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Development Potential Of Cocoa Agroindustry In Southeast Sulawesi, Indonesia

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***Abstract**: Cocoa (Theobroma cacao L) is one of the leading estate commodities whose role is quite important in the regional economy, especially in the generation of jobs, sources of income, and the development of the region and agro-industries. At present, the main problem in the cocoa development in Southeast Sulawesi is the low quality of cocoa beans. This study aimed to identify potential and problems in the development of cocoa agro-industries in raw material producing centers which can simultaneously increase farmers' income and ensure sustainability of agro-industry enterprises. Qualitative and quantitative research design was used with data being analyzed by qualitative and economic analysis. The study examined in-depth the development of cocoa agro-industry in Southeast Sulawesi using case study method. The study explored potential for the development of cocoa agro-industry in production center areas with the purpose of increasing value added of the commodity to directly benefit farmers and other agro-industrial actors. Information from this study is very important for cocoa smallholder farmers and agro-industry actors as a reference in order to develop their agro-industry enterprises to have bargaining position, and for the government in the formulation of policies related to cocoa agro-industry development in Southeast Sulawesi.*

***Keywords**: agro-industry, cocoa, development, Indonesia, potential*

I. Introduction

Cocoa (Theobroma cacao L) is one of the leading estate commodities whose role is quite important in the national economy, especially in the generation of jobs and as sources of income and foreign exchange (Ntiamoah et al, 2008; Sufri, 2007; Faissal et al, 2009). Cocoa also plays an important role in the development of the region and agro-industries.

Based on data from the International Cocoa Organization (2012), in 2012 Indonesia occupied the third rank in the world as cocoa bean producer with a market share of 13.6%. The first and second main suppliers of cocoa beans in the world are Ivory Coast (38.3%) and Ghana (20.2%). According to Suryani and Zulfebriansyah (2007) and Godfrey (2011), such achievement in Indonesia is mainly due to the success of Cocoa Production and Quality Improvement program that has been implemented by the government since 2009.

At present cocoa plantations in Indonesia recorded a total area of 1.75 million hectares with production reaching 828,255 tonnes, spreading almost in all provinces with the main production centers being in the provinces of South Sulawesi, Southeast Sulawesi, Central Sulawesi, West Sulawesi, North Sumatra, East Kalimantan, NTT and Java East. Most (94%) of the cocoa plantations belong to smallholder plantation (Dirjenbun, 2012).

In Southeast Sulawesi, cocoa is the first priority commodity among estate crops (Saediman, 2015). According to 2014 statistic data from provincial Estate Crops and Horticulture (Disbunhorti Sultra, 2014), Southeast Sulawesi supplied cocoa with a share of 19.30% from the total national production. Cocoa plantation area in Southeast Sulawesi reached 260,009 ha and is entirely smallholder plantation with a total production of 150,058 tonnes per year and productivity of 800.19 kg of cocoa beans per hectare per year. Of this total production, approximately 90 percent is exported in the form of raw, unfermented cocoa beans (Mochtar, 2011). This indicates the underdevelopment of cocoa agro-industry in Southeast Sulawesi.

Based on these facts, the development of agro-industries is one of the options to be considered for developing cocoa in general. Agro-industry development can provide various advantages such as: (i) provide higher value added; (ii) increase the income of smallholder farmers; (iii) change the yield into more durable product ; (iv) save and utilize crop yields (Dhamvithee et al, 2013); (v) provide higher returns and to be more competitive; and (vi) can generate jobs (Sinaga and Susilowati, 2007; Indrawanto, 2008)

Furthermore, a common problem encountered in the development of agro-industry is that a highly large agro-industrial potential has not been fully realized in an efficient and effective manner. This condition is due to the quality and continuity of raw materials, limited capital resources, technological barriers and lack of institutional effectiveness which is not yet able to carry out strategic functions. Such problems arise because of some weaknesses in the policy and implementation of agro-industry development programs.

Referring to the facts and phenomena described above it is necessary to undertake an in-depth study on the potential for the development of cocoa agro-industry in Southeast Sulawesi in integrated and comprehensive ways, with the hope that the study can provide useful information to realize the potential of agro-industrial development in a sustainable manner for the welfare of cocoa smallholder farmers in the future. The purpose of this study was to explore the potential of cocoa agro-industry development in Southeast Sulawesi. Conceptual framework to achieve the research objectives is shown in Figure 1.

