IMPLEMENTING GOOD AGRICULTURE PRACTICE (GAP) AND ITS IMPACT ON THE COFFEE PRODUCTIVITY OF PANTI SUB-DISTRICT JEMBER REGENCY, EAST JAVA, INDONESIA

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ABSTRACT:

Indonesia is the world's coffee producer which currently experiencing decline on its production. This study was aimed to describe the ideal coffee cultivation practice and its impact on the robusta coffee productivity of farmers in Panti Sub-district. This is an ex-post facto research conducted from July to December 2018. The method used was quantitative analysis supported by descriptive analysis. The population was the robusta coffee farmers with 105 respondents from three villages; Kemiri, Suci, and Kemundungan. The respondent was determined through simple random sampling. The data was analyzed by using linear regression, frequency distribution. The result showed that implementing GAP on coffee farmers caused difference and not all GAP components were implemented based on the standard. The robusta coffee farmers who implemented GAP very well showed the higher coffee productivity. The unstandardized GAP implementation on coffee was caused by the small amount of farmers who were willing to give their time, energy, and cost. Improving the robusta coffee product in Panti and other regions requires education and proper GAP technology transfer which is also supported by the adequate facilities to conduct a more efficient GAP activity and produce the better output. This research is different to the other researches, where this research specifically analyzes the standardized GAP implementation in Indonesia and its impact on production. The standard used as the basis of the good agriculture practice is the good coffee cultivation regulation published by the government. The public coffee production in Panti Sub-district is viewed through two main behaviors of the farmers.
KEYWORDS: Coffee, Good Agricultural Practice, Productivity, Implementation.

INTRODUCTION:

Coffee is one of the plantation commodities which has a big role for the economy of Indonesia as the job vacancy provider, income source, and foreign exchange for the country. Indonesia is the 6th world's biggest producer and exporter (International Coffee Organization, 2018). There are three types of plantation in Indonesia. They are public plantation, government plantation, and private plantation. The public plantation takes 81% of the plantation area width in Indonesia while the rest is belonged to the government and private plantation. Nearly 70% of the Indonesia's coffee production is marketed to various countries and the 30% is for the public consumption in Indonesia. (Ermadita Wahyu R dan Anik Suwandari, 2012).

According to the statistics of General Directorate of Plantation Department of Agriculture of Indonesia 2017, In Jember region, the coffee area is quite wide by taking 9.356,73 Ha for the whole area with total

production 63.631 (Kw). Jember is the second biggest robusta coffee producer in East Java after Malang Regency. The widest coffee plantation area in Jember is in the Silo Sub-district which mostly consists of the public plantation. The second biggest coffee yield is in Ledokombo Sub-district which then is followed by Panti Sub-district.

Coffee is produced by several regions in Indonesia. Indonesia's coffee can potentially become the excellent product, still the coffee development in each region is vary that until now, there are various obstacles and problems which causing decline on the coffee productivity and product quality. Various problems and obstacle were found from various sources and supported by the field problems identification results. According to Yani, the high damage on the coffee bean was caused by the biotic factor contamination (Yani, 2007). Hartiati said the coffee cultivated improperly (Hartiati, Tuningrat, & Duniaji, 2016). Lizawati said that the seed used was obtained from the seed grows under the tree, has never been fertilized, there is no treatment for the coffee plant infected by disease and pest, and there is no a certain schedule for harvest (Lizawati, Elis Kartika, 2019) . These are the problems of the improper coffee cultivation. Additionally, the organizational problem which did not support the coffee development as mentioned by Titisari that farmers are unable to determine the coffee price. The price only benefits the capital owner. There are many limited aspects such as human resource, facility, technology, and capital. Only the cooperation helps with its limited development (Titisari, n.d.).

A research conducted on the coffee farmers in Panti Sub-district is due to the coffee production and quality are varied and commonly considered as low. The coffee quality is far from the government expectation. In general, the public coffee productivity in the Panti region is below 1 ton/Ha (Disbun Jatim, 2017). The coffee farmers only get little income from the coffee yield, Iphov et al to decrease the risk in the form of low income in managing the plantation (price and product quality), while the farmer's income on the product value added is low, then the most suitable strategy according by using Fuzzy AHP is GAP. GAP shall be implemented to improve the quality and increase the product selling price, since the coffee quality is determined by the on farm activity for 80% and the 20% is influenced by the post-harvest activity (Iphov K.S, Yandra A, Dahrul Syah, 2014). GAP is considered as a way to increase the productivity and improve the agriculture product quality, in line with the opinion of Yani, Mahyuda et al, Lizawati.

