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Competitiveness, production, and productivity of cocoa in Indonesia

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Abstract. Cocoa is one of Indonesia's five foreign exchange earner, thus cocoa must stay competitive for the export market. Aims of this study are: analyze the cost structure, production and productivity of cocoa farming, the level of competitiveness, and map the types of government policies that affect the competitiveness of cocoa plants. The method used is descriptive qualitative and quantitative. Data analysis is done by using PAM (Policy Analysis Matrix). The results showed, structures are at the cost of production of cocoa farming in Indonesia almost 50 percent for wages, and 31.6 percent for land rental. The big percentage of workers wages indicates that cocoa farming is labor intensive production. In Indonesia total productive cocoa farms only 27.6%, with a productivity level of 655,515 kg per hectare. Cocoa farming in Indonesia is carried out with protective policies, the value of EPC 4.29, indicating the government's policy towards the inputs and outputs of cocoa has been effective. While the PCR value of 0.51, indicating cocoa farming has a competitive advantage, but it does not have a comparative advantage. In conclusion, productivity, out-put prices, and exchange rates should be raised, and input prices should be lowered, so that cocoa farming can provide higher net transfer values for farmers. To improve the competitiveness of cocoa farming, the islands of Sulawesi and Sumatra are two islands that require special policies, especially on out-put price policy, input prices, and productivity, as well as improvement of other cocoa commodity farming systems, as these two islands contributed more the 80 percent of Indonesia cocoa bean production.

1. Introduction

Cocoa is one of the main export commodities of Indonesia where over the past five years, Indonesia has provided about 1,951,270 hectares' area of cocoa plants. Unfortunately, its productivity level in the same period results only around 655 kg per hectare. In comparison, the productivity of cocoa in Malaysia reaches about 1800 kg per hectare, around 800 kg per hectare in Ivory coast, while in Ghana it reaches about 360 kg per hectare [1].

The top five cocoa production countries only grow about 2.01% in average in the last ten years. Meanwhile, the industrial demand for this product grows 3% per year and those big five cocoa

production countries produce more than 95% of the world's cocoa needs [2]. Here, the trend of the world market needs for cocoa clearly show that the demand is much higher than the production capacity of cocoa. Unexpectedly, cocoa producers like Indonesia and Nigeria tend to have a negative trend of cocoa production instead of experiencing a positive growth. In Indonesia itself, there are various reasons support the low growth of cocoa' production and productivity, for instance, the limited knowledge of the farmers in cocoa cultivation and crop management; the limited access of cocoa's farmers to the financial institutions; the problem of marketing (price stability is not guaranteed); the decline of soil fertility; the pests and disease; the old cocoa plants which already passed the peak of production; the government policies toward the input and output prices; and the different exchange rates for different islands of each province [3].

Since the cocoa is important for the Indonesia's export, there are two basic strategies to be applied in terms to be able to compete in the global market such as: cost minimisation strategy, and product development strategy. Indonesia applies the first strategy. One of the ways to minimise the production cost is through increasing the cocoa crops' productivity since its cost is lower compared to the cost of crops which result in scant productivity level [4]

Cocoa plantations in Indonesia are dominated by the small-scale farmers and are carried out by relatively poor farmers as well [5]. This farmers' plantation is required the government supports so that the plantation product can compete in the export market. The problem is that it is not clear yet whether the government' policies are supporting the competitiveness or competing capabilities of the cocoa products of Indonesia [6]. This research is interesting because it manages to show the cause of the low competitiveness of Indonesia's farmer-based cocoa production, such as the structure of production cost of cocoa; the government policies; and the levels of productivity viewed especially from provincial, island, and national levels.

2. Literature review
2.1. The Concept of Competitiveness and Comparative Advantage
The competitiveness will determine the position of a commodity in the competition market, and one of the measurement is through the market share [7]. Increases in the market share of a commodity will lead to the augment of commodity competitiveness. Therefore, competitiveness can be determined using the approaches of market share and market growth. The approach to be used in measuring the competitiveness commodity are the degree of profits generated and the business efficiency of producing the commodity. The level of profits portrayed from the private and social advantages, while the business efficiency of producing the goods illustrated from their level of comparative and competitive advantages.

The term of comparative advantage itself used for the first time by Ricardo [8] when discussing trade between two countries. Theoretically, Ricardo proved that when two nations perform a mutual trade, and both countries concentrate on exporting their goods of comparative advantage, then both sides will benefit together. In regional economy, the term of comparative advantages in this sense applies in the context of a comparison, not for the real added value. In other words, the comparative advantage is an economic activity that is in comparison more advantageous for the development of the region.

2.2. Competitive Advantage and Policy Analysis
A competitive advantage is a tool used to measure the competitiveness of an activity based on the actual condition of the economy. Operationally, competitive advantage can be defined as the ability to supply the goods and services on the time, place, and form desired by the consumers; either in domestic or international market, at a price that is equal to or better than that offered by the competitors to earn profit.

