

SUSTAINABILITY OF TEMANGGUNG COFFEE FARMING SYSTEM IN THE PERSPECTIVE OF GEOGRAPHICAL INDICATIONS

I KETUT ARDANA

Indonesian Center for Estate Crops Research and Development
Jl. Tentara Pelajar No. 1, Bogor 16111

e-mail: ardana_1992@yahoo.com

be accepted : 01-07-2019

revised : 11-09-2019

Approved : 01-10-2019

ABSTRACT

Geographical Indications (GIs) certificate is required to protect specific flavors of crops in the given region. The study aimed to analyze the sustainability of the coffee farming system basis of Sindoro-Sumbing Java Arabica Coffee and Temanggung Robusta Coffee from the perspective of GIs protection. The study used survey methods with data collection techniques: (1) literature studies, interviews, and discussions with stakeholders, and (2) observation of the application of coffee cultivation and processing. The analytical methods used were (1) analysis of technical and institutional performance, and economic benefits with cross-tabulation and descriptive interpretation, and (2) analysis of the sustainability of coffee farming system using a multidimensional scaling approach. The results showed that the management of coffee farming in the Temanggung Regency was quite sustainable from the perspective of GIs protection with an index value of 66.88. The six dimensions of sustainability, showing fairly sustainable performance with an index of 59.22-74.99. This indicated that a comprehensive improvement is required to sustain the GI protection in Temanggung Regency, i.e., ecology, economy, ethics, institutions, social, and technology. Sensitive lever factors to improve the performance of each dimension are (1) adaptation to climate influence, land conservation, and cropping patterns for ecological dimensions, (2) commodity alternatives and price stability for economic dimensions, (3) logo inclusion on packaging, environmental maintenance, and the authenticity of products for ethical dimensions, (4) optimizing the role of GIPC for institutional dimensions, (5) involvement of stakeholders in the social dimension, and (6) improvements in harvesting methods for technological dimensions.

Keywords: Lever factors, arabica coffee, robusta coffee.

ABSTRAK

Sertifikat Indikasi Geografis (GI) diperlukan untuk melindungi rasa tanaman tertentu di wilayah tertentu. Penelitian ini dilakukan dari bulan Desember 2017 hingga Mei 2018, bertujuan untuk menganalisis keberlanjutan usahatani kopi Arabika Java Sindoro-Sumbing dan Kopi Robusta Temanggung dalam perspektif perlindungan IG menggunakan metode survei dengan teknik pengumpulan data: (1) studi pustaka, wawancara dan diskusi dengan pemangku kepentingan, dan (2) observasi penerapan budidaya dan pengolahan kopi. Metode analisis yang digunakan meliputi: (1) Analisis kinerja teknis, kelembagaan, dan manfaat ekonomi dengan tabulasi silang dan interpretasi secara deskriptif, dan (2) Analisis keberlanjutan menggunakan pendekatan multidimensional scaling. Hasil penelitian menunjukkan bahwa pengelolaan usahatani kopi di Kabupaten Temanggung cukup berkelanjutan dari perspektif perlindungan IG dengan nilai indeks 66,88. Keenam dimensi keberlanjutan, menunjukkan kinerja cukup berkelanjutan dengan indeks 59,22-74,99 mengindikasikan bahwa untuk meningkatkan keberlanjutan

perlindungan IG kopi di Kabupaten Temanggung masih perlu perbaikan pada dimensi ekologi, ekonomi, etika, kelembagaan, sosial, dan teknologi. Faktor pengungkit yang sensitif untuk memperbaiki kinerja masing-masing dimensi adalah: (1) adaptasi terhadap pengaruh iklim, konservasi lahan, dan pola tanam untuk dimensi ekologi, (2) alternatif komoditas dan stabilitas harga untuk dimensi ekonomi, (3) pencantuman logo pada kemasan, mitigasi lingkungan, dan keaslian produk untuk dimensi etika, (4) mengoptimalkan peran MPIG untuk dimensi kelembagaan, (5) soliditas komunitas "Sahabat Kopi" dan keterlibatan stakeholder untuk dimensi sosial, serta (6) perbaikan cara panen untuk dimensi teknologi.

Kata kunci: faktor pengungkit, keberlanjutan, kopi arabika, kopi robusta, indikasi geografis.

INTRODUCTION

Coffee is a plantation commodity that has a high value in the lives of the people of Indonesia, because in addition to meeting the taste needs for coffee connoisseurs also provide economic benefits for farmers in the production center. The results of previous studies indicated that the coffee farming system in the production center was financially feasible (Kristi et al. 2014, Puspita et al. 2015, Silitonga et al. 2012, Wijaya 2017). The results of the study by Priantara et al. (2016) showed that the processing of red coffee fruit into roasted coffee in Kintamani gave high added value (ratio >40%). The development of coffee plants in Indonesia has covered 34 provinces with a total area in 2017 reaching 1.253.796 ha and production of 668.677 tons (Pusdatin 2018). There are 3 types of coffee in Indonesia, namely robusta, arabica, and liberica. The distribution of the development of the three types of coffee is more determined by the suitability of the land of each type of coffee. Robusta and arabica coffee distribution areas are often different based on elevation, while liberica coffee is able to adapt to peatland (BPTP Balitbangtan Jambi 2013). The diversity of coffee agroecosystems in Indonesia which is also managed by different cultivation between regions has resulted in different distinctive flavors of coffee. The peculiarity of

the taste of coffee has been partially protected by a geographical indication certificate (GI). Until 2018, coffee products are ranked highest in the number of GI certificates obtained compared to other plantation commodities (DJKI 2018).

Temanggung Regency has two coffee products that obtain geographic indication certificates, namely Sindoro-Sumbing Java Arabica Coffee (SSJAC) and Temanggung Robusta Coffee. Sindoro-Sumbing Java Arabica Coffee is one of the coffee products that obtained GI certification in December 2014 (Direktorat Jenderal Perkebunan 2016) Sindoro-Sumbing is a geographical area between two mountains, namely Gunung Sindoro and Gunung Sumbing as center of Arabica coffee production which administratively includes the area of Temanggung Regency and Wonosobo Regency, Central Java Province. While Temanggung Robusta Coffee obtained GI certificates in 2016 with a production center in the geographical lowlands of Temanggung Regency (DJKI 2018).

