

# Strengthening Community Economics on the Slopes of Merapi through Innovation in Merapi Coffee Management as a Regional Potential of Sleman Regency

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## ABSTRACT

Merapi Coffee is a superior product of local potential in Sleman Regency because it attracts domestic and foreign tourists. This can also be seen from the great demand for this Merapi Coffee product, especially after the Helsinki Coffee Festival exhibition, which has been participated in by the Sleman Regency Government from 2016 -2018. Since then, there has been a lot of demand for exports abroad, but due to the limited production of Merapi Coffee, this export demand has not been fulfilled. The advantage of this Merapi Coffee is that it tastes different from other types of coffee in Indonesia, namely because of the geographical conditions where Merapi Coffee is grown on the slopes of Mount Merapi, whose soil consists of volcanic ash from the eruption of Mount Merapi and the human factor who cares for the plant with knowledge, for example. By crossbreeding to produce superior seeds and have characteristics and reputation, resulting in outstanding aroma and taste. The purpose of this study is to determine the management of the local potential of Merapi Coffee in Sleman, both from the aspect of legal protection and the management of coffee plants. This study uses the action research method, which is research that takes action to implement the process of implementing a job. In carrying out this research, coordination with related parties, especially policymakers in the area, will be carried out. Merapi coffee is an excellent product of local potential in Sleman Regency, which provides economic benefits for the community and regional income. Therefore, serious efforts are needed to manage the local potential, both plant management and cultivation. With reasonable control of Merapi Coffee, of course, this will benefit the economy of the surrounding community and even increase regional income. This Merapi Coffee management activity focuses on the management of the coffee cultivation process, coffee cultivation, and legal protection for Merapi Coffee from the threat of economic abuse due to export activities.

**Keywords:** *Cultivation, Economic Strengthening, Geographical Indication, Legal Protection, Merapi Coffee*

## 1. INTRODUCTION

The elements that affect the distribution of flora and fauna are soil and climate. Soil affects fertility and nutrients used by plants. At the same time, the environment determines the temperature and sunlight that plants need to grow. Tropical climates such as Southeast Asia have high rainfall and sunshine

throughout the year. This allows agriculture to develop rapidly, as crops can be grown all year round. One of the plants that thrive in Indonesia is coffee. Subtropical and tropical regions are good locations for coffee cultivation. Therefore, the countries that dominate the world's coffee production are South America, Africa, and Southeast Asia. Indonesia is one of the largest coffee-producing and exporting countries in the world. Coffee plants are plants

originating from Africa and South Asia, including the Rubiaceae family and the *Coffea* genus with up to 5 meters. The leaves are about 5-10 cm long and 5 cm wide. The white coffee flowers flower simultaneously, while the coffee cherries themselves are oval in shape, about 1.5 cm long, green, and then yellowish to red and black when roasted. Coffee beans are ready to be picked when they are 7 to 9 months old. Coffee plants consist of *Coffea arabica*, *Coffea robusta*, and *Coffea liberica*. Green then yellowish to red and black when roasted. Coffee beans are ready to be picked when they are 7 to 9 months old. Coffee plants consist of *Coffea arabica*, *Coffea robusta*, and *Coffea liberica*. Green then yellowish to red and black when roasted. Coffee beans are ready to be picked when they are 7 to 9 months old. Coffee plants consist of *Coffea arabica*, *Coffea robusta*, and *Coffea liberica*.

According to data from the Central Statistics Agency, in 2019 the area of smallholder coffee plantations was around 1,215 million hectares, an increase from 2018, 1,210 million hectares. Similar to the coffee area, coffee production from 2017 to 2019 continues to increase. Production in 2017 reached 685.80 thousand tons, then in 2018 increased to 727.9 thousand tons and reached 731.6 thousand tons in 2019. Indonesia's coffee production is mostly exported abroad, and the rest is marketed domestically.

This tropical climate plant has been an ancestral heritage from time immemorial. This plant grows on almost every island in the country, but the taste of coffee from each region is also very different. The taste of coffee in Sumatra, Java, Sulawesi, and other islands varies due to various genetic sources and local environmental factors, such as the regional climate, which also differs from place to place. The uniqueness of the taste is maintained and highlighted as a characteristic of coffee in each region.