According to Hartiati, GAP can be implemented widely in various agriculture products. For example, GAP is implemented to increase the productivity and quality of the coffee (Hartiati, Tuningrat, & Duniaji, 2016). This research differs its position than the other researches by putting GAP aspects and GAP standard based on the government regulation as a review material in a research. Determining the standard basis is very important. This is supported by the opinion of KOEN that the personal-based standard does not provide an impact as expected by the consumer, socio-economic environment (Vanderhaegen, Teopista, Dekoninck, Jocqué, & Muys, 2018),. Thus, the research is aimed to describe the GAP implementation on robusta coffee as its impact on the robusta coffee yield productivity. Based on the review result, a repair and development recommendation can be determined. It is expected that the information related to the robusta coffee cultivation implementation level on the farmers in Panti and how far the productivity is can be used as the suggestion and consideration for government in improving the good robusta coffee cultivation competency based on the ideal coffee cultivation as an effort

to improve the public coffee productivity and quality. The long term plan of the effort in improving the productivity and quality of the robusta coffee is to improve the farmer's welfare especially in Panti Sub-district and the surrounding regions.

LITERATURE REVIEW:

Good Agricultur Practice (GAP) on The Coffee Cultivation

Good Good Agriculture Practice (GAP) is a good cultivation technique and is able to use continuously. According to the Minister of Agriculture Regulation number 49/Permentan/OT.140/2014 there are 4 important points in GAP such as implementing sustainable coffee cultivation, good coffee cultivation technique, coffee cultivation business diversification, harvest and post-harvest. (Dirjenbun, 2014).

Tabel 1. indicators in the process of coffee plant cultivation according to the GAP standard

Production Process	Limitation	Indicator
Seeding	Vegetative and generative seeding	Vegetative seeding connects the lower stem with the entres material. Generative seeding is the seeding technique by using seed.
Planting	Planting in the cultivation field	The use of planting distance, making planting hole, and providing the basic fertilizer
Fertilizing	Type of fertilizer to use, fertilizing time, fertilizer dosage	Organic and inorganic fertilizer to use, fertilizing is conducted at the beginning and the end of the rainy season, the fertilizer dosage either the organic or inorganic is 10-20 Kg/tan.
Pruning	Single stem pruning, shape pruning, maintenance pruning	Implementing the single stem pruning for the coffee plant, shape pruning is removing the shoot on the primary stem, maintenance pruning is removing the unproductive stem.
Controlling disease and pest	Way to control	Controlling through technical culture is a technical control, biological control is using the natural enemy, simultaneous planting, trap installation

Sumber: Ministry of Agriculture (2014)

Produktivitas Usaha Kopi

According to the experts of productivity, according to Simangun (2005) is a concept which describes the relationship of result (the amount of produced goods with the source of labor, capital, land, energy, etc. according to Handoko (2011) it is the relationship between inputs and outputs in the production system. According to Smith and Wekeley (1995) in Simangun (2005) productivity is production or output produced in the unit of time. Based on the definitions above, the definition of productivity is a concept which describes the production activity started from the material until it produces a good or service in a certain unit of time.

The basic concepts used to analyze productivity are the production function, production factors of the number of labor, productive area width, and coffee tree age, the wider productive area being planted with the coffee plants, the older the coffee plants will be (Pamoriana, 2013). According to Thamrin (Thamrin, 2016) the factors influence the coffee productivity are area width (ha), the amount of productive tree (amount of tree/ha), fertilizer and pesticide, labor per area width (HOK/ha). The total productivity of the partial production factor is the average production of a production factor which is measured as the distribution result of the total production and the total use of production factor.