According to the provisions of Law no. 20/2016 concerning brands and geographical indications that the right to Geographical Indications is the exclusive rights granted by the state to registered Geographical Indication rights holders, as long as reputation, quality and characteristics that are the basis for giving protection to the Geographical Indications still exist (Kementerian Hukum dan Hak Azasi Manusia Republik Indonesia 2016). These provisions mean that in addition to rights, there are also obligations that must be fulfilled. Moreover, the sustainability of GI protection is largely determined by the extent to which the benefits of GI for the community, regional government, and geographical sustainability are characteristic of the GI products concerned. Based on specific flavors, sustainable farming system issues and the right for geographical indications, an analysis of the sustainability of the coffee farming system in Temanggung Regency has been carried out. The objective of the study is to analyze the sustainability of coffee farming systems from the perspective of geographical indication protection.

METHODOLOGY

Study Site and Sample Determination

The study was conducted in December 2017 until May 2018 in Temanggung Regency, Central Java. Determination of Research Locations by purposive sampling with consideration of the main areas of producer of Java's Sindoro-Sumbing Arabica coffee and Temanggung robusta coffee in Temanggung Regency

and as the locus of the Geographical Indication Protection Community (GIPC), namely: Tlahab Village and Glapan Sari Village, Kledung District for SSJAC, and Blimbing Village and Malebo Village, Kandangan Subdistrict for Temanggung Robusta Coffee.

Determination of respondents used the snowball sampling method (Nurdiani 2014), began with a discussion with the Head of the Agriculture Service and Food Security of Temanggung Regency during the Service Team Visit to the Indonesian Center for Estate Crops Research and Development followed by discussions with SSJAC-GIPC management and Robusta Coffee Temanggung GIPC, interview with coffee farmers, and discussions with the Head of Regional Development Planning Agency of Temanggung Regency.

Types and Data Sources

Research data include primary and secondary data. Primary data included descriptions of coffee cultivation and processing technology, institutional protection for geographical indications of Sindoro-Sumbing arabica coffee and Temanggung robusta coffee. Secondary data included the characteristics of the agroecosystem and coffee data in terms of area, production, productivity, and distribution area. Data sources are coffee farmers, extension agents, GIPC administrators, the Ministry of Law and Human Rights, Directorate General of Estate Crop, and the Temanggung Regency Agriculture Service.

Data Collection

Data collection was carried out through (1) literature study, (2) interviews with coffee farmers, (3) discussions with key informants and Head of Bapeda Temanggung Regency, and (4) observation of the application of coffee cultivation and processing. The literature study was conducted to collect secondary data on the distribution of area and coffee production, as well as the rules related to the certification of geographical indications. Interviews were conducted to collect primary data. Observations were made to confirm data on the application of coffee cultivation and processing obtained from interviews.

Data Analysis

The sustainability of development was assessed from the harmonization between economic, social and environmental (ecological) aspects. According to Munasinghe (1993), the main goals of sustainable development are economic, ecological, and social dimensions. Economic goal was related to issues of

efficiency and growth; ecological goal was related to the problem of conservation of natural resources, and the social goal was related to the problem of poverty reduction and equitable development. From the perspective of a geographical indication of the sustainability of the coffee farming system in Temanggung District, in addition to ecology, economics, and social dimensions, it was assessed from the dimensions of ethics, institutions, and technology.

The analytical methods included: (1) Analysis of technical, institutional, and economic benefits with cross-tabulation and descriptive interpretation, and (2) Sustainability analysis of GI-SSJAC protection and Temanggung Robusta Coffee GI used a

multidimensional scaling approach (MDS) with dimensions and attributes in Table 1. The performance appraisal of attributes in each dimension used expert judgment with a scale from 0 to 10, reflecting poor to good performance. Determination of the sustainability status of a coffee farming system used a sustainability index referring to Kavanagh and Pitcher (2004) modified developed by Nababan and Dewita (2008), Hardjomidjojo et al. (2016), and Edwarsyah and Safrina (2017). They divided the sustainability status into 4 interval categories of indices: Non-sustainable 0–25, Less Sustainable 26–50, Self-sustainable 51–75, and Sustainable 76–100. Data analyses used the RapiFish application (Pitcher and Preikshot 2001).

Table 1. List of dimensions and attributes for the analysis of the sustainability of coffee farming in Temanggung Regency

DIMENSION			ATTRIBUTE					
Ecology	Land conservation	Cropping pattern	Fertilizer use	Pesticide use	Climate influence	na	na	na
Economic	Price stability	Demand	Product development	Farmers income	Marketing system	Commodity alternative	Productivity	Regional budget support
Ethical	SOP application	Brand inclusion	Visitors reception	Authenticity of Products	Environmental maintenance	Product competition	Waste disposal	na
Institution	Farmer group	GIPC	Regulation	Coaching	Evaluation	Figure support	Main buyer	
Social	Social culture contribution	Community	Income equity	Consumer behavior	Stakeholder involvement	na	na	na
Technology	Cultivation	Harvest	Fermentasion	Drying	Roasting	Bariesta	Packaging	na

Notes : na = not applied.

RESULTS AND DISCUSSION

Characteristics of The Study Sites

The territory of Temanggung Regency is mostly plain with an altitude varied between 500 -1,450 m above sea level. The dominant soil type is Yellowish Red Latosol with an area of 29,209.08 ha (35.33%) distributing in the east and west, followed by Brown Latosol with an area of 26,563.47 ha (32.13%) distributing in the middle of the area from the northwest to southeast, Regosol covering an area of 16,873.97 ha (20.14%) distributed around Progo times and steep slopes, Reddish Brown Latosol covering an area of 7,879.93 ha (9.53%) distributed mostly in the east-southeast, and Andosol covering an area of 2,149.55 ha (2.60%) distributed in the valley between hills (give reference).

The slope of the land in Temanggung Regency varies from flat, almost flat, sloping, rather steep, almost steep, steep and very steep, as seen in the slope class as follows: 0 - 2% covering 968 ha (1.17%), 2 - 15% covering an area of 32,492 ha (39.31%), 15 - 40% covering an area of 31,232 ha (37.88%), and > 40% covering an area of 17,983 ha (21.64%).

Temanggung Regency has two seasons : dry season, between April and September and that rainy season between October and March. Most of the area is cold where the mountain air temperature ranges from 20 to 30° C. The cool air regions are mainly in the Tretep Subdistrict, Bulu (slope of Sumbing Mountain), Tembarak, Ngadirejo and Candiroto Districts.

