PAPER • **OPEN ACCESS**

Identification of potential locations and factors for coffee agro-industry development in Argopuro mountain, Jember

To cite this article: N Kuswardhani *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **250** 012065

Identification of potential locations and factors for coffee agro-industry development in Argopuro mountain, Jember

N Kuswardhani, F N Sari and Y Wibowo

Study Program of Agroindustrial Technology, Agricultural Technology Faculty, University of Jember, Jl. Kalimantan 37, Tegalboto, Sumbersari, Jember Regency, East Java, Indonesia

E-mail: nita.ftp@unej.ac.id

Abstract. Argopuro mountain in Jember district, East Java, has the potential to develop coffee agroindustry. The areas include Arjasa, Sukorambi, Panti, Bangsalsari, Tanggul and Sumberbaru sub-districts. This research was conducted to determine potential coffee-producing locations for coffee agro-industry development. The research was quantitative and qualitative research using location quotient (LQ) method, then for region with highest LQ value, then factors identified for development coffee agroindustry using factor analysis with KMO and Bartlett's Test. The highest LQ results were found in Bangsalsari sub-district which (5.02). Identification of factors affecting the development of coffee agro-industry in the Bangsalsari contained 9 factors, namely education, members farmer group, institutions, marketing, quality, area, production, capital and technology. Analysis of factor obtained the KMO value of 0.590, significance value of Bartlett's Test, and Sphericity was 0.001. The factor analysis was appropriate for coffee agroindustry development and results of anti-image matrices obtained 5 factors, namely marketing (0.737), quality (0.709), production (0.707), capital (0.673) and technology (0.633). These factors influence the development of coffee agro-industry in Argopuro mountain area Jember.

1. Introduction

Coffee has an important role in improving the country's economy, employment providers, and income sources of farmers. Coffee industry involved in the process of cultivation, production or processing to become a product and marketing process [1]. Coffee is produced in more than 50 countries in the world, including Indonesia. Total coffee production in Indonesia in 2014 was 643,857, more than 96% of it was from smallholder plantations, 1.82% from state plantations and 1.99% from private plantations [2]. Generally, the coffee variety were robusta and arabica coffee. The Argopuro mountain area of Jember Regency precisely in districts of Sumberbaru, Tanggul, Bangsalsari, Panti, Sukorambi and Arjasa produces quite large coffee.

The coffee is cultivated by several coffee farmer groups and carried out in simple processing through dry and wet methods using conventional technology. Processing of coffee fruit aims to separate the coffee beans from the meat, the skin and dry the beans. The results of products marketed in the form of coffee beans or rice coffee. The optimum moisture content of coffee rice ranges from 10-13%. Marketing is carried out together with members of farmer groups, some through middlemen and traders. Constraints experienced by coffee farmer groups are locations that are far from the center of the crowd, human resources, coffee processing from harvest to post-harvest, and price fluctuations caused due to quality variation [3].

Agro-industry is the processing of agricultural products ranging from inputs, production processes to output. The development of coffee agro-industry has good prospects in regional markets, nationally and internationally. At present coffee has a broad market share so that cooperation with various stakeholders is needed supported by the availability of raw materials, extensive land, technology and adequate human resources. The development of agro-industry has considerable opportunities because the demand for agro-industrial products is increasing along with economic growth, socio-cultural conditions and the flow of globalization, population growth, industrialization as business opportunities in increasing added value, and business opportunities [4]. Based on this, the research was conducted to identify potential coffee producing locations for the development of coffee agro-industry and identify factors that influence the development of coffee agro-industry on the Argopuro Mountain area, Jember Regency.

2. Methods

This research was carried out in coffee farmer groups on the Argopuro Mountains in Jember Regency, namely in Panti, Sukorambi, Bangsalsari, Sumberbaru, Arjasa, and Tanggul Districts of Jember Regency. Of these six sub-districts, one district was selected to develop coffee agro-industry. The data collection was carried out in April - June 2018 by survey and searching for supporting information from government institutions. The type of data used in this study consists of primary and secondary data. Data processing of this research was carried out qualitatively and quantitatively. For data analysis using several methods, namely the method of analyzing location quotient and factor analysis.

Determination of the location of coffee production is done by the method of quotient location analysis, because to find out one of the six potential sub-districts for the development of the coffee agroindustry. Location Quotient (LQ) was used to find out the location that was the center or basis of an activity [5]. LQ value was calculated as follows:

$$LQ = \frac{Ri/Rt}{Ni/Nt}$$

Information:

Ri	:	Commodity production i at the sub-district level
Rt	:	Total commodity production at the sub-district level
Ni	:	Commodity production i at the district level
Nt	:	Total commodity production at the district level

If the LQ value > 1, the area was an appropriate for development, while for LQ < 1 indicated the area was not a potential area for development. The high LQ value showed that the growth rate of coffee commodities in the sub-district was greater than in the district and had a strong role in economic activity.