2.3. Policy Analysis Matrix
Policy Analysis Matrix (PAM) is a model used to analyse the comparative advantages (economic

analysis) and competitive advantage (financial analysis) of a commodity that was introduced by Monke and Pearson [9]. The result of the PAM analysis can be used to determine whether a country has a high or low competitiveness in a system of commodity production as seen from a particular area and technology, as well as how policy can improve the competitiveness through the creation of business efficiency and income growth. In addition, it can also show the extent of the impact of the input price policy, the impact of the output price policy, or the combination of both price policies established by the government for the manufacturers.

3.   Methodology

3.1. Methods of Analysis and Data Processing

The method used in this study is qualitative and quantitative descriptive. Data analysis is carried out by using PAM model.

3.2. Types and Sources of Data

The data used in this research is the secondary data of Agricultural Census 2013 obtained from the Central Bureau of Statistics (BPS), the Directorate General of Plantations of the Ministry of Agriculture, and Food Agriculture Organization (FAO). Based on the goals that will be analysed, the data used, among others: (1) farmer-based input-output, (2) the distribution cost, (3) the input price, (4) the output price, (5) the government policy.

4.   Results and Discussion

4.1. Cost Structure of Cocoa Farm in Indonesia

In 2014, the largest part of production cost was in labour fee and agricultural services, as shown in figure 1, that reached 49.7% or equivalent to IDR. 5.94 million. The rent of land also contributes a high portion which amounting to 31.6%.
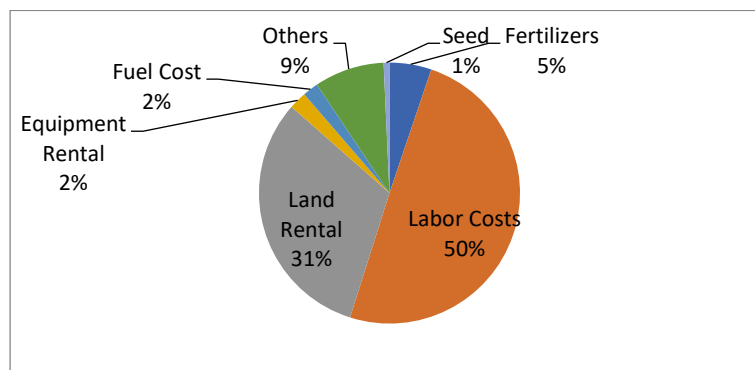
Source: Indonesia Statistical Bureau (2015)

Figure 1. Structure cost of cocoa farming per season/ha in 2014

The harvesting expenses around 40% and drying around 9.9% of the total cost. The data indicates that cocoa farming is a labour-intensive production and its cost structure, also, determine the season and place of cultivation whether it on lowland or highland. Moreover, the innovation, individual experience, and farmers' ethnics ascertain to the structure costs as well.

4.2. Productivity and Production Capacity of Cocoa

Indonesia cocoa production in 2014 was 728,418 ton [2], with the average production within the least five years was 745,845. Total cocoa farm in Indonesia approximately 1,727,437 hectares, with the productive farm merely 477,488 hectares. The highest cocoa farm productivity is on Sulawesi island

with an average of 823.67 kg/ha then followed by Sumatera island of 664.7 kg/ha, next is Java island of 595.6 kg/ha. As overall, the national average of productive land is 27.67% from total 1,828,437 ha cocoa farm.

Based on the data above, two possible solutions can be taken by the government and the related stakeholders to increase the cocoa production in Indonesia. First, increase the productive land. Second, set target productivity. The main point of these two activities is the government involvement in improving infrastructure, availability, and affordability of production facilities, strengthening farmers' institution, and maintain price stability by rationalising market chain.

4.3. Cocoa Competitiveness Analysis

Nominal Protection Coefficient on Output (NPCO) is an indicator showing the level of the government protection against domestic output. Policy considers being protective of output if NPCO > 1, and vice versa. Based on Table 1, all cocoa policies in Indonesia indicates the level of the government protection against domestic output. The island of Sumatera has the highest level of protection to domestic output, with 2.16, and the lowest is on the islands of Bali-Nusa Tenggara at 1.25.

Table 1. Policy Analysis Matrix of Cocoa Farm in Indonesia, 2014

Island	NPCO	NPCI	Net Transfer	EPC	PCR	DRC
Bali-Nusa Tenggara	1.25	0.27	5,155,550	1.37	0.51	0.62
Java	1.99	0.58	113,736,862	2.34	0.50	1.23
Kalimantan	1.35	0.33	66,348,480	2.39	0.37	0.88
Maluku-Papua	1.55	0.20	61,472,673	1.87	0.54	0.98
Sulawesi	1.65	0.49	105,310,756	2.73	0.62	1.87
Sumatera	2.16	0.58	139,859,010	15.04	0.51	3.23
Indonesia	1.66	0.41	81,980,555	4.29	0.51	1.47

Source: Agricultural Census (2013), data processed

Nominal protection coefficient on input (NPCI) is an indicator that shows the level of the government protection against domestic agricultural input prices. The policy is protective of input if NPCI < 1, meaning there is a policy of subsidy on the input of tradeable, and vice versa. Table 1 shows that the cocoa farming in Indonesia is protected of inputs, since the NPCI is 0.41. Papua-Maluku islands are the highest level of protection against input prices with the NPCI value of 0.20. In contrast, the islands of Java and Sumatera, are the lowest.