The development of arabica coffee in Temanggung Regency was originally in a terrace reinforcement plant or conservation plant as well as a diversified plant besides tobacco plants which were the main and superior plants. The development and planting

of the first Arabica coffee in 1991/1992 in Tretep and Wonobojo Subdistrict was facilitated by the Special Region Development Project (P2WK) by the Central Java Provincial Plantation Office covering 100 ha and used the Lini S 795 variety. The potential of Arabica coffee areas in Temanggung Regency was distributed across 10 Districts (Table 2) (Bappeda Kabupaten Temanggung 2016).

Tlahab Village and Glapansari Village, Kledung Subdistrict, which is the area of protection of GI of

Sindoro-Sumbing Java Arabica Coffee are located at the elevation of 1,138 m above sea level (Pemerintah Kabupaten Temanggung 2016 b). Whereas Blimbing Village and Malebo Village, Kandangan Subdistrict, which is the area of protection for the Temanggung Robusta Coffee are located at the elevation of 500-842 m above sea level (Pemerintah Kabupaten Temanggung 2016a).

Table 2. Potential area of arabica coffee in Temanggung Regency

No.	Sub District	Potential area of arabica coffee (ha)
1.	Kledung	578.09
2.	Tretep	293.00
3.	Bulu	170.86
4.	Candiroto	96.93
5.	Ngadirejo	81.70
6.	Selopampang	49.00
7.	Wonobojo	46.70
8.	Bansari	40.45
9.	Parakan	38.75
10.	Tembarak	20.00
11.	Kaloran	9.00
12.	Tlogomulyo	5.00

Source: Bappeda Kabupaten Temanggung 2016.

Geographical Indications (GIs) of Coffee in Temanggung Regency

The geographical indication certificate of Sindoro-Sumbing Java coffee was obtained in 2014 which stipulated Arabica coffee cultivated in the slopes of Sindoro and Sumbing Mountains with polyculture planting patterns with tobacco plants, thereby producing a flavor of "tobacco-flavored coffee". Further, the Temanggung Robusta coffee obtained a certificate of Geographical Identification dated December 6, 2016, which has a taste like chocolate and a distinctive aroma that leads to sweetness (DJKI 2018). Based on the interview results with GIPC administrators, the proposed Coffee IG of Sindoro-Sumbing Java and Temanggung Robusta coffee was initiated by the Plantation Office of Central Java Province. The preparation of GI requirements documents and the characterization of the specialty/specialty coffee

characteristics was made in collaboration with the Indonesian Coffee and Cocoa Research Institute (ICCRI) involving coffee farmers. The GI region of Sindoro-Sumbing Arabica coffee includes Temanggung Regency and Wonosobo Regency with the GIPC Secretariat in each district, while the GI area of Temanggung Robusta coffee covers only Temanggung Regency.

Obtained Sindoro-Sumbing Java Arabica coffee GI certificate is inseparable from previous rural development programs. Tlahab village is one of the villages used as a location for rural development programs and cluster-based local economic development. The program changed the mindset and habits of farmers by planting monoculture tobacco into polyculture, namely intercropping tobacco and coffee. The reason for choosing coffee as intercropping because of strong roots to reduce soil erosion, conserve land to maintain productivity, and to increase farmers' income

as other additive income alternatives. On the other hand, the Arabica coffee cluster-based local economic development program was implemented in Temanggung Regency with its barometer is Tlahab Village, leading to the government pays more attention to the provision of environmental infrastructure and coffee processing equipment (Febriharjati and Setyono 2015).

The development of the tobacco-coffee polyculture cropping pattern is also inseparable from the preferences/considerations of farmers for the benefits of applying the cropping pattern compared to monoculture tobacco plants. In the experience of farmers, land use for 1 coffee tree is equivalent to 6 tobacco plants. Calculation from the revenue from each plant, the yield of 7 kg of wet coffee/tree/ year is equivalent to 1 kg of green bean/tree/ year at a price of Rp. 48,000 / kg minus Rp. 12,000 / kg. net Rp. 36,000 / tree / year. With a population of 1,000 trees/ha, the revenue of IDR 36,000,000 /ha/year could be achieved. Comparison with tobacco products, 6 tobacco plants produce 3 kg of wet tobacco leaves at a price of Rp. 10,000 / kg, so the revenue of Rp. 30,000 / 6 tobacco plants. With a plant population of 6,000 plants/ha, the revenue of IDR 30,000,000 /ha/year could be achieved. In terms of the role of farmers in farming, coffee farmers can process coffee beans to serving brewed coffee, while tobacco farmers cannot process up to cigarettes. So the opportunity for coffee farmers to obtain added value from the process is more benefit able. With this in mind,

tobacco farmers could accept the suggestion to integrate coffee plants as conservation plants on tobacco land.

Potential Sustainability of Temanggung Coffee GI Protection

The results of the sustainability analysis using the Rapfish method (Figure 1) showed that the protection of SSJAC-GI and Robusta Coffee IG is included as a fairly sustainable category with an index value of 66.88. The technological dimension provides the biggest contribution to the sustainability of SSJAC-GI with an index of 74.99 followed by institutional dimensions with index 74.40, economic dimensions with indexes of 67.37, ecological dimensions with indexes of 64.08, ethical dimensions with indexes of 61.26 and social dimensions with an index of 59.22.

Monte Carlo simulations are used to estimate errors. The validity test of the results of the MDS analysis is done by calculating the difference in the index value that reflects the performance of each dimension of sustainability to the results of the Monte Carlo analysis. The test results showed that the average difference in index value with the value of Monte Carlo analysis is <5% (Table 3), so it could be indicated that the value of sustainability index of coffee farming system in Temanggung Regency in the perspective of geographical indication is valid and has a relatively small random error.