Sleman Regency is the largest regency compared to other regions such as Bantul Regency, Kulonprogo Regency, Gunungkidul Regency and Yogyakarta City. One area of Sleman Regency is at the foot of Mount Merapi/Merapi Slope. However, administratively, the Mount Merapi area is included in the districts of Magelang, Boyolali and Klaten in Central Java, and Sleman in Yogyakarta. Mount Merapi is one of the most active volcanoes in Indonesia. The volcanic activity provides fertility for land on the slopes of Merapi. The vomited material from the Merapi eruption contains a lot of nutrients, especially phosphorus and potassium. The fertility of the Merapi area is used by the people of the slopes of Merapi to grow various commodities, such as horticulture, fruits, coffee, and tobacco.

This research needs to be done because Sleman has local potential for Merapi Coffee which is in great demand abroad, and the high export demand so far cannot be fulfilled. The novelty of this research is that by relying on coffee management, both from the legal aspect as well

as cultivation and plant management, it can increase exports as well as get legal protection for the local potential of Merapi Coffee. Because with the submission of Geographical Indications for Merapi Sleman Coffee, the planting and post-harvest procedures are required to meet the standards in accordance with the provisions.

In general, Cangkringan residents rely on agriculture, livestock, and a small number of entrepreneurs and civil servants [1]. Importantsari Village, Cangkringan Subdistrict in 2019 produced Robusta Coffee of 2,380.96 kg/Ha), which experienced an increase of 13.64% for three years [2] or an average production of 1,454 tons per year. Robusta coffee also produces an Arabica coffee harvest of around 34 tons. The significant difference between Robusta and Arabica coffee production in Cangkringan is due to the different plantation areas. For comparison, in 2018 the area of Robusta Coffee plantations was 151.15 Ha while the Arabica Coffee plantation area was only 27.00 Ha. For Merapi Robusta Coffee, the productivity is categorized as good enough for smallholder coffee plantations. Even with technical improvements in cultivation, the level of productivity can still be increased. With such a land area, coffee has now become one of the essential export commodities for the local community.

Most of the coffee in Cangkringan District is Robusta coffee. These growth figures show that the existence of coffee plants in Sleman Regency, especially in the Cangkringan area, still exists today and even has a tendency to grow in a positive direction by various campaigns for the success of coffee farmers and the stretching of the coffee trade which brings benefits to many parties.

Recently, the coffee market has continued to grow, and consumers tend to buy coffee with good taste and distinctive character. In the era of the global market with increasingly fierce competition as it is today, product differentiation is an essential means to attract consumers' attention. At the coffee farmer level, various efforts have been made to improve coffee production and quality, especially taste quality.

This study will analyze the management activities related to Merapi Coffee, especially Robusta Coffee from coffee cultivation, as well as in terms of legal protection for Merapi Coffee as a potential local area from the threat of economic abuse due to export activities.

## **2. RESEARCH METHOD**

This study uses the action research method, which is research that takes action to implement the process of implementing a job. In carrying out this research, coordination with related parties, especially policymakers in the area, will be carried out. The next stage is collecting data in the field to implement research activities, especially in obtaining superior Robusta

Coffee seeds and an optimal and efficient irrigation system in the use of water resources. In this implementation, the next step is to evaluate to find out the impact or assessment of the programs that have been implemented, and make improvements if needed. There are four stages in carrying out data analysis, namely data collection, data interpretation, and follow-up plans.

### 3. RESULT AND DISCUSSION

#### 3.1. Merapi Coffee Development in Cangkringan, Sleman Regency

Based on the conditions and considerations above, the Merapi Robusta coffee farming community intends to increase the added value of its coffee cultivation and processing business. The aim is to gain recognition for the quality and uniqueness of the coffee product, as well as a way to preserve the tradition of coffee production in the region, which in turn will strengthen the economy of the community in Cangkringan Sleman Regency.

Merapi coffee is a superior product of local potential in Sleman Regency, which provides economic benefits for the community and regional income. Therefore, serious efforts are needed to manage the local potential, both in terms of plant management and in terms of legal protection. Merapi coffee is a potential natural wealth in Sleman Regency, which has a unique taste. Some of Merapi's Robusta and Arabica coffee products, when grown on the slopes of Merapi, taste better, this is because the soil texture contains volcanic ash, so they have the advantage of taste and quality. The superiority of the taste of Merapi Coffee, apart from being influenced by geographical conditions, is also influenced by human factors in the process of growing to harvest the coffee by utilizing local wisdom from the farming community in Cangkringan, which has been maintained for tens or even hundreds of years ago. The type of coffee that is widely cultivated in Cangkringan is the type of Robusta Coffee, where this type of coffee is easier to grow in areas that are not too high considering the height of Mount Merapi where the coffee grows is not too high, which ranges from 500 - 999 meters above sea level, as well as the conditions of climate and environmental factors. Rainfall in Cangkringan significantly affects the growth of Robusta coffee plants.