Determination of agroindustry development factors in accordance with the potential conditions of the region to be developed, based on the results from the location quotient analysis for the sub-district with the highest value. After identifying potential locations for the development of coffee agroindustry, the next stage was the focus group discussion (FGD) with farmer groups. The results of FGD were the factor analysis to determine the factors that were very influential in the development of coffee agro-industry. The factor analysis process used SPSS 16.00 software. The following stages in factor analysis can be seen in Figure 1.

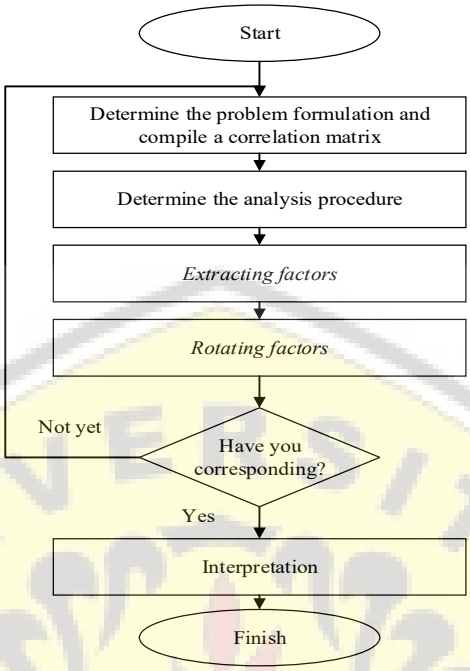

Figure 1. Flow factor analysis chart

The following was the variable selection process:

a. Kaise-Meiyer-Olkin (KMO) Test and Barlette's Test
   This test was a test of the appropriateness of factor analysis and was used to determine if the factors that were valid or not, and to find out whether all data obtained were sufficient to be factored. If the results were from (KMO) and the Barlette Test is above 0.5, it was feasible to carry out further analysis [6]. After the KMO and Barlett's Tests were carried out, an examination was carried out with the Measure of Sampling Adequency (MSA) value to find out the appropriate variables. MSA values can be known from the SPSS anti image matrics output.
b. Anti-image matrics
   In anti-image matrices to see feasible variables for factor analysis and find out factors that have a strong or no correlation with values greater than or equal to 0.5. If the value > 0.5, all the variables forming factors were feasible and no factors were reduced. In anti-image matrices that were reduced first were variables that have the smallest MSA value <0.5.

3. Results and discussions

Argopuro Mountain is located in the regions of Probolinggo, Jember, Lumajang, Bondowoso and Situbondo. This mountain has a peak height 2,475 meters, located at coordinates 7.97° South Latitude and 113.57°East Longitude. The districts in Jember are included in the Argopuro mountain area, Sumberbaru district has an area of 166.37 km^2, Tanggul 199.99 km^2 district, Bangsalsari district 175.28 km^2, Panti district 160.71 km^2, Sukorambi district 60.63 km^2, and Arjasa district 43.75 km$^{2.}$ [7]. Of thesesix coffee producing districts in Jember district which are located in Argopuro mountain area, location quotient (LQ) analysis is carried out.

Based on the value obtained, if LQ > 1 can be interpreted as feasible or the sector can export its products outside the region. If LQ < 1, the sector imports or is referred to as a non-base sector because it cannot fulfill its own needs so that it requires imports from outside the region. And if the value of LQ = 1 means that the sector does not carry out activities both from within and outside [8]. The higher the LQ value indicates the higher the potential superiority of the commodity [4]. Calculation by LQ (location quotient) analysis uses a comparison of coffee crop production with other commodities in the plantation sector in each district of the Argopuro mountain range in Jember district (Table 1).

Table 1. LQ value of potential coffee producing areas

District	Coffee Production (× 100 kg)	Production of Plantation Crops (× 100 kg)	LQ Values
Sumberbaru	5466.38	9840.38	3.04
Tanggul	4350.83	9771.05	2.44
Bangsalsari	9945.8	10839.69	5.02
Panti	3392.42	4417.52	4.21
Sukorambi	1425	2955	2.64
Arjasa	2519.1	7210.34	1.91

Source: Data processed (2018)

Based on Table 1, districts that have the lowest LQ value are Arjasa sub-district with a value of 1.91 with a total coffee production of 2519.1 Kw. Whereas for the highest LQ results, namely Bangsalsari sub-district with a value of 5.02 and a total production of 9945.8 Kw, the region can illustrate the economic strength that is quite good and influences the increase in the economic growth of the community. Bangsalsari District consists of 11 villages and 40 hamlets and a population of 113,905 people is dominated by the Javanese and Madurese tribes.