Coffee Quality

Coffee quality is influenced by the harvest process and the post-harvest process conducted by farmers. Determining coffee bean quality can be seen from the coffee bean defects value, the higher defect value will decrease the price gained by farmers. Resolution Number 407 concerning the Coffee Quality Improvement Program determines the amount of sample to see the defect value of Arabica coffee which maximally shall be 86 of

300 grams of coffee beans to take as the sample, while the maximum defect value of robusta coffee is 130 of 300 gr sample. (Kurniawan & Hastuti, 2017).

According to Ramanda & Lestari (2016), coffee quality grouping based on PT. Nestle includes three grades of coffee quality which can be seen as in the following table.

Table 1. Coffee Quality Characteristics based on the Coffee Quality Grade

Coffee Quality Grade	Coffee Quality Characteristics based on the Coffee Quality Grade
Grade 1	Maximum defect 120, strange thing 0,5%, with maximum water content of 10,49%
Grade 2	Maximum defect 120, black beans 2%, with maximum water content of 10,5-10,99%
Grade 3	Maximum defect 120, broken beans 3%, with maximum water content of 12%

Source : Ramanda & Lestari, 2016

METHODOLOGY:
Research Location and Time

This research was conducted on March until June 2019 and it was located in Panti Sub-district, Jember. Panti was chosen as object since Panti is one of the coffee producer centers in Jember.

Type of Data and Data Analysis Technique

There are two types of data used, they are: first, Primary data is the data obtained from the field by using certain methods such as interview and observation. The primary data source is the respondents. In this research, primary data was obtained through questionnaire given to the respondents – which in this case is the coffee farmers – which contained their opinion or appraisal related to the GAP implementation. Second, the secondary data is the data obtained from the other parties and is not self-made. The secondary data source is the written documents, journals, report of the related researcher and institutions as well as the guidebook (Sugiyono, 2012). The data is analyzed through linear regression. The data will also be displayed by using frequency distribution tool. Frequency distribution is a method to describe the data distribution through percentage frequency calculation.

Data Collection Method

Penelitian This research used several data collection methods. First, observation is one of data collection methods through direct observation as well as taking notes on every single thing related to the research. Second, literature review is a data collection method through studying the books related to the research. Third, interview is a data collection method through direct interview with the parties related to the research object (Supranto, 2000). Fourth, questionnaire is a data collection method through providing a set of questions which had been set by the researcher.

Population and Sample

The research population is the robusta coffee farmers who have been cultivating coffee for five years. The sampling technique is simple random sampling which was taken from 3 villages for 105 respondents. Respondents from Suci village are 25 people, from Kemiri village are 40 people, and from Pakis village are 40 people.

Definition of Operational Variable and Indicator Variable

Table 3. Operational Indicator Definition

Variable	Operational Definition	Indicator	Measurement
GAP Implementation (X1)	Showing farmer's skill in implementing the good coffee robusta cultivation practice	X1.1 Knowledge	The level of farmer's skill in implementing GAP on robusta coffee cultivation with the measurement criteria high, medium, low
		X1.2 Attitude	The farmer's attitude in implementing GAP on robusta coffee cultivation with the measurement criteria strongly agree, agree, and disagree
		X1.3 Skill	The farmer's ability in implementing GAP on robusta coffee cultivation with the measurement criteria often (>10 times), rarely (1-9 times), never
Productivity (Y1)	A certain amount of robusta coffee produced successfully with the standardized coffee quality	Y1.1 amount of production (kg/ha)	The Amount of coffee bean yield in a harvest season with the measurement criteria high (>10 tons/ha), medium (>tons/ha), low (<5 tons/ha)
		Y1.2 coffe beans color quality	The coffee beans color in the harvesting process with the grouping of red, yellow, green
		Y1.3 post-harvest yield quality	The coffee beans quality as the result of wet or dry processing with the grouping of high, medium, low

DISCUSSION:

Implementing GAP on robusta Coffee

The good coffee cultivation shall be based on the SOP issued by the government in 2014. Therefore, the robusta coffee GAP was made as the standard to evaluate how far the farmers cultivate the coffee in Panti Sub-district, Jember. Mastering the good robusta coffee cultivation can be reviewed through the farmers' attitude aspect in cultivating the coffee. Farmers' actions in cultivating the robusta coffee are varied. Review on good robusta coffee cultivation can be measured through the skill mastery, farmer's attitude, and GAP implementation level.