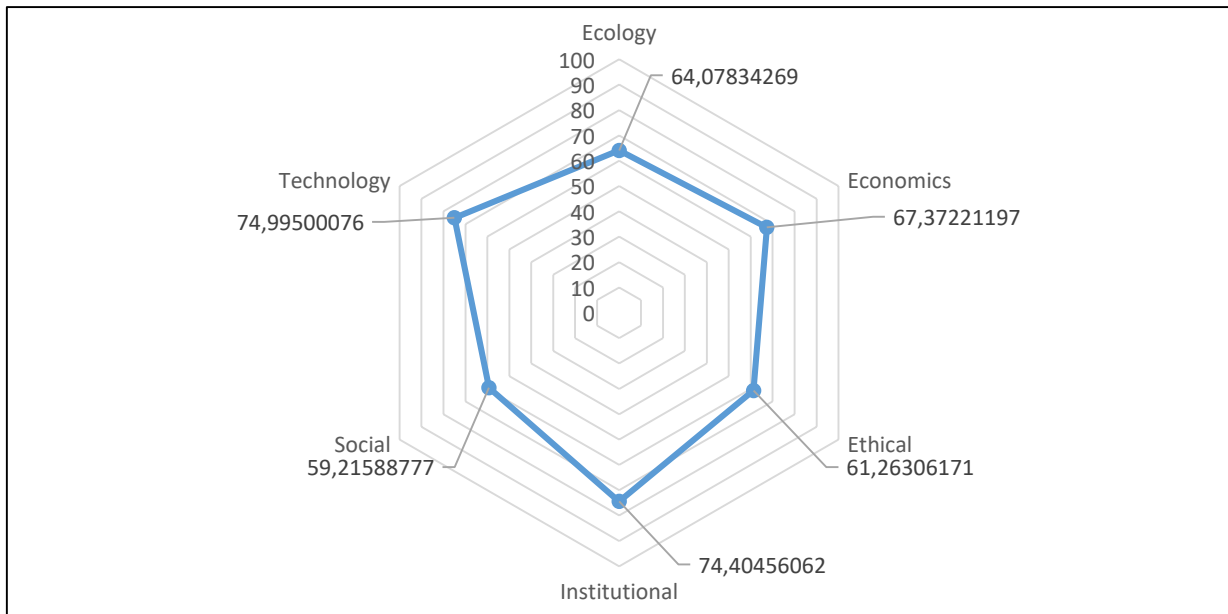


Figure 1. Diagram of sustainability index of the coffee farming system in Temanggung Regency with respect to ecological, economic, ethical, institutional, social, and technology dimensions

Table 3. Comparison between MDS index values and Monte Carlo analysis

Dimension	Index Value	Monte Carlo	Difference	
			Nominal	%
Ecology	64.08	66.34	2.28	3.55
Economic	67.37	64.03	3.34	4.96
Ethical	61.26	61.29	0.03	0.04
Institution	74.40	75.31	0.99	1.33
Social	59.22	54.39	4.83	8.15
Technology	76.55	77.25	0.70	0.91
Average	67.15	66.44	2.02	3.13

Ecological Dimension

From the ecological dimension, climate change characterized by the occurrence of extreme weather conditions is very important for the sustainability of agroecosystems that are characteristic of coffee development areas in Temanggung Regency in line with the results of Wijaya 's research (2017), indicating the biggest physical limiting growth factor to robusta coffee farming in the District Candiroto, Temanggung is a climate. In addition, conservation measures in the form of terracing and applying polyculture of coffee as a conservation plant and the tobacco on the slopes of Mount Sindoro and Mount Sumbing. This planting pattern had the potential to reduce the occurrence of land degradation and adaptation to climate change. The results of the analysis of leverage attributes on the ecological dimension are presented in Figure 2.

Economic Dimension

From the economic aspect, the IG certificates provides positive benefits for stakeholders, as indicated by the increase in coffee prices at both the farmer and UPH levels and at the merchant level (cafes and coffee shops) that have the potential to increase income for each actor and contribute to regional income (PAD). This condition is in line with the statement of the Minister of Law and Human Rights in his remarks at the "Future of Geographical Indication in Indonesia" Seminar that Arabica Toraja Coffee and Gayo Arabica Coffee before being registered as Geographical Indication products, the price is Rp. 25,000/kg and after registration the price becomes Rp. 205,000/kg. Likewise with Plump White Pepper before being registered as a product of Geographical Indications the price range is

Rp. 30,000/kg and after registration the price is Rp. 200,000/kg (Purnama 2018). Sudjana (2016) suggested that certified geographical products have high economic value and thus become a means for local economic development.

The results of the analysis in Figure 3 show that the attributes of commodity alternatives are the most sensitive attributes in increasing the sustainability of the economic dimension. Two attributes that are also sensitive are price stability and product development. The attributes of commodity alternatives largely determine whether farmers may continue to grow coffee, in this case, related to land-use competition between coffee plants, tobacco and vegetable crops. The coffee development area in Temanggung Regency is a Srintil tobacco production center (a leading commodity in the development area of Sindoro-Sumbing arabica coffee) and vegetable crops are mostly cultivated in the development area of Temanggung Robusta coffee. Alternative commodity attributes are also related to the application of cropping patterns which are important attributes in the ecological dimension. Most coffee farmers in Temanggung Regency apply polyculture planting patterns with both tobacco plants and other plantation crops, as well as with vegetable crops and other horticultural crops. With polyculture, farmers' income is expected to increase as reported by Silitonga et al. (2012) that the average income per hectare of monoculture cultivation of Arabica coffee is only 67.49% of intercropped Arabica coffee income. Haroeno (2010) stated that the Tlahab Pattern coffee-tobacco farming business, by planting 1,000 coffee trees and 15,000 tobacco plants per hectare, the farmer obtained an income of Rp. 12.5 million/ha.