Bangsalsari District, Jember Regency has an area of 175.28 km2, tropical climate with temperatures ranging from 23-31°C with rainfall of 2000-2500 mm/year. The condition of the land has a flat topography, slope, slope and hilly. Land use is dominated by forest area utilization. The high coffee production in the Bangsalsari district of Jember Regency is caused by the size of the plantation area and the productivity of coffee farmers and industry players in the area. The coffee planted consists of arabica and robusta, the majority of which are dried. In the Bangsalsari district of Jember Regency there are 4 villages as coffee-producing areas located right on the slopes of the Argopuro mountain range, Jember Regency, namely Banjarsari, Badean, Tugusari and Curahkalong Villages. Based on data from the Agricultural Extension Agency in 2016, in the village of Banjarsari there was one coffee farmer group, Badean village there were six coffee farmer groups, Tugusari and Curahkalong villages there were two coffee farmer groups in each region.

The next step was to do a factor analysis of four villages on the slopes of the Argopuro mountains in the Bangsalsari sub-district of Jember district. The results obtained from interviews and focus group discussions with farmer groups and related institutions obtained nine factors that influence the development of coffee agro-industry consisting of production processes, quality, human resources, institutions, capital, tools and technology, marketing, education, and group members farmer.

Determination of the scale of each factor in the development of coffee agro-industry is carried out using a scale of 1, 2 and 3 to determine the grouping with the same conditions based on the characteristics of each farmer group. This scale determination is carried out by literature study. The results of grouping of each farmer group based on the factors obtained. Factor analysis was then performed with the Kaiser Meyer Olkin (KMO) and Measure of Sampling Adequacy (MSA). KMO MSA is an index used to examine the accuracy of the use of factor analysis, if the KMO values obtained are 0.5 to 1 it can be concluded that factor analysis can be used [9]. The results obtained from KMO MSA calculations using SPSS 16.00 software are as follows.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.590
Bartlett's Test of Sphericity	Approx. Chi-Square	67.503
	Df	36
	Sig.	.001

Source: SPSS 16.00 output, secondary data processed (2018)

The 9 criteria or factors contained in the farmer group and which affect the development of coffee agroindustry produced KMO value is 0.590 means that the value is> 0.5 and the significance value of Bartlett's Test of Sphericity is 0.001 meaning the value is <0.05 so it can be obtained the conclusion that all the data obtained was sufficient to be factored in and the exact factor analysis was used to simplify the process in the coffee agroindustry development strategy. With the analysis factor, it can be known grouping and mapping objects against the characteristics that exist in the factor, as a first step of the next data analysis method.

The anti-image matrices, especially in the anti-image correlation section was to reduce and find out the influential factors. The results of anti-image matrices can be seen in Table 3.

Table 3. Anti-Image Matrics

		Educa-tion	Mem-ber	Institut ional	Market ing	Quality	Area	Produc tion	Capital	Techno logy
Anti-image Covariance	Education	.349	-.135	-.004	.049	.080	-.006	-.074	.019	-.053
	Member	-.135	.272	-.030	.030	-.152	.018	.047	.000	.000
	Institutional	-.004	-.030	.085	.008	.019	.087	-.037	-.043	.040
	Marketing	.049	.030	.008	.048	-.036	.043	-.025	-.002	-.023
	Quality	.080	-.152	.019	-.036	.174	-.017	-.015	-.015	.015
	Area	-.006	.018	.087	.043	-.017	.188	-.080	-.040	.030
	Production	-.074	.047	-.037	-.025	-.015	-.080	.079	.002	-.002
	Capital	.019	.000	-.043	-.002	-.015	-.040	.002	.032	-.027
	Technology	-.053	.000	.040	-.023	.015	.030	-.002	-.027	.043
Anti-image Correlation	Education	.301[a]	-.439	-.021	.382	.325	-.024	-.444	.177	-.427
	Member	-.439	.367[a]	-.197	.260	-.699	.079	.322	-.007	-.007
	Institutional	-.021	-.197	.409[a]	.126	.159	.691	-.447	-.831	.654
	Marketing	.382	.260	.126	**.737[a]**	-.394	.455	-.400	-.055	-.494
	Quality	.325	-.699	.159	-.394	**.709[a]**	-.095	-.124	-.197	.174
	Area	-.024	.079	.691	.455	-.095	.245[a]	-.659	-.510	.330
	Production	-.444	.322	-.447	-.400	-.124	-.659	**.707[a]**	.036	-.034
	Capital	.177	-.007	-.831	-.055	-.197	-.510	.036	**.673[a]**	-.711
	Technology	-.427	-.007	.654	-.494	.174	.330	-.034	-.711	**.633[a]**