Based on the research, the obtained result can be seen on the Table 4, generally the farmers had various knowledge, attitude, and implementation level. Someone's level of knowledge may determine his/her attitude and behavior, however in some certain things, the good knowledge mastery is not always followed by the attitude and willingness to implement the good coffee cultivation. The result which showed the less knowledge on GAP will tend to show the poor attitude and behavior. This is the disobedient behavior that did not implement the GAP which is purely caused by the lack of knowledge and resulted on the poor attitude and behavior. For example only a few of the farmers (44,7%) understand the ideal coffee planting space, then 30.4% farmers are tolerant to the various planting space of the coffee plant. Some of the farmers (35.2%) plant the coffee without having knowledge on the ideal coffee planting space (2x3 m).

In contrast, there was a condition where the farmers have an adequate knowledge but it was not followed by the good attitude and behavior. This kind of behavior was caused by other things despite the farmer's knowledge. The farmer committed negative behavior while they had the proper knowledge on GAP. The

poor post-harvest handling was caused by the farmer's response on the market and environment. For example, 50,4% farmers in general understand the coffee beans criteria which is ready to pick and 56% farmers also have the knowledge on when the coffee beans shall be harvested, however the good knowledge on harvesting is not followed by the good action. Only some of the farmers (36.1%) harvested the coffee beans based on the ripe coffee criteria. Economy factor and environment security urged the farmers to decide the earlier harvest time. The coffee price factor did not show a significant difference between the good quality coffee and the less quality coffee. The plantation security factor was poor. Thus, they wanted to sell the coffee beans as soon as possible while the time is not yet come and because they wanted to get the income. There were some farmers assumed that the early or late harvest did not guarantee any additional income from the coffee plant. Merchant determined the coffee price. Other economic reasons and because the farmers had borrowed money from the merchant that it caused them to harvest the coffee earlier than the ideal time. The more detailed coffee cultivation standard implementation practice can be seen on the following table.

Table 4. Knowledge, Attitude, and GAP implementation on Robusta Coffee Farmer in Kemiri Sub-district, Jember

NO	Robusta Coffee GAP Components	Farmer's GAP Mastery Percentage (N=105)		
		Knowledge	Attitude	Practice
1	Planting coffee with ideal planting space	44.7	30.4	35.2
2	Providing inorganic fertilizer with the suggested dosage	53.3	60.9	35.2
3	Providing organic fertilizer with the suggested dosage	67.6	39.1	61,9
4	Providing fertilizer with the suggested application frequency	64.7	49.5	47.6
5	Suggested pruning	54.3	31.4	44.7
6	Controlling pest and disease on the coffee plant	53.3	23.8	36.2
7	Harvesting coffee with good picking technique	41.9	49.5	62.8
8	Harvesting coffee at the time based on the ripe coffee criteria	50.4	51.4	36.1
9	Harvesting the red-colored coffee beans	56	36.2	48.5

Source: Primary data, processed. 2019

On the column of farmer's knowledge on GAP, the average was relatively low, except in the fertilization process. Generally, farmers have the knowledge on the fertilization standard but they did not implement it. The high production cost tends to be avoided by the farmers. Limited capital becomes the main factor. Farmers are more enthusiastic in planting than other activities, while their attitude has not yet been maximal towards the maintenance and harvest. It means some of the farmers pay attention to the maintenance activity while others do not. The farmers have a quite good skill however the harvest handling is still considered as poor. The farmers bad habit in harvesting the coffee earlier caused the poor quality coffee and poor coffee production.

GAP Standard Implementation on Coffee Processing

Processing coffee based on the GAP principle is highly suggested for Indonesia's farmers to ensure the farmers had the good coffee product and quality. If the farmers succeeded in implementing the coffee processing principles based on GAP standard then the farmer has been succeeded in achieving the sustainable and eco-friendly agriculture (Dirjenbun, 2014). GAP standard was made by the government as the farmer's guideline in cultivating the coffee, however the environment condition and the farmers capacity has not yet been able to cultivate plants by referring to the standard set by the government. Several differences of the cultivation technique and post-harvest coffee

handling by the farmer in Panti Sub-district can be seen in the following table:

Table 5. Comparison between farmer's GAP implementation and the GAP standard of the government