Merapi Coffee is an icon of Sleman Regency, especially the slopes of Mount Merapi, which is managed mainly by the community in 3 sub-districts. One of them is Cangkringan District, wherein Cangkringan District is the most significant production of Merapi Coffee, especially the Robusta type compared to other areas, so it can be concluded that most of the majority of the population has a livelihood as coffee farmers. Explicitly the production of Merapi Robusta Coffee can be shown in the following map:

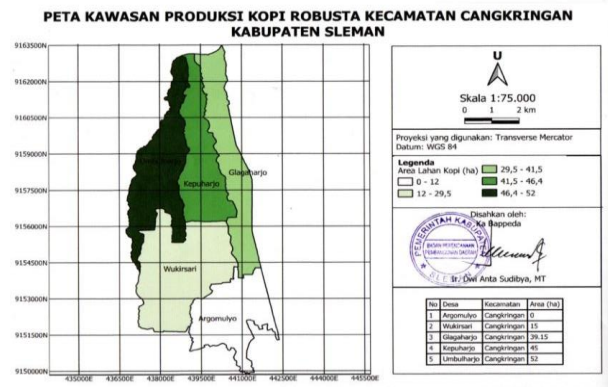


Figure 1. Map of Coffee Area in Cangkringan District

Legenda : The legend is a part of the map. In WebGIS this is a legend that provides color information for each layer that is currently active.

Table 1. Merapi Coffee Production in Cangkringan 2020

Area	Land Area (Ha)	Production (Kg)
Argomulyo	0	0
Wukirsari	15	3718,29
Glagahharjo	39,15	9295,725
Kepuhharjo	45	11154,87
Umbulharjo	52	13014,015
Jumlah	151,15	37182,90

Source: Agriculture Office of Sleman Regency, 2020

In the Cangkringan area, the types of coffee plantations can be categorized as people's coffee, namely coffee plantations that are cultivated by the people, where the main problem in developing community coffee is the use of seeds that are not superior and not certified so that productivity is low, the ability of cultivation techniques is low so that it is not as recommended, institutional undeveloped and weak farmers. Farmers are experiencing limited capital constraints [3].

#### 3.2. Merapi Coffee Cultivation To Get Superior Seeds

The problem of seeds in the plantation business is essential because plantation crops are a long-term investment. Good seed quality will determine the success of coffee cultivation when it is cultivated. Good quality coffee requires various determining factors, one of which is quality coffee plant seeds to cultivate good coffee plants. The cultivation of Merapi Robusta Coffee is carried out to obtain high-yielding varieties of seeds that are good for the sustainability of coffee plantations in Sleman and are also an investment for farmers.

The low quality of coffee plants in Indonesia is sometimes caused by the quality of the coffee beans used in planting techniques. One way to do this is by stem cuttings from coffee plants to produce fruit and grow fast.

Stem cuttings are tree propagation techniques by grafting between the top of the trunk and other branches of the coffee tree. Coffee plants that use the Stem Cutting technique are Robusta Coffee because of the vegetative propagation technique.

One way to cultivate Merapi Coffee is by vegetative propagation, namely by connecting/cutting. By doing the connecting technique, it is hoped that optimal results will be obtained because some potential failures can be minimized. The advantages of the cutting process are that it is easy to do, and the condition of the coffee plant is strong enough because grafting is done on mature coffee plants, so the ability to adapt is much faster and successful because grafting will be parented on the initial plant.

Coffee grafting is the merging of scions on mature coffee seedlings or on coffee plants that are no longer productive so that coffee plants can be better and become juvenile plants and also aim to increase production because if this grafting technique is successful, the yield of each tree can increase up to 50% of coffee plants that are not grafted, so the quantity of harvest will increase significantly. In addition, this grafting technique will produce superior quality seeds in terms of larger fruit compared to coffee plants that are not spliced / cuttings. In periods, grafted coffee plants will bear fruit faster than coffee plants with no grafted / cuttings.



**Figure 2.** Cultivation of cuttings on coffee plants

The types of superior robusta coffee varieties used as coffee seeds for grafting are usually the following types: BP42, BP 234, BP288, BP 368, BP 409, and SA237.

Considering that Robusta coffee is cross-pollinated, the planting should be 3-4 polyclonal clones per garden area.