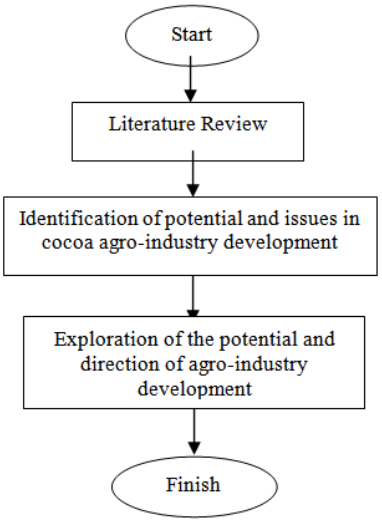


Figure 1. Flow diagram of cocoa agro-industry development research

II. Research Methods

This study is a qualitative and quantitative research. Data were analyzed using both qualitative and economic analysis. Qualitative analysis was used to identify natural and labor potentials. Secondary data needed were geographical location, climatic conditions, production, land area and demographics as well as conditions in cocoa agro-industry development in Southeast Sulawesi in particular and in Indonesia in general.

Economic analysis used was R/C ratio to determine the economic potential of cocoa agro-industries. In this regard, R/C ratio was used to determine the feasibility of cocoa agro-industry with the following formula:

$$\frac{R}{C} - ratio = \frac{R}{C}$$

Where R is Revenue (IDR) and C denotes the total cost (IDR). Cocoa agro-industry enterprise is feasible when the R/C ratio is more than 1, and not feasible when R/C ratio is less than 1. The results of the analysis of R/C ratio would be used to provide recommendations for the direction of cocoa agro-industry development in Southeast Sulawesi by comparing it with various research results relating to cocoa agro-industry development.

III. Results And Discussion

A. Cocoa agro-industry development potential

The potential of cocoa agro-industry development in Southeast Sulawesi in particular and in Indonesia in general can be identified from several aspects as follows:

Natural potential:

Natural environment of cocoa plant is a tropical forest. Therefore, rainfall, temperature and sunlight are part of climatic factors that play significant roles. Likewise, physical and chemical characteristics of soil are closely related to permeability and capacity of roots to absorb nutrients.

Seen from the planting sites, cocoa is grown in areas located between the latitudes of 10^0 north and 10^0 south. However, the spread of the cocoa crop in general is in the regions with latitudes between 7^0 north and 18^0 south. This is closely related to the distribution of rainfall and the amount of solar radiation throughout the year. Thus, Indonesia which is located between the latitudes of 5^0 N - 10^0 S, is still appropriate for the cultivation of cocoa. Areas in Indonesia are ideal for cocoa growing if situated in the location not higher than 800 m above sea level with rainfall range of 1,100-3,000 mm per year.

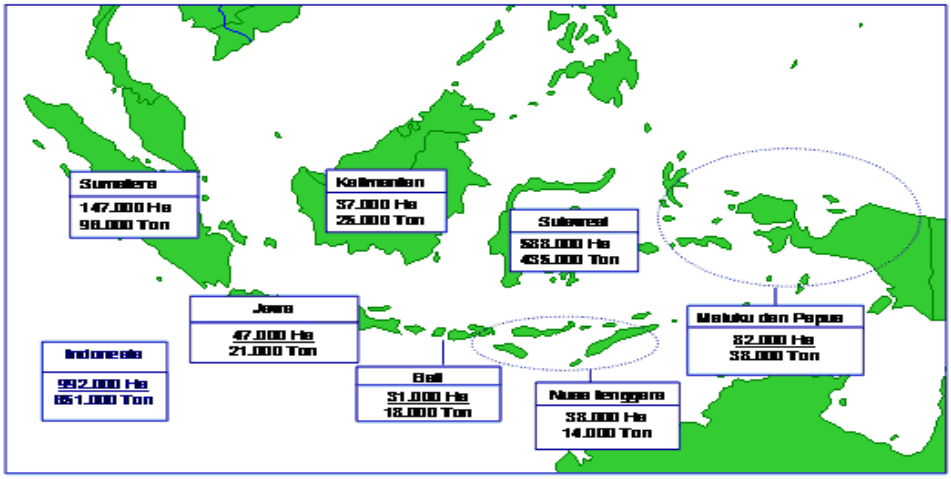
As production centers of cocoa in Southeast Sulawesi, geographically East Kolaka and North Kolaka districts are highly suitable for cocoa growing. Climatic conditions in East Kolaka and North Kolaka can be seen in Table 1 below:

Table 1. Rainfall and Temperature at Two Cocoa Production Centers in Southeast Sulawesi

Location	Rainfall (mm/year)	Temperature (^{0}C)	
		Max	Min
East Kolaka District	>2,000	33.9	23.8
Aere Subdistrict	1,939.80	33.9	23.8
North Kolaka District	2,272.8	31	10
Lasusua Subdistrict	1,788.70	33.9	23.8

Source : BPS, 2014

Geographically Indonesia is situated in strategic position because it is close to export destination countries leading to lower transportation costs. At present, land size of cocoa plantation areas in Indonesia is 1,745,789 Ha with total production of 828,255 tons, spreading in almost all provinces but with the main producing areas in South Sulawesi, Southeast Sulawesi, Central Sulawesi, West Sulawesi, North Sumatra, East Kalimantan, NTT and East Java. Most (94%) of the cocoa plantations are smallholder plantations (Dirjenbun, 2012).



Source: Center for Data and Information Department of Industry, 2007

The details of land area, production, productivity and the number of cocoa smallholder farmers in Southeast Sulawesi province during the period of 2009-2013 are presented in Table 2.

Table 2. Land Area, Production, Productivity and Number of Cocoa Smallholder Farmers in Southeast Sulawesi Province in the Last Five Years (2009-2013)

Year	LandArea (Ha)					Production		Productivity		Number of Farmers	
	TBM	TM	TTR	Total	%	(Ton)	%	(Kg/Ha)	%	Person	%
2009	50,715	151,758	33,471	235,944	-	131,830	-	868.686	-	149,754	-
2010	36,868	176,635	27,929	241,432	2.33	145,818	10.61	825.533	-4.97	154,444	3.13
2011	38,019	180,941	27,549	246,509	2.10	146,705	0.61	810.789	-1.79	159,174	3.06
2012	39,981	181,166	29,191	250,338	1.55	148,746	1.39	821.048	1.27	160,906	1.09
2013	42,128	187,529	30,352	260,009	3.86	150,058	0.88	800.186	-2.54	157,669	-2.01
Average	**41,542**	**175,606**	**29,698**	**246,846**	**2.46**	**144,631**	**3.37**	**825.248**	**-2.01**	**156,389**	**1.32**

Notes: TBM = young plants still not productive; TM = productive plants; TTR = Aged plants
Source: Department of Crops and Horticulture, Southeast Sulawesi, 2014

Land size, production, and and the number of cocoa farmers from year to year showed an increasing trend as seen in Table 2. During the last five years (2009-2013), cocoa production in Southeast Sulawesi increased rapidly with an average annual growth of 3.37%. Sources of such production growth are the growth of an average land size of 2.46% per year and an increase in the number of farmers of 1.32% in average per year. But in terms of productivity, growth is negative, which is about 2.01% per year. Cocoa productivity in the province is 825.248 Kg/Ha in average and is still below the average national productivity, which amounted to 1,200 Kg/Ha. The condition is a consequence of the age of cocoa plants which are generally older, and the use of cultivation techniques not according to recommended practices. It is also due to lack of maintenance of cocoa farming and attack of pests and diseases.

Labor potential

Competitive advantage of cocoa in Indonesian compared to that in other producing countries can be assessed from the cost of production. According to World Bank, cost of cocoa production in Indonesia is relatively low, which is only within the range of US$ 500-800 per ton. This is mainly attributable to the low cost of labor in Indonesia where the labor wage is lower compared to that in other producing countries. As a comparison, for example, labor wage in Indonesia is five times lower that that in Malaysia. The above description shows that, although the price of cocoa in the world has decreased, financially cocoa production in Indonesia should still be profitable because labor cost contributes to about 70-80 percent of the cost of production (Syam H, 2006 ; Carlos et al, 2009). Thus cocoa agro-industry could be competitive.