No	GAP and GHP components	GAP standard according to the Ministry of Agriculture Regulation	Farmer
1	Planting	.. using planting space .. good quality seeds .. good variety	.. using planting space .. using the fallen off coffee beans as seeds .. unclear variety
2	Fertilization	.. using N, P, K fertilizer .. using organic fertilizer .. conducted 3 times	.. only use N and P fertilizer .. some of them use organic fertilizer .. conducted once per season
3	Pruning	.. pruning is conducted twice at the beginning/end of the rainy season and after the fertilization	.. generally, pruning is conducted only once after the harvest
4	Controlling Pest and Disease	.. using the technical culture .. phyto-pesticide .. chemical pesticide	.. rarely conduct pest and disease control .. using chemical pesticide
5	Harvesting	.. red picking .. fully ripe fruit	.. random pick .. picking when there is a bunch of red colored coffee beans
6	Sorting	.. separating from the branch, pebbles, etc. .. sorting the beans based on its color	.. never conduct sorting
7	Storage	.. storing after the wet/dry processing .. dry storage room (based on the standard)	.. never storing .. storing was placed in the sack .. put on a para-para

Source: Primary data, processed. 2019

From table 5, we can conclude that in general farmers did not implement the GAP standard. Any half-hearted effort in implementing good coffee cultivation will affect the productivity and quality. This will be discussed further (see table 6). Implementing good coffee cultivation requires higher cost. For example, the good fertilization frequency is 3 times, and twice for good pruning frequency. Those required more time, energy, and cost. Small farmers will choose to provide lower time, energy, and cost. This is suitable with the opinion of mahyuda that GAP was not fully implemented in a proper way since the farmers tend to choose the easy components in the GAP to do but they expected the highest and most beneficial results(Mahyuda, Siti Amanah, 2018).

The varied coffee productivity and quality in Panti Sub-district was relevant to the limited resources existed. Panti represented the public coffee business. Robusta Coffee is produced by mostly small farmers. This is in line with the opinion of Rahayu et al that generally, the coffee plantation area managed by small farmers showed its cultivation technology and coffee products were managed by a small amount of resources, limited entrepreneurship knowledge access and limited agriculture service access. (Rahayu, Pranita, & Rachmahani, 2018).

Robusta Coffee Productivity

Based on the data obtained from total 105 farmers, 76% of the farmers had coffee production amount with the range of 1-5 kw while those with 11-15 kw were only 3%. The complete result can be seen on the table 6.

Table 6 Total Production of Robusta Coffee in Kemiri Sub-district, Jember

No	Production Amount	Amount (people)	percentage
1	1 kw – 5 kw	80	76
2	6 kw – 10 kw	22	21
3	11 kw – 15 kw	3	3
	Total	105	100,00

Source: Primary Data, Processed. 2019

Only some of the farmers are succeeded in achieving high production of Robusta coffee. Those who achieved the maximum production in Panti Sub-district is taught by the intensive coffee maintenance practice, pruning, balanced fertilization, rejuvenating the unproductive coffee plant or those infected by pest or disease.

The Impact of GAP Implementation on Coffee Productivity

Based on the linear regression calculation result (table 7) there was significant influence between GAP implementation and robusta coffee productivity of farmers in Kemiri Sub-district, Jember. The better GAP implemented by the farmer will cause better coffee productivity, and in the other hand, those with poor GAP implementation will cause poor coffee productivity and quality. The detailed information can be seen on table 7.

Table 7. GAP Implementation Influence Coefficients on Productivity

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	4.474	1.361		3.286	0.001
	GAP	0.065	0.028	0.227	2.365	0.020

a. Dependent Variable: PRODUKTIVITS

Sumber : Data primer diolah, 2019.