Net Transfer (NT) represents the difference between the net gain earned by the manufacturer and its net social gain. Value NT > 0, indicates an additional surplus of producers caused by the government policies applied to inputs and outputs, and vice versa. NT cocoa farming business nationally amounted to 81,980,555.

Illustration of the government' policy on cocoa farming, whether it is simultaneously protective of outputs and inputs, or not, measured by the Effective Protection Coefficient (EPC) approach. If the policy is protective then the value of EPC > 1. The greater the value of EPC means the higher the level of government protection against domestic cocoa beans commodity. Table 1 shows the national EPC value of cocoa farming is 4.29, with the highest EPC on the island of Sumatera 14.04, and the lowest EPC of 1.37 in the islands of Bali-Nusa Tenggara.

Private Cost Ratio (PCR) is a private profitability indicator that shows the ability of the commodity system to pay the cost of domestic resources and remain competitive. If PCR < 1, means cocoa commodity system has a competitive advantage and otherwise. Nationally, the value of cocoa commodity PCR in Indonesia is 0.51, means Indonesia has the competitive advantage in the cocoa farming unit.

Domestic Resource Cost (DRC) is a formula for the indicator of comparative advantage that shows some domestic resources that can be saved to produce one unit of foreign exchange. Cocoa commodity system in Indonesia has a comparative advantage if DRC < 1, and vice versa. Based on the data in Table 1 shows that cocoa farming in Indonesia has a competitive advantage but does not have a comparative advantage.

Profitability Coefficient (PC) and Net Transfer (NT) values are used to measure the impact of the government policy on farmer output, input and income as a whole. National value of EPC is 4.29, meaning that government policy on cocoa input and output has been effective. A positive net transfer value indicates that government policy on inputs and outputs will increase cocoa farmers' surplus by Rp 81,980,555 per hectare.

4.4. Sensitivity Analysis of Cocoa Competitiveness in Indonesia
Switching value analysis aims to find out the extent to which changes in output prices, input prices, productivity, and exchange rates affect the competitiveness of cocoa farming in Indonesia. Sulawesi and Sumatera are the two main islands where has the concentration of production and the most area of cocoa farmland in Indonesia. The cocoa farmland on the island of Sulawesi, accounted for 62.5% of the total cocoa farming land in Indonesia with the total production of 61.5% of the total production of cocoa beans Indonesia. While the island of Sumatera has total land area of 416,832 hectares, with cocoa beans production of 155,842.

Table 2. Switching Value Analysis of Cocoa Commodity in Indonesia (%), in 2013

Island	Scenario					
	Output Price	Input Price	Productivity	Exchange Value	Average Production in 5 years (ton)	Average Land Size in 5 years (ha)
Sumatera	(0.74)	(1.73)	(0.74)	28.69	155,842	416,832
Java	(19.67)	943.27	(19.67)	(1.67)	33,614	88,618
Bali-NT	(51.43)	226.22	(44.77)	(32.56)	17,059	75,392
Kalimantan	(53.76)	1349.22	(53.76)	(17.76)	9,118	36,674
Sulawesi	4.99	(216.45)	3.49	53.19	495,306	1,220,857
Indonesia	(23.32)	378.36	(23.71)	4.92	745,845	1,951,270

Source: Agricultural Census (2013), data processed

To increase competitiveness Indonesia cocoa farming, the price of output, productivity, and exchange rate should be increased, while input prices should be lower, especially those on Sulawesi and Sumatera, which covers 83.8% of the total land area cocoa farming in Indonesia. Just like [10] found that the agricultural economic activity variable that has the strongest positive direct effect on poverty reduction is cocoa production, including agricultural extension sustainability [11].

5.   Conclusions
The cost structure of cocoa farming production in Indonesia is almost 50% for wages which indicated a labour-intensive farming, and 31.6% for land rental. Stagnant production over the past five years, and declined in productivity, due to the traditional management of cocoa farm by the majority of poor farmers. Under these conditions, the cocoa commodity farming system in Indonesia, generally has no financial or economic competitiveness or lacks comparative advantage, but has a competitive advantage. Therefore, productivity, output prices, and exchange rates should be increased, and input prices should be lower, resulting in higher net transfer value for the farmers.

To improve the competitiveness of cocoa farming in Indonesia, the islands with 80% contribution of cocoa beans in Indonesia namely Sulawesi and Sumatra are two islands that require special policies, especially on output and input price policy, productivity, and improvement of other cocoa commodity farming systems.

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