The following is how to propagate coffee utilizing stem cuttings:

a. Parent selection

Choose coffee tree shoots that are approximately two years old or more, choose old stems that are large so that they will bear fruit quickly. Then select a coffee tree branch that is superior, and that produces a lot of fruit.

b. Coffee Plant Cutting

Choose branches that are 3-6 years old instead, already brown. Make cuts in sections 2-4 from the shoots and vice versa, and cutting is done obliquely. The tip of the cuttings is tapered. The cutting length is about 10cm, then cut half of the leaf halves to reduce the evaporation process. Store the moisture in the cut branches in a wet sack to dry out in the wind. After cutting the stems, soak the cutting base in a liquid that stimulates the roots. Make adjustments at the end of the rainy season.

c. Coffee Nursery

Prepare a planting medium consisting of a mixture of soil and compost with a 2:1 composition. Transfer the kooi tree slices from the growing media bed into polybags. Put in a 1-meter wide polybag for easy maintenance. Coffee tree seed care includes watering and fertilizing. Pour - 2 times a day or depending on soil moisture. Fertilization can be done by pouring a mixture of cow dung, water, and urea with a composition of 10:10:1. The pouring dose for each coffee tree seed is about one coconut shell per week. Coffee seeds can be brought to the planting area after 8-9 months.

d. Harvest Process

Coffee beans can be harvested after the plant is planted 2.5–3 years after planting. Cuttings can run faster. Usually, the first coffee harvest is still tiny. Over time the number of branches increases, and yields increase.

In this vegetative cultivation, plant height and primary branches did not differ significantly between the two populations [4]. Cultivating coffee plants using the stem cuttings technique also has many advantages, including being easy to do, having the same characteristics as the parent has chosen, fruiting faster, and the results will be more uniform.



**Figure 3.** Superior Seeds in Coffee Plants after Cuttings

Cultivation of this coffee plant also requires adequate irrigation. Merapi coffee is grown on the slopes of Mount Merapi, which is a plateau with an altitude of about 625 m above sea level. Due to its geographical condition in the highlands, the water sources obtained are relatively far away. And challenging to cause garden irrigation is not optimal, thus causing reduced and not maximal Merapi Coffee harvest. So far, the Merapi coffee plantations have only relied on the rain that falls and will cause problems if the dry season arrives so that there will be a drought in coffee plantations. An effective and efficient irrigation technique is required with Drip Irrigation or Drip Irrigation. The importance of saving irrigation water is still not fully realized by farmers. To overcome water limitations, the drip irrigation system is the right choice in increasing the efficiency of water use [5]. According to Hadiutomomo [6].

Drip irrigation is a method of giving water to plants directly, both in the root area of plants and on the soil surface, through continuous and slow drops. The efficiency of water use with drip irrigation systems can reach 80 - 95%.[7] The provision of water in drip irrigation is made using an application tool (applicator, emission device) that can provide water with low discharge and high frequency (almost continuously) around plant roots [8]—both in the area of plant roots and on the soil surface through continuous and slow drops. The efficiency of water use with drip irrigation systems can reach 80 - 95%.[7] The provision of water in drip irrigation is made using an application tool (applicator, emission device) that can provide water with low discharge and high frequency (almost continuously) around plant roots [8]—both in the area of plant roots and on the soil surface through continuous and slow drops. The efficiency of water use with drip irrigation systems

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**Figure 4.** Coffee Plant Irrigation Drip Pipe



**Figure 5.** Making Drip Irrigation at Merapi Coffee Plantation

### ***3.3. Efforts to Protect Merapi Robusta Coffee Varieties That Have Excellent Taste and Characteristics Due to Geographical Elements***

Merapi coffee is a superior product of local potential in Sleman Regency, which provides economic benefits for the community and regional income. Therefore, serious efforts are needed to manage the local potential both in terms of management, plants, and in terms of legal protection. Merapi coffee has the potential to be submitted for Geographical Indications because it has advantages and characteristics that are different from coffee from other regions, both in terms of aroma, taste, and texture. This is based on the geographical conditions where Merapi Coffee is planted on the slopes of Mount Merapi, whose soil consists of volcanic ash from the eruption of Mount Merapi and the human factor that takes care of the plant with knowledge, for example by interbreeding to produce superior seeds and have characteristics and reputation. However, until now, there has been no protection for Merapi Coffee. If left unchecked, it can be claimed by other countries because of the large number of exports that have been carried out.