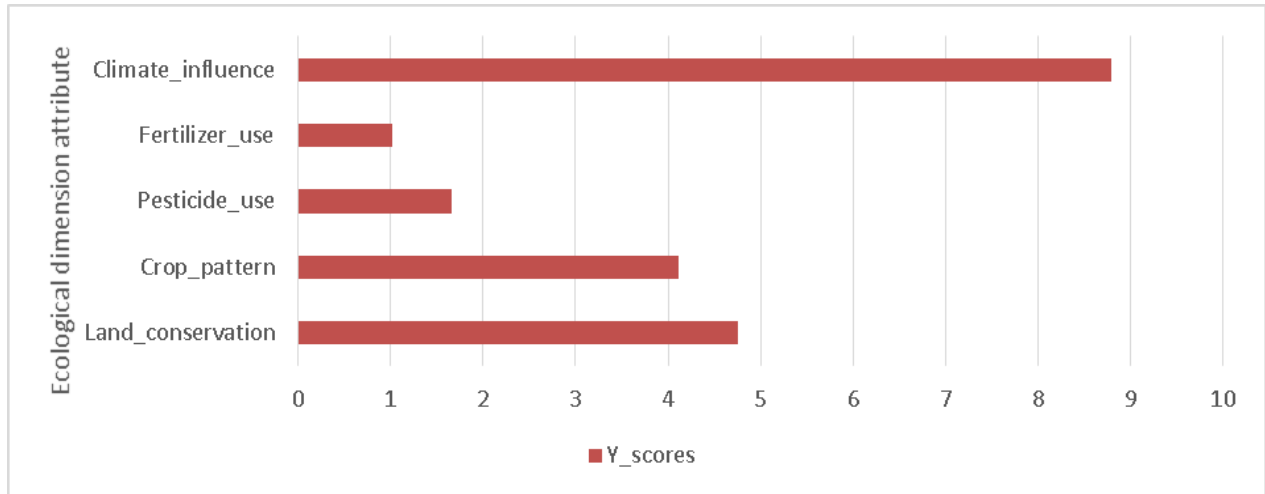


Figure 2. Leverage analysis of the ecological dimension

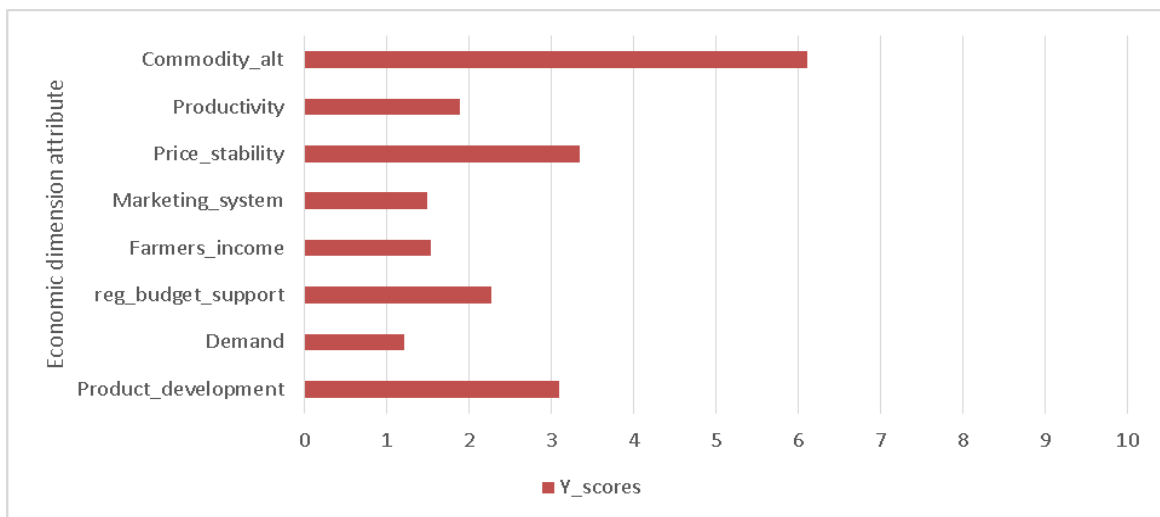


Figure 3. Leverage analysis graph of the economic dimension

Ethical Dimension

From the ethical dimension, the attribute that is sensitive to increase the sustainability of geographic coffee indication protection in Temanggung Regency is the brand inclusion, environmental mitigation, and product authenticity (Figure 4). The inclusion of a brand accompanied by a geographical indication logo is the obligation of a GI certified product manufacturer because the logo is the official identity of the IG product. The inclusion of brands is also important to prevent counterfeiting of products or registration of brands by other parties as stated by Herviandi et al. (2017). Furthermore, Herviandi et al. (2017) states that imitation

of well-known brands belonging to others is basically based on bad faith, especially to take advantage of the brand's fame. Based on the results of interviews and observations at the processing units and product sales points (galleries), most of the packaged coffee products that are marketed do not include a geographical indication logo (only includes the brand). The producer believes that without including the GI logo, the product is already sold and the buyer does not question the inclusion of the logo. Related to environmental maintenance, the occurrence of forest fires in the Sindoro-Sumbing region in the last two years is thought to have an effect on the sustainability of the agroecosystem development of Sindoro-Sumbing

arabica coffee. Therefore, mitigation policies to prevent environmental damage from fire are urgently needed. As with the brand inclusion attributes and environmental mitigation, the attributes of the authenticity of the product also greatly determine the distinctiveness of the taste of the produced coffee. The limitations of certified geographical indication coffee production capacity on the one hand, and high market opportunities, on the other hand, could be an attractive business for people to buy coffee raw materials from other regions and market them with Temanggung coffee brand.

Institutional Dimension

From the institutional dimension, the most sensitive attribute in increasing the sustainability of geographic indication of coffee is the GIPC attribute (Figure 5). GIPC's central position in the protection of geographical

indications is crucial not only in the process of preparing documents and registering proposed certification but also in the supervision of the application of SOPs and labeling according to GI requirements. In the case of the Temanggung Coffee GI protection, GIPC requires a Main Buyer. The role of the Main Buyer is needed in ensuring the absorption and price stability of coffee products. Until 2018 GIPC coffee in Temanggung Regency has not been bound by cooperation with the Main Buyer because it has not been able to meet the quantity and continuity requirements of production. Different conditions are indicated by the research results of Ardana (2017) on the institutional performance of Kintamani's coffee GI protection which states that GIPC has collaborated with the Main Buyers and included the Main Buyers as part of the GIPC institution.