Measures of Sampling Adequacy (MSA)

[a]Note: thick number is factor used further analysis

Source: SPSS 16.00 output, secondary data processed (2018)

Of the nine factors analyzed, there are five factors that show the criteria for the Measures of Sampling Adequacy (MSA) number above 0.5. This means that the variables used can be predicted to be analyzed further. Based on the results of the anti-image correlation it can be seen that there are a number of numbers that form a diagonal and marked "a", which means the amount of MSA is a variable. The factors used for further analysis consist of:

a. Marketing (0.737)
   The availability of market information, marketing channels, the formation of farmer associations and the availability of infrastructure to support the distribution process.

b. Quality (0.709)
   The quality or quality of coffee is divided into two, namely physical quality and flavor. Physical quality is determined based on the value of damage in the coffee beans in accordance with the standards in SNI (Indonesian National Standard) 2907-2008 or SCAA (Standard Specialty Coffee Association of America) for specialty coffee. Whereas for flavor quality is determined based on organoleptic test or sensorial analysis by panelists.

c. Production result (0.707)
The increase in production results is accompanied by an increase in quality with seven strategic steps ranging from land revitalization, nurseries, human resources infrastructure, farmer financing, institutional, technology and downstream industries. Coffee consumption in Indonesia is predicted to increase by 20% annually [10].

d. Capital (0.673)
Capital is used as a means to provide adequacy and ease of obtaining costs for investment and operating costs of production activities.

e. Technology (0.633)
The selection of the right tools and technology can be applied in increasing production yields and product quality, used in the coffee processing process from the input of the coffee beans to the output of coffee beans. The processing stages include fruit sorting, stripping, washing, drying, dry stripping, sorting and warehousing.

4. Conclusion

Based on the results of the research that has been done, it can be concluded that the location of coffee producers in the Argopuro Jember mountain area that is the most potential, namely in the Bangsalsari sub-district with the location quotient (LQ) value obtained by 5.02. There are nine factors that influence the development of coffee agro-industry in Argopuro Mountain area Jember consisting of production processes, quality, human resources, institutions, capital, tools and technology, marketing, education and members farmer groups. Factor analysis results obtained by the value of KMO 0.590> 0.5 and the significance value of Bartlett's Test of Sphericity was 0.001 <0.05 so it can be concluded that the result factor analysis is appropriate for used in coffee agroindustry development, and results of anti-image matrices obtained 5 factors, namely marketing (0.737), quality (0.709), production (0.707), capital (0.673) and technology (0.633). So that these factors influence the development of coffee agro-industry in Argopuro mountain area Jember.

Acknowledgments
The authors wish to thank the Faculty of Agricultural Technology, University of Jember and the coffee farmers group in the Bangsalsari sub-district of Jember district and all parties involved in the study.

References

[1] Widyotomo S and Yusianto 2013 *Pelita Perkebunan* **29** pp 53–68
[2] Directorate General of Plantations 2015 *Indonesian Plantation Statistics: Coffee 2014–2016* (Jakarta: Ministry of Agriculture)
[3] Najiyanti S and Danarti 2001 *Coffee, Cultivation and Harvesting* (Jakarta: Spreader Self-help)
[4] Ministry of Industry and Trade 2005 *Program and Strategy for the Development of Chemical, Agro and Forest Products Industry* (Jakarta: Directorate General of Chemical, Agro and Forest Products Industry 2005-2009)
[5] Rahayu P and Maulidy A N 2014 *POMITS Technical Journal* **3** ISSN: 2337–3539
[6] Yamin S, Rachmach L A and Kurniawan H 2011 *Regression and Correlation in Your Grip* (Jakarta: Salemba Empat)
[7] Jember Regency Central Bureau of Statistics 2017 *Bangsalsari District in Figures 2017* (Jember: BPS Jember)
[8] Hendrayana R 2013 *Agricultural Informatics: Application of Location Quotient (LQ) Method in Determining National Leading Commodities* (Bogor: Institute for Agricultural Technology Research and Development)
[9] Bilson S 2005 *Multivariate Marketing Analysis* (Jakarta: Gramedia Main Library)

[10] AEKI (Indonesian Coffee Exporters Association) 2016 *Developments in Export & Import Coffee in 2007-2013* Accessed at www.aeki-aice.org/page/realisasiekspor- Import-kopi-indonesia-/id on [October 8, 2018].