**Table 2.** Test Results of Coffee and Coffee Soil Samples from Merapi Sleman (Puslitkoko Jember 2021)

Asal Sample	Tekstur Sample (%)			Terhadap 1 kg contoh kering 105 °C			Ekstrak NH4	P2O5	pH
	Pasir	Debu	Liat	C	N	C/N	K-	eBray	H2O
	%			gram				Mg	
Purwobinangun	75	17	8	5,30	0,32	17		616	5,9
Tenggalpanggung Girikerto	75	17	8	2,87	z	12		124	6,0
Pakem	74	24	2	1,77	1,77			90	5,7
Turi	73	20	7	1,88	1,88			246	5,8

The effort to provide legal protection for Merapi Coffee is by applying for registration of Geographical Indications (IG) of Merapi Coffee to the Directorate General of Intellectual Property (DJKI) of the Ministry of Law and Human Rights of the Republic of Indonesia. With the legal protection of IG, Merapi Coffee will be protected by state law and recognized nationally and internationally that Merapi Coffee plantation products come from Sleman Regency. Examples of Geographical Indications are Pondoh Salak, Kintamani Coffee, Cilembu Sweet Potatoes, and others.

In Sleman Regency, there is potential for natural wealth that can be registered for Geographical Indications, namely Merapi Coffee, which has a unique taste. Some of Merapi's coffee products are Robusta, Arabica, and Luwak Coffee. When planted on the slopes of Merapi, the taste is better. This is because the soil is volcanic. This is the advantage, namely from the taste and quality.

The importance of protecting geographical indications is due to various infringement cases, namely Kopi Gayo, where the trademark is claimed by Holland Coffee BV company from the Netherlands as the right holder. Meanwhile, Gayo Coffee is a specialty coffee of Nanggroe Aceh Darussalam and has been registered internationally under Gayo Mountain Coffee [9]. Geographical Indication (GI) is one of IPR. The definition of GI, according to Article 1 Number 6 of Law Number 20 of 2016 concerning Marks and Geographical Indications, is a sign indicating the area of origin of an item or product due to geographical, environmental factors including natural factors, human factors, or a combination of these two factors. Provide reputation, quality, and characteristics on the goods and products produced. If you look at the article, goods and/products that are included in GI are those that meet the elements of environmental factors, these environmental factors can be influenced by natural and human factors. GI is different from brand rights. If brand rights only show an identity of an item/product, while a product can be said to have GI, it is said to have unique characteristics to be

said to have GI. Like coffee, some coffee-producing areas have different characteristics influenced by natural factors, human factors, or a combination of natural and human factors. Environmental factors that influence, for example, coffee plants must be planted above a certain height with certain weather factors so that they can bear fruit optimally.[10]

From the results of the Coffee Laboratory test in Jember on Merapi Robusta Coffee, the results for Quality 1 and Quality 2 categories have a water content of about 11-12%. Merapi Robusta coffee at a medium roasting degree shows a relatively homogeneous roast, with a bitter, astringent coffee aroma, as well as earthy, herbal, and fruity flavors. Based on the sensory analysis results, it shows that the taste of Merapi Robusta Coffee has a spicy aroma, milk chocolate, caramelly, 'kweni' Mango Aroma. Merapi Robusta coffee has a bitter and astringent taste.

From the results of laboratory tests on Merapi Coffee and soil on the slopes of Merapi, it can be analyzed that the characteristic taste of Merapi Coffee is obtained from the influence of geographical conditions and soil nutrients in the location where Merapi Coffee grows so that the characteristics of Merapi Coffee may not be the same as the taste. Coffee in other areas, mainly due to the influence of the thickness of volcanic ash on the slopes of Mount Merapi which gives rise to a robust and distinctive taste in Merapi Coffee. That's why there is a need for legal protection against Geographical Indications of Merapi Coffee. Currently, the submission of Geographical Indications is being pursued in 2021 with the initiation of the Sleman Regency Government.

#### 4. CONCLUSION

The advantage of coffee cultivation through cuttings/grafting will certainly provide long-term investment for farmers because it has superior Merapi Coffee seeds both in terms of quantity which increases by 50%, and the harvest period is short and in terms of the quality of the coffee cherries, which is greater than the

coffee variety. Merapi before cuttings. In addition, from land management, optimal irrigation is also needed but is efficiency due to limited water resources in the area. Furthermore, in terms of national and international legal recognition, efforts are required to apply for a GI for Merapi Coffee to get legal protection from the state. Legal protection has the meaning of guaranteeing the rights of citizens to fight for what should be obtained [11].

### **AUTHORS' CONTRIBUTIONS**

Dyah Permata Budi Asri, lead researcher, and coordinator, data related to Geographical Indications; Edy Sriyono, field data, analysis and implementation of drip irrigation; Subeni, field data, analysis and implementation of coffee cultivation.

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