

## **Factors affecting Productivity and Welfare among Indonesian Cacao Farmers**

Yulistiana Endah Utami, M. Syamsul Maarif, Idqan Fahmi,  
Arif Imam Suroso

*Business School, Bogor Agricultural University, Indonesia*  
*Corresponding Author: Yulistiana Endah Utami*

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**Abstract:** *The purpose of this paper is to determine the key factors that affecting the productivity of small holder cacao farming in Indonesia; to study the multiple variables corelated to the productivity of small holder cacao farming in Indonesia; and to design the appropriate policy that will increase the productivity of small holder cacao farming in Indonesia. This study using structural equation modelling (SEM) as primary research method, this paper identifies variables and factors affecting the productivity among cacao farmers in Indonesia. An empirical survey was conducted on three main cacao production regions in the Sulawesi Island of Indonesia, namely the Parigi Moutong district, the Sigi district and the Pinrang district. Primary data collected from the survey were analysed using the confirmatory factor analysis approach to determine which variables and factor that strongly correlated to the productivity of cacao farmer in the study regions. Using the structural equation modelling, this study confirmed that the natural resources and the farmers economical capital were the dominant variables that strongly influenced the productivity of cacao farmers in the study regions. The confirmatory factor analysis also showed that all the factors tested in the model were positively correlated to cacao productivity in the study regions. The results in this paper also suggested that the policy of cacao farming from the Indonesian ministry of agriculture was ineffective, although farmers were agreed that the policy was important to increase the production of cacao in Indonesia. This paper contributes to the existing literature on the socio-economic dynamics of the cacao production in Indonesia by providing the empirical evidence on the factors and variables that contributed to the small holder cacao farmers in Indonesia. The results from this study also provides key insight to strengthening the policy that support the small holder cacao famers in Indonesia.*

**Keywords:** *Structural equation modelling, farming system, agriculture policy analysis*

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Date of Submission: 28-09-2018

Date of acceptance: 15-10-2018

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### **I. Introduction**

Cacao is one of the main agricultural export commodities from Indonesia. In effort to boost the cacao export, the Indonesian Government has introduced the Bea Keluar Policy, which intended to reduce exported raw cacao beans and divert the raw cacao for the domestic chocolate industry, while processing raw cacao bean into processed cacao bean that have higher added value and competitiveness in overseas market<sup>1</sup>. This policy has resulted in the surge of domestic cocoa processing industry in Indonesia, from 16 unit in 2010 to 20 unit in 2016. However, of the total 800 thousand processing capacity, only 392 thousand processing capacity achieved. This condition, along with low raw cacao beans availability has resulted in the import effort of raw cacao beans by the Indonesian government, from 39.2 thousand imported cacao beans in 2007, to 175.5 thousand in 2011 and steadily increased to 341.4 thousand in 2014<sup>2</sup>. The increase in imported raw cacao beans indicated the local production of cacao in Indonesia was not at fully capacity, and this reduction in cacao production may have been resulted by the older cacao tress, ppor cacao farm management and pest-diseases attack<sup>3,4</sup>.

Despite the decline in cacao production in Indonesia, there still a potential to increase the cacao productivity, especially among the small holder's cacao farmers. There are total 11.72 million ha of cacao farm in Indonesia<sup>5</sup>. Currently, the average cacao production rate in Indonesia is 789 kg.ha<sup>-1</sup><sup>6</sup>. With the maximum potential of cacao production 2.5 ton.ha<sup>-1</sup><sup>5</sup>, the cacao production in Indonesia still can be increased.

The cacao farming in Indonesia is one of the biggest workforce's agricultural sector. There are 1.73 million of cacao farmers in Indonesia in 2016<sup>6</sup>. Currently, most of cacao farmers in Indonesia still hesitant and/or ineffectively manage their cacao plantation<sup>7,8,9</sup>. Hence, if all the 1.73 million cacao farmers in Indonesia effectively manage their cacao plantation, is not impossible to increase the cacao production.

One of the plausible reasons of why the Indonesian cacao production is decreasing is because the unsustainable and ineffectively cacao plantation management<sup>10</sup>. Other factors that contributed to this decrease is the low economical capital of small holder's cacao famers. This has resulted the high dependent of small

holder's cacao farmers to the trader. The result from Yantu's study<sup>11</sup> showed that most of the small holder's cacao farmers borrow money from the trader and used the money not only to manage the cacao plantation, but also using it for daily needs. Hence, the small holder's cacao farmers are very dependent to the trader. This has resulted in farmer's weak bargaining position to the trader and low cacao prices from the trader<sup>12</sup>. Moreover, even though there are already institutions and organizations that support the cacao farmers, but those institutions and organizations are still unsuccessfully support the cacao farmers<sup>13</sup>.

Looking at those problems surrounding the small holder's cacao farmers in Indonesia, there is a need to formulize strategies and policy to support the cacao famers and increase the productivity of cacao famers in Indonesia. The purpose of this paper is to determine the key factors that affecting the productivity of small holder cacao farming in Indonesia; to study the multiple variables corelated to the productivity of small holder cacao farming in Indonesia; and to design the appropriate policy that will increase the productivity of small holder cacao farming in Indonesia.

## II. Methodology

**Sample and Study Regions :**The study was conducted in three different regions that has become the main production cacao regions in Indonesia. These three regions are: 1) the Parigi Moutong district in the Central Sulawesi Province; 2.) the Sigi district in the Central Sulawesi Province; and 3.) the Pinrang district in the South Sulawesi Province of Indonesia.

