sharp odor, and good aeration. They also keep their coffee beans in sacks or storage which indicates that
they still use sacks to store their coffee beans since there is no special storage for keeping coffee beans. The coffee which is stored is in the form of coffee husk, cherries, and green beans. Some obstacles in storing coffee beans in storage and sacks are insects, high moisture, and vectors. Concerning the storage of coffee, are search done by Ross et al. [27] indicates that sensory changes occurred in ground coffee during storage at room and freezer temperatures, and these changes could be detected by a sensory panel. The specific attributes of the coffee that are most affected by storage were coffee aroma and bitterness, with fresh coffee found to have a stronger coffee aroma and stored coffee found to be more bitter. The panelists had different preferences but overall, appeared to prefer the fresh coffee to the stored coffees. The results indicate the importance of proper storage of ground coffee and the idea of freer storage may be more effective at retarding some of the attribute changes during storage.

3.2. Government’s policy in developing coffee in Karo Regency
Concerning the management of coffee plants, most of the coffee growers state that they have obtained aid from the Government. The Karo District Administration has provided coffee growers with coffee seedlings, hullers, roasting machines, and plastic choke units for coffee packages, and water content measurement devices. Most of the coffee growers admit that they do not have any access to banking. Regarding the programs which related to the management of coffee crops, most of informants said that they never received any government support. But some of them said government given supports such as the procurement of 120.000 seedlings of sigararutang variety in all sub districts in 2017. The procurement of coffee Attractan in 2017 for 12,995 was handed over to the villages of coffee farmers. Provision of 7 huller machines for farmers in Village of Cimbang Sub district of Payung, and Kuta Rakyat. The 2 units of roasting machine for farmers in Cimbang and Kuta Rakyat. Provision of 2 units of plastic clamps for coffee packaging in Village of Cimbang. The support of measuring equipment of water content in Villages of Cimbang and Kuta Rakyat as well as providing coffee seeds and compost for Siosar refugees for 52,000 of coffee seedlings. However, according to the informant, that coffee seedlings provided by the government to farmers, are not certified or qualified.

4. Conclusion
Coffee plant cultivation in Karo Regency is still done traditionally by using coffee seedlings made by them and come from their coffee plants. Most of them do not fertilize, trim, maintain and renewtheir coffee plants, and plant shade trees in their coffee plantations. Their reasons are their coffee plants do not need intensive maintenance, they lack money, and they believe that coffee planting is not the main priority. Coffee growers pick their dark red, ripe cherries, but they have some obstacles in doing it during the harvest time such as high rainfall and lack of hired men. Coffee growers dry their green beans in the sun in open places, using mats (not directly touches the ground) and sell their coffee in the form of husk (green beans) and cherries with the reason that they need cash quickly and get a high price. Coffee growers do not roast their coffee because they do not have any roasting machines since they cannot afford to buy them. It seems that the government does not pay any attention to develop coffee plants.

5. Recommendation
It is recommended that coffee growers increase their generating income, change their mindset in growing coffee by changing the traditional practice of growing coffee to the sustainable one by selecting qualified seedlings, planting shade trees, using fertilizers, combating pests in natural way, trimming coffee plants, doing harvest properly, picking red cherries, sorting green beans, processing green beans properly, starting from sorting, peeling, drying them in the sun, grinding, roasting, and storing them according to the procedure. The Government should make Regional Regulation which requires coffee growers to pick only red cherries and encourage coffee agro-tourism sector.

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