Cocoa production absorbs a large number of labors, in which 143,433 households from the total number of 466,440 households in the province are involved in cocoa cultivation. Table 3 shows that in all cocoa producing areas majority of population are in their productive age. This indicates the great potential of human resources for the development of cocoa business or small industries, especially for cocoa products both in the form of wet cocoa beans and processed products.

Population in North Kolaka and East Kolaka districts shows a constantly increasing trend from year to year. Along with that, the number of people in working or productive age has also increased. In 2013 the number of labor force reached 65,920 in East Kolaka consisting of 33,967 men (51.53%) and 31,953 women (48.47%). In other words, the labor force increased 6.15 percent compared to the figures in 2012. The number of labor force in North Kolaka reached 76,893 consisting of 39,602 men (51.50%) and 37,291 women (48.50%).

Table 3. Total population according to age group in cocoa main producing areas in Southeast Sulawesi, Indonesia

Location	Total population by age group					
	0-14	%	15-54	%	>54	%
East Kolaka District	37,704 (M 19,425 – F 18,279)	32.95	65,920 (M 33,967 – F 31,953)	7.6	18,176 (M 9,513 – F 8,663)	15.8
Aere Subdistrict	3,400 (M 1,780 – F 1,620)	31.9	6,423 (M 3,349 – F 3,074)	0.3	772 (M 430 – F 342)	7.2
North Kolaka District	43,765 (M 22,656 – F 21,109)	33.6	76,893 (M 39,602 – F 37,291)	9.1	17,927 (M 9,264 – F 8,663)	13.7
Lasusua Subdistrict	8,335 (M 4,296 – F 4,039)	33.6	14,638 (M 7,505 – F 7,133)	9.15	1,770 (M 896 – F 874)	7.15

Notes: M = male, F = Female
Source: BPS, 2014

Economic potential

Cocoa fermentation process consists of five stages namely: (i) procurement of raw material; raw material used is newly harvested cocoa. Availability of raw materials are often not appropriate with the processing needs; (ii) sorting of cocoa beans; this aims to clean the cocoa beans from contamination such as leaves and separate the defective beans from the good ones. Wet cocoa beans that have been sorted are then put immediately into a box for fermentation process; (iii) the processing of cocoa fermentation is done for five days in order to get a good quality cocoa; (iv) drying is done by using the rack or directly on the drying floor to produce dried cocoa beans with a water content of 7-8%; and (v) packaging and storage are the last stage of the cocoa fermentation process and cocoa beans are then ready to be marketed. Packaging is done through the

process of sorting and washing to clean up the beans from dirty leftover materials during fermentation process (Sukotjo et al., 2014).

Economic potential can be assessed by analyzing the financial feasibility of cocoa fermentation process, using R/C ratio. R/C-ratio is used for making decision regarding the feasibility of business enterprise. R indicates revenue and C is the cost, consisting of fixed costs and variable costs. Fixed costs consists of depreciation of tools and building, such as warehouse, drying floor, fermentation boxes, scales, beans sorter, shovels, tarpaulins, tester, lights and cables. Details of fixed costs can be seen in Table 4.

Table 4. Details of fixed costs in cocoa fermentation process

No.	Equipment	Cost (Rp)	Economic life (year)	Depreciation cost (Rp/year)
1.	Warehouse	30,000,000	25	1,200,000
2.	Drying floor	10,000,000	25	400,000
3.	Fermentation box	10,000,000	10	1,000,000
4.	Scale	4,000,000	25	1600,000
5.	Tester	15,000,000	15	1,000,000
6.	Beans sorter	24,000,000	25	960,000
7.	Tarp	750,000	3	250,000
8.	Shovel	150,000	3	50,000
9.	Lamp and cable	60,000	3	20,000
Total		93,960,000		5,040,000

Table 4 shows that cocoa fermentation enterprise has assets of facilities and equipment amounting to Rp93.96 million. Fixed costs in the form of depreciation costs amounted to Rp5,040,000 per year.