The difference on the good coffee cultivation practice in the farmer community in Panti Sub-district, Jember, East Java caused the difference on the harvested coffee yield. The maximum range of coffee production that could be reached by the farmers was 11 quintal up to 15 quintal. Generally, farmers reached 1-5 quintal of coffee production. The low coffee productivity was caused by the coffee cultivation technique. The coffee cultivation technique that could not follow the GAP standard caused low amount of coffee and low coffee quality. Some of the GAP instructions neglected by the farmers are related to the low quality of coffee seeds and coffee plant. The coffee varieties grew in the same one plantation. The coffee seeds were mostly taken from those fallen off from the trees. The fertilizer used was imbalance and incomplete based on the coffee fertilization needs. Farmers used organic fertilizer in the limited amount, although most of farmers knew the excellence of organic fertilizer, and instead, they tend to use inorganic one as the main coffee fertilizer. The fertilization frequency was only once in a season. Whereas, to gain the maximum coffee yield, fertilization shall take 3 times in one season. If there was any pest and disease attack, the farmers tend to do nothing. Some of them were providing actions but they used the chemical controller for pest and disease. The inappropriate coffee plantation management actions based on the plantation management standard impacted on the decreased coffee yield. It is in line with Iphov et al who said that to obtain the product quality, 80% were determined by on farm activities and 20% from the post-harvest activity (Iphov K.S, Yandra A, Dahrul Syah, 2014). The on farm activity is the dominant factor in determining the coffee. Besides, the inappropriate cultivation technique potentially produces coffee beans that are not resistant to pest. As addressed by Yani, the defected coffee beans (defected, blackened) provide an opportunity for the okratoxin biotic factor to grow and cause damage on the coffee beans (Yani, 2007). The defected coffee bean from the plantation is the result of inappropriate coffee cultivation technique implementation.

The unstandardized post-harvest handling will impact on the low coffee quality. One example of unstandardized actions of the farmers is the random pick. Random pick caused the harvested coffee failed to meet the adequate criteria for being harvested. One

coffee pick activity gained both the ripe or unripe coffee fruit. The harvested coffee will be mixed with other types of coffee with different ripeness level. Farmers did not sort the harvested coffee yield. The unstandardized coffee harvesting technique will decrease the coffee quality. The next impact is that the coffee yield were purchased by the merchant with a low price since it has various type and ripeness level of coffee, this was in line with the finding of Iphov that to determine a high selling price of a product was 80% determined by post-harvest activity and 20% on farm activity. Thus, to obtain an excellent coffee quality and high selling price, both on farm activity and post-harvest handling shall be carried out maximally. Both activities are inseparable in terms of good standardized cultivation based on the government regulation.

As an effort to optimize the on farm activity and post-harvest handling based on the standard, it requires an empowerment program for robusta farmers through education for improving knowledge, reinforcement of attitude and behavior on carrying out the good coffee cultivation based on the standard to achieve the coffee productivity and quality as expected by the farmers, merchants, and government. This was supported by the finding of mahyuda et al that the implementation level of GAP innovation on coffee in Gayo Aceh could increase the productivity from 0,5-0,8 to 0,8-1,2 tons of dry grain/ha. Implementing GAP could increase the coffee production and quality (Mahyuda, Siti Amanah, 2018). Thus, the successful GAP implementation in Gayo Aceh could be applied and transferred to the coffee farmers especially in Panti and the surrounding regions.

CONCLUSION:

Indonesia is the world's coffee exporter which currently experiencing production decline due to the unstandardized good agricultural practices. There were two main types of farmers' behavior which showed disobedience through performing unstandardized coffee cultivation. First, the lack of knowledge caused farmer to commit unstandardized coffee cultivation. The lack of knowledge on fertilization and pruning caused less maximal plantation management. Second, the farmers committed a behavior where they performed poor post-harvest handling despite the their proper personal knowledge. The farmers understood the criteria and age of the coffee plant to be harvested still they conduct an earlier harvest.

The low good agricultural practices implementation impacted on the low coffee production. The unstandardized GAP implementation on those farmers with purely low knowledge and low coffee management impacted on the low coffee production. Unstandardized GAP implementation on those farmers with proper knowledge but having lack of post-harvest handling impacted on the low quality coffee yield.

The most important thing is taking an effort to increase the coffee production through education, providing facility to ease the good coffee cultivation practice based on the standard to increase the amount of coffee yield and gain a higher price.

LIMITATION AND STUDY FORWARD:

This research is limited to the discussion from one point of view of the factors influencing the coffee productivity. Productivity is limited to the harvested amount of coffee yield. The upcoming research shall measure the coffee productivity by including the calculation of area width, amount of plants, and production cost.

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