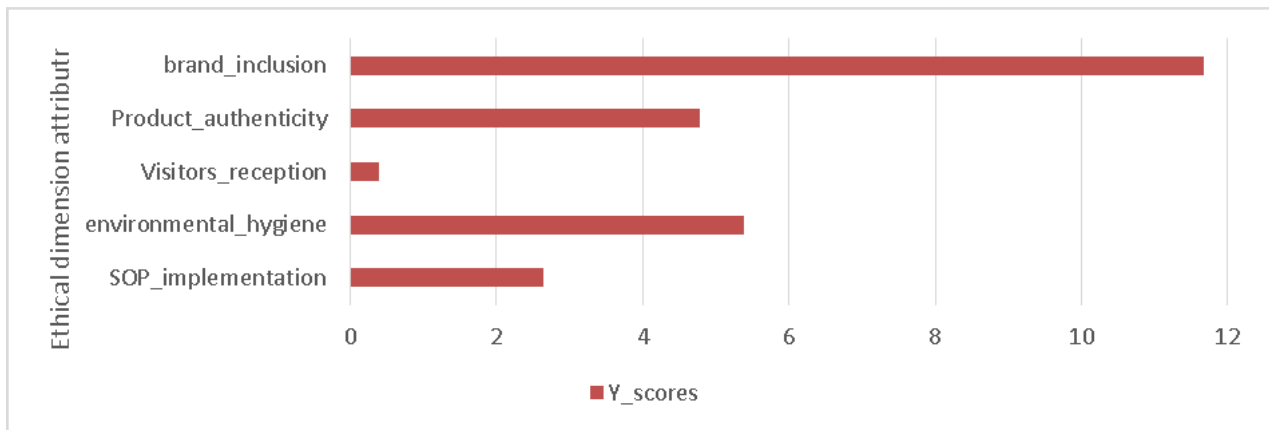


Figure 4. Leverage analysis of the ethical dimension

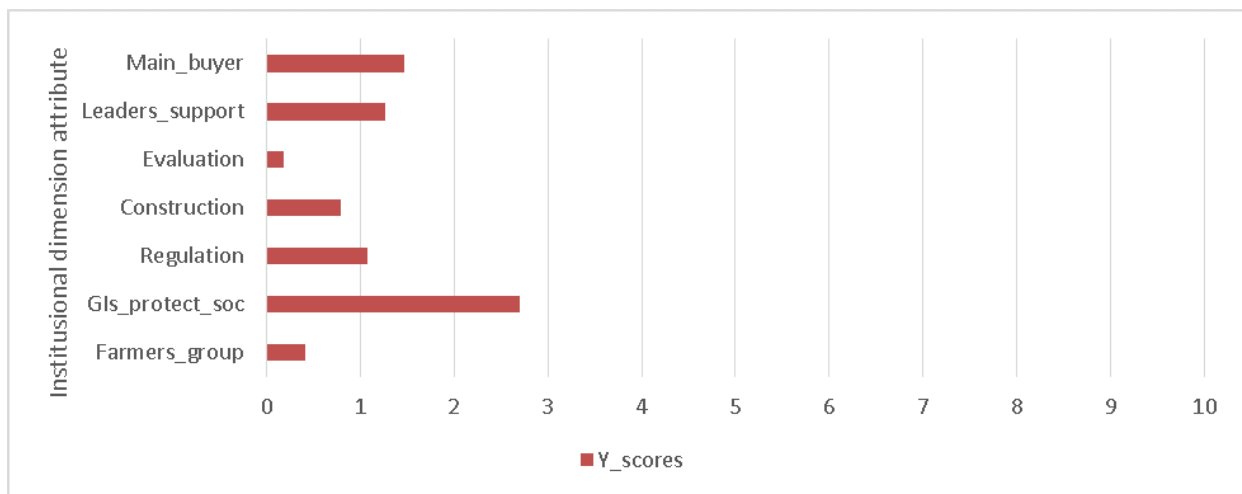


Figure 5. Leverage analysis graph of the institutional dimension

Social Dimension

From the social dimension, the formation of the SSJAC-GIPC and GIPC Robusta coffee in Temanggung has not significantly contributed to the socio-cultural life of the community in the Sindoro-Sumbing Arabica coffee producer region, but the acquisition of GI_SSJAC in 2014 encouraged the growth of the coffee industry in the Temanggung area. At the level of farmer groups to cafes and coffee shops, it has succeeded in inspiring the formation of "Sahabat Kopi" (coffee friendship) that routinely carry out fundraising activities for socio-religious activities. The solidarity of the Sahabat Kopi community in mobilizing stakeholder involvement is an important factor in increasing the sustainability of the geographical indication of coffee protection in Temanggung Regency as indicated by the results of the analysis of social dimension leverage (Figure 6).

Technological Dimension

From the technology dimension, the role of harvest attributes is very important in increasing the sustainability of the geographical indication of coffee (Figure 7). How to harvest red picks with the percentage of red fruit >95% is an important component in the SOP for geographical indications of coffee because it greatly determines the quality of the produced coffee. From the interviews, it was revealed that in Temanggung Regency, the efforts of the GIPC board to change the habits of coffee farmers from picking rainbows (a mixture of red, yellow and green) into red picks took 8 years. The proportion of farmers applying red fruit quotas >95% has only reached 70% of the total members of farmer groups, while farmers who are not included in the farmer group do not apply the red quotes on average.