Variable costs consist of the cost of purchasing wet cocoa beans, other post-harvest handling, and sacks. The details of variable costs are presented in Table 5.

Table 5. Details of variable costs in cocoa fermentation processing enterprise

No.	Description	Unit	Volume	Unit price (Rp)	Amount (Rp)
1.	Procurement of raw materials	kg	50,000	11,550	577,500,000
2.	Post-harvest handling	man-day	36	50,000	1,800,000
3.	Sacks	pieces	275	2,500	687,500
Total					597,575,000

Table 5 shows that the highest cost in cocoa fermentation enterprise is for procurement of raw materials in the form of wet cocoa beans, amounting to Rp577,500,000 with the price of Rp11,550 per kg. This value is derived from the price of dried non-fermented cocoa beans of Rp35,000 per kg with the dried beans output rate of 33%. Output rate is the percentage of dried cocoa beans weight divided by wet cocoa beans weight (Davit et al, 2013). The smallest cost is for provision of sacks accounting for Rp.687,000. Each sack is filled with 60 kg of fermented cocoa beans, and sacks are used to cover the total of 16,500 kg of fermented cocoa beans.

To find out the feasibility of cocoa fermentation processing enterprise analysis of R/C ratio was used based on the breakdown of fixed costs and variable costs presented in Tables 4 and 5 previously. The details of R/C ratio can be seen in Table 6.

Table 6. R/C ratio of cocoa fermentation processing enterprise in cocoa producing areas in Southeast Sulawesi

Fermented cocoa beans (Kg)	Price (Rp)	Fixed Cost (Rp)	Variable Cost (Rp)	Total Cost (Rp)	Revenue (Rp)	R/C
16,500	40,000	5,040,000	597,575,000	647,975,000	660,000,000	1.02

Table 6 shows the difference between revenue (R) and costs (C), where R>C. Revenue amounting to Rp660,000,000 is obtained from fermented cocoa beans of 16,500 kg with the assumed price of Rp40,000 per kg. Value of R/C ratio is greater than one (R/C ratio > 1). This indicates that cocoa fermentation business is feasible. However, the ratio value is low because of very small difference in the price of non-fermented and fermented cocoa beans so that the profit earned is not high. For this reason, majority of farmers are reluctant to perform fermentation so intervention from the government is needed to settle the issue.

Some researchers had studied the feasibility of cocoa fermentation business in various regions in Indonesia. According to Sukoco (2011), in Southeast Sulawesi R/C ratio of cocoa fermentation business is 1.58 and that for non-fermentation is 3.04. Sukotjo et al (2014) shows that R/C ratio is 1.07 for cocoa fermentation business in the villages of Purema Fertile, Teteinea, Horoopi and Benua Utama in South Konawe District of Southeast Sulawesi province. In Mamuju district of West Sulawesi Province, R/C ratio for cocoa fermentation business is 1.45 indicating that the business is profitable (Semaun, 2013).

All the results of these studies indicate that cocoa fermentation business in various regions in Indonesia is financially feasible. Cocoa fermentation can be conducted in various regions in Indonesia and in other countries in the world.

IV. Conclusion

Potential development of cocoa agro-industries that is examined in this study includes:

First, the natural potential in the form of geographic, topographic, and climatic factors that are highly suitable for the cocoa growth and development. In addition, the increase in cocoa production is also supported by the availability of land as the main production factor in Indonesia especially in Southeast Sulawesi as the main producing area of cocoa.

Second, the potential labor force is shown by a competitive advantage of Indonesia. Productive age is dominant in all cocoa production centers.

Third, the economic potential is indicated by the feasibility of cocoa agro-industry. The implication of this study is about information to find out the potential of nature, labor, and economy for the cocoa agro-industry development.

This study contributes to additional knowledge of the potential which is owned and needs to be developed, at the local, national, and even global level. This is because of (a) the availability of cocoa as a source of raw materials for cocoa fermentation, which is abundant in Indonesia, (b) the abundant availability of labor, and (c) the feasibility of cocoa agro-industry which has been analyzed in this study and also in previous researches.

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