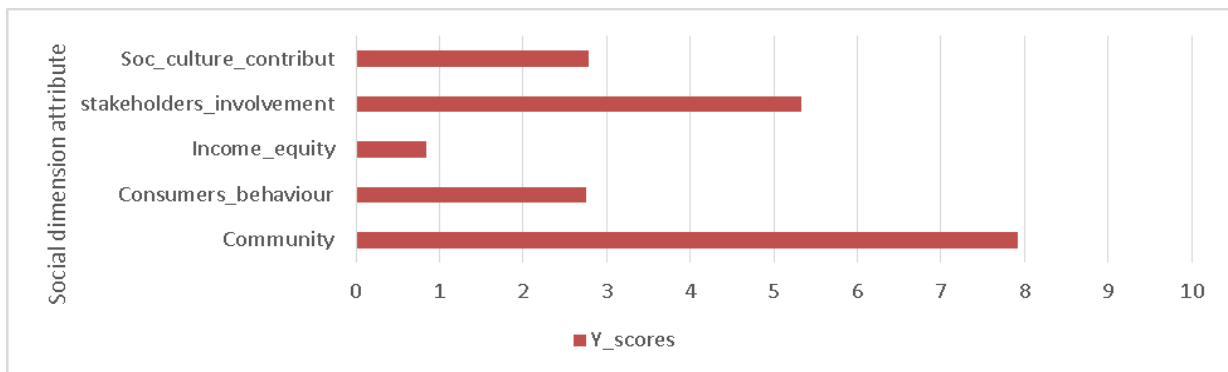


Figure 6. Leverage analysis graph of the social dimension

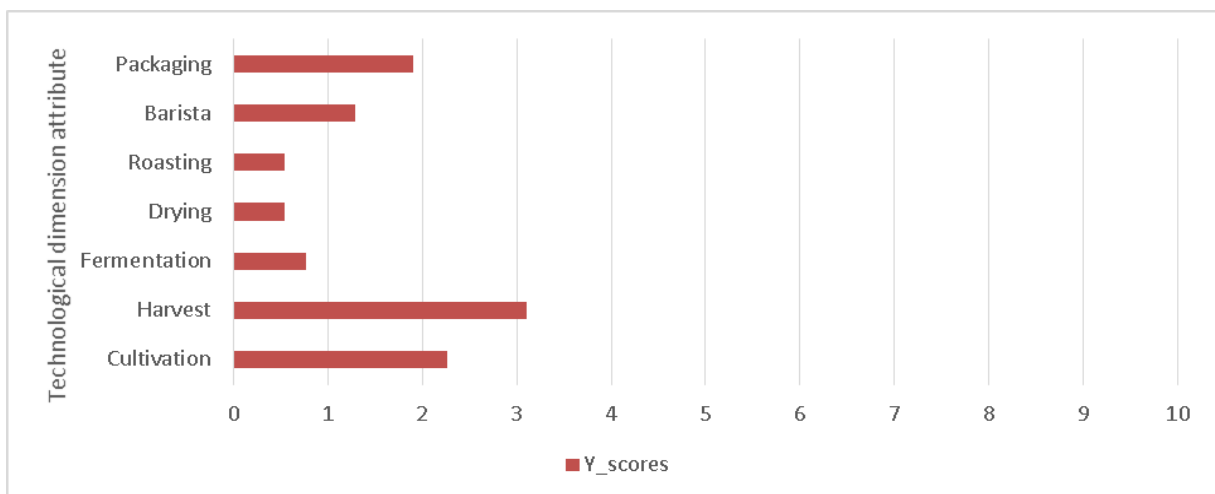


Figure 7. Leverage analysis graph of the technological dimension

Gambar 7. Grafik analisis leverage dimensi teknologi

In addition to harvesting methods, the application of cultivation and post-harvest technology also affects the physical quality and taste of coffee. (Rubiyo et al. 2005) showed that the interaction between manure doses and fermentation duration affected the physical quality and flavor of Arabica coffee varieties S 795. The role of cultivation attributes was ranked two after harvest attributes in increasing the sustainability of the geographical indication of Temanggung coffee. The availability and utilization of coffee post-harvest technology in Temanggung Regency has been relatively well characterized by the growth and development of coffee processing units from commercial industry scale which process fresh coffee fruit into packaged coffee to the level of farmer groups that process coffee fruit into coffee beans. This is inseparable from consumer appreciation for the taste of Temanggung coffee to buy at high prices. In addition, the Government's support in providing post-harvest technology through tool assistance and technical guidance contributed to the mastery of technology at the farm level (Mayrowani 2013).

CONCLUSIONS

The management of coffee farming in Temanggung Regency is quite sustainable from the perspective of geographical indication protection with an index value of 66.88. The six sustainability dimensions show quite sustainable performance with indices 59.22-74.99 indicating that to improve the sustainability of the geographical indication of coffee protection in Temanggung Regency needs improvement in the dimensions of ecology, economy, ethics, institutions, social and technology. Sensitive factors to improve the performance of each dimension are: (1) adaptation to the influence of climate, land conservation, and cropping patterns for ecological dimensions, (2) commodity alternatives and price stability for economic dimensions, (3) logo inclusion on packaging, environmental mitigation, and the authenticity of products for ethical dimensions, (4) optimizing the role of GIPC for institutional dimensions, (5) solidity of the community of "coffee friends" and involvement of stakeholders in the social dimension, and (6) improvement in harvesting methods for technological dimensions.

ACKNOWLEDGMENTS

Thank you to the Director of the Indonesian Center for Estate Crops Research and Development (ICECRD) for allocating the budget through Policy

Analysis activities, to allow data collection activities for this study. Thank you also to the Head of the Temanggung District Agriculture Service and the staff who have provided access to the data and information needed for this study. Thank you also to Dr. Siswanto, Senior Researcher of ICECRD who has assisted in data collection and provided expert judgment on the performance of the attributes in the dimension of coffee farming system sustainability.

REFERENCES

- Ardana, I.K. (2017) Kinerja Kelembagaan Perlindungan Indikasi Geografis Kopi Kintamani. *Agricore*. [Online] 2 (1), 242–246. Available from: <http://jurnal.unpad.ac.id/agricore/article/view/15073>.
- Bappeda Kabupaten Temanggung (2016) *Sejarah Kopi Arabika di Kabupaten Temanggung di Kawasan Sindoro Sumbing*. [Online] Badan Perencanaan Pembangunan Daerah Kabupaten Temanggung. Available from: <http://bappeda.temanggungkab.go.id/artikel/detail/sejarah-kopi-arabika-di-kabupaten-temanggung-di-kawasan-sindoro-sumbing>.
- BPTP Balitbangtan Jambi (2013) *Mengenal Kopi Liberika Tungkal Komposit (LIBTUKOM)*. [Online] p.2. Available from: <https://jambi.litbang.pertanian.go.id/ind/images/PDF/14leaflitukom.pdf>.
- Direktorat Jenderal Perkebunan (2016) *30 Produk Perkebunan Indikasi Geografis*. [Online] Available from: <http://ditjenbun.pertanian.go.id/berita-421-30-produk-perkebunan-indikasi-geografis.html>.
- DJKI (2018) *Indikasi Geografis Terdaftar*. [Online] Available from: [http://www.dgip.go.id/images/ki-images/pdf-files/indikasi_geografis/IG_Terdaftar_+ LOGO update JAn 2018.pdf](http://www.dgip.go.id/images/ki-images/pdf-files/indikasi_geografis/IG_Terdaftar_+ LOGO_update_JAn_2018.pdf).
- Edwarsyah & Safrina, R. (2017) Indek dan Status Keberlanjutan Pulau Kecil Terluar: Studi Kasus Pesisir Pulo Raya Aceh Jaya. *Jurnal Pengelolaan Perikanan Tropis*. [Online] 1 (1), 51–58. Available from: <http://journal.ipb.ac.id/index.php/jurnalppt/article/viewFile/20153/13911>.
- Febriharjati, S. & Setyono, J.S. (2015) Keberlanjutan Penghidupan Petani Kopi Desa Tlahab, Kecamatan Kledung, Kabupaten Temanggung. *Jurnal Teknik PWK*. [Online] 4 (4), 605–621.

- Available from: <https://ejournal3.undip.ac.id/index.php/pwk/article/view/9828>.
- Hardjomidjojo, H., Raharja, S., & Chosy'ah, M. (2016) Pengukuran Indeks Keberlanjutan Industri Gula. *Manajemen IKM*. [Online] 11 (1), 89–96. Available from: <http://journal.ipb.ac.id/index.php/jurnalmpi/article/viewFile/12893/110110>.
- Haroeno, T.W. (2010) *Pola Tlahab Menyelamatkan Lahan*. [Online] Available from: <file:///D:/Pola Tlahab Menyelamatkan Lahan.html>.
- Herviandi, A., Susilowati, E. & Njatrijani, R. (2017) Optimalisasi Perlindungan Hukum terhadap Pendaftaran Merek Dagang di Negara Lain (Kajian Perlindungan Hukum Merek Kopi Arabika Gayo). *Diponegoro law journal*. [Online] 6, 1–14. Available from: <http://www.ejournal-s1.undip.ac.id/index.php/dlr/>.
- Kavanagh, P. & Pitcher, T.J. (2004) Implementing Microsoft Excel Software For : A Technique For The Rapid Appraisal of Fisheries Status. *Fisheries Centre Research Reports*. [Online] 12 (2), 1–75.
- Kementerian Hukum dan Hak Azasi Manusia Republik Indonesia (2016) *Undang-Undang Republik Indonesia Nomor 20 Tahun 2016 tentang Merek dan Indikasi Geografis*. [Online] (252). Available from: <http://peraturan.go.id/uu/nomor-20-tahun-2016.html>.
- Kristi, S., Tarigan, K. & Sebayang, T. (2014) Analisis Pendapatan Kopi Arabika. *Journal on Social Economic of Agriculture and Agribusiness*. [Online] 3 (8). Available from: <https://jurnal.usu.ac.id/index.php/ceress/article/view/9627>.
- Mayrowani, H. (2013) Kebijakan Penyediaan teknologi Pasca Panen Kopi dan Masalah Pengembangannya. *Forum Penelitian Agro ekonomi*. [Online] 13 (1), 31–50. Available from: <doi:http://dx.doi.org/10.21082/fae.v31n1.2013.31-49>.
- Munasinghe, M. (1993) *Environmental Economics and Sustainable Development*. [Online] (3), The World Bank. Available from: <http://documents.worldbank.org/curated/en/638101468740429035/pdf/multi-page.pdf>.
- Nababan, B.O. & Dewita, Y. (2008) Tinjauan Aspek Ekonomi Keberlanjutan Perikanan Tangkap Skala Kecil di Kabupaten Tegal Jawa Tengah. *Buletin Ekonomi Perikanan*. [Online] 8 (2), 50–68. Available from: <http://journal.ipb.ac.id/index.php/bulekokan/article/download/2701/1687>.
- Nurdiani, N. (2014) Teknik Sampling Snowball Dalam Penelitian Lapangan. *ComTech*. [Online] 5 (2), 1110–1118. Available from: http://research-dashboard.binus.ac.id/uploads/paper/document/publication/Proceeding/ComTech/Volume 5 No 2 Desember 2014/55_AR_Nina Nurdiani_OK_a2t.pdf.
- Pemerintah Kabupaten Temanggung (2016a) *Situs Resmi Kecamatan Kandangan Pemerintah Kabupaten Temanggung*. [Online] Available from: <http://kandangan.temanggungkab.go.id/web>.
- Pemerintah Kabupaten Temanggung (2016b) *Situs Resmi Kecamatan Kledung Pemerintah Kabupaten Temanggung*. [Online] Available from: <http://kledung.temanggungkab.go.id/web>.
- Pitcher, T.J. & Preikshot, D. (2001) RAPFISH : a rapid appraisal technique to evaluate the sustainability status of ® sheries. *Fisheries Research*. [Online] 49, 255–270. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.552.7110&rep=rep1&type=pdf>.
- Priantara, I.D.G.Y., Mulyani, S. & Satriawan, I.K. (2016) Analisis Nilai Tambah Pengolahan Kopi Arabika Kintamani Bangli. *Jurnal Rekayasa dan Manajemen Agroindustri*. 4 (25), 33–42.
- Purnama, D. (2018) *Indikasi Geografis Berikan Nilai Tambah Ekonomi*. [Online] Gatra.com. Available from: <https://www.gatra.com/rubrik/ekonomi/313749-indikasi-geografis-berikan-nilai-tambah-ekonomi>.
- Pusdatin (2018) *Statistik Pertanian 2018*. Susanti,A.A. & Waryanto,B. (eds.) [Online] Jakarta, Pusat Data dan Informasi Pertanian Kementerian Pertanian Republik Indonesia. Available from: <http://epublikasi.setjen.pertanian.go.id/arsip-perstatistikan/160-statistik/statistik-pertanian/586-statistik-pertanian-2020#/1/zoomed>.
- Puspita, C., Rifin, A. & Daryanto, H.K. (2015) Revenue and Farming Management Analysis of Arabica and Robusta Coffee in Jember Rgency, East Java, Indonesia. *International Journal of Scientific and Research Publication*. [Online] 5 (11), 139–143. Available from: <http://www.ijsrp.org/research-paper-1115/ijsrp-p4722.pdf>.
- Rubiyo, Kartini, L. & Agung, I.M.S. (2005) Pengaruh Dosis Pupuk Kandang dan Lama Fermentasi

terhadap Mutu Fisik dan Citarasa Kopi Arabika Varietas S 795 di Bali. *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian*. 8 (2), 250–260.

- Silitonga, S.M., Salmiah & Sihombing, L. (2012) Analisis Komparasi Tingkat Pendapatan Usahatani Kopi dengan Berbagai Pola Tanam (Monokultur dan Polikultur) di Kabupaten Dairi Kecamatan Sumbul Desa Tanjung Beringin. [Online] 1–15. Available from: <https://jurnal.usu.ac.id/ceress/article/view/7822>.
- Sudjana (2016) Implikasi Perlindungan Indikasi Geografis Berdasarkan Undang-Undang Nomor 20 Tahun 2016 terhadap Pengembangan Ekonomi Lokal. *VEJ*. [Online] 4, 30–58. Available from: doi:10.25123/vej.2915.
- Wijaya, M.I. (2017) Usahatani Kopi Robusta di Kecamatan Candirotto Kabupaten Temanggung (Studi Kasus Desa Gunungpayung dan Desa Sidoharjo). *E-jurnal UNY*. [Online] Universitas Negeri Yogyakarta. Available from: <http://eprints.uny.ac.id/52942/3/E-Jurnal13405241062.pdf>.