The sampling was done using the convenient sampling technique, based on the recommendation from the agricultural field extension officers in the corresponding district. The respondents involved in this study comprised of 279 small holder's cacao famers in the selected district. The farmers selected in this study had comprehensive knowledge on the management of the cacao plantation in the past and present condition.

**Data Collection :**Primary data were collected using direct survey and structured questionnaire. This study used a five-point Likert scales (1-5) to measure each factors and variables that contributed to the cacao production in the study regions. The survey questionnaire measure which construct variables and factors that strongly correlated to the productivity of cacao in the study regions. Items selected for construct variables and factors were based on the theoretical consideration. There are 7 construct variables selected in this study, namely: 1.) economical capital; 2.) natural resources capital; 3.) cacao's technological input and infrastructure; 4.) stakeholders and institution; 5.) government policy; 6.) human resources capital; and 7.) cacao market availability. Selected factors correlated to the construct's variables are presented in Table 1.

**Data Analysis :**This study used the Structural Equation Modelling to construct the model of cacao production in the study regions, followed by the Confirmatory Factor Analysis (CFA) to identify and confirm the variables and subsequent factors under each construct. LISREL 9.10 (windows corp.) was used to conduct the CFA. Goodness of fit was evaluated using the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Goodness of Fit Index (GFI), the Normed Fit Index (NFI), the Non-Normed Fit Index (NNFI), the Relative Fit Index (RFI), the Incremental Fit Index (IFI), and the Adjusted Goodness of Fit Index (AGFI). The standard value for each index were presented in Table 2.

**Table 1.** Construct Variables and Selected Factors in the Structural Equation Modelling

No	Construct Variables	Indicators/Factors	Reference
1	Natural resources capital	Total area of cacao plantation Productive area of cacao planation Soil Fertility	Charisma <sup>14</sup> , Rinaldi <i>et al.</i> <sup>15</sup> , Riani <sup>16</sup> , Saputra <sup>17</sup> , Jauda <i>et al.</i> <sup>18</sup> Soemartoto <sup>19</sup> , Riani <sup>16</sup> Pattiasina-Suripatty dan Mussa <sup>20</sup>
2	Human resources capital	Number of family members Total workers Workers availability Education level Farmer's age Farmer's experience	Pattiasina-Suripatty& Mussa <sup>20</sup> , Jauda <i>et al.</i> <sup>18</sup> Farid <sup>21</sup> , Rinaldi <i>et al.</i> <sup>15</sup> Pattiasina-Suripatty& Mussa <sup>20</sup> , Rinaldi <i>et al.</i> <sup>15</sup> Pattiasina-Suripatty& Mussa <sup>20</sup> , Charisma <sup>14</sup> Charisma <sup>14</sup> , Riani <sup>16</sup> , Jauda <i>et al.</i> <sup>18</sup> Nadir <sup>22</sup> , Septiana <sup>23</sup> , Riani <sup>16</sup>
3	Cacao's technological input and infrastructure	Road condition Superior varieties Superior seedlings Fertilization Pesticide Irrigation Maintenance technology Harvesting technology Post-harvest technology	Iqbal & Dalimi <sup>24</sup> , Wijayanti <sup>25</sup> Dewi <sup>26</sup> , Farid <sup>21</sup> Rinaldi <i>et al.</i> <sup>15</sup> , Riani <sup>16</sup> Riani <sup>16</sup> , Saputra <sup>17</sup> Dewi <sup>26</sup> Septiana <sup>23</sup> Rinaldi <i>et al.</i> <sup>15</sup> , Hendiarto <sup>27</sup> Soemartoto <sup>19</sup> , Hendiarto <sup>27</sup> Soemartoto <sup>19</sup> , Hendiarto <sup>27</sup>
4	Stakeholders and institution	Farmer's group Agriculture extension officer Capital institution	Jauda <i>et al.</i> <sup>18</sup> Arsyad <sup>28</sup> , Jauda <i>et al.</i> <sup>18</sup> Iqbal & Dalimi <sup>24</sup>

		Non-government organization (NGO) Indonesian Agency for Agricultural Research and Development (IAARD)	Iqbal & Dalimi <sup>24</sup> Hendiarto <sup>27</sup> , Arsyad <sup>28</sup>
		Big trader Regional Plantation Agency Middle-man Traditional Market Local trader	Baihaqi et al. <sup>29</sup> , Riani <sup>16</sup> Hendiarto <sup>27</sup> Baihaqi et al. <sup>29</sup> , Riani <sup>16</sup> Baihaqi et al. <sup>29</sup> , Riani <sup>16</sup> Baihaqi et al. <sup>29</sup> , Riani <sup>16</sup>
5	Government policy	GernasKakao Policy Fermentation box policy	Ditjenbun Kementan <sup>8</sup> Kementan <sup>30</sup>
6	Economical capital	Fertilization cost Pesticide cost Workers cost Transportation cost	Soemartoto <sup>19</sup> , Rinaldi et al. <sup>15</sup> , Saputra <sup>17</sup> Soemartoto <sup>19</sup> , Rinaldi et al. <sup>15</sup> , Saputra <sup>17</sup> Soemartoto <sup>19</sup> , Rinaldi et al. <sup>15</sup> , Saputra <sup>17</sup> Soemartoto <sup>19</sup> , Rinaldi et al. <sup>15</sup> , Saputra <sup>17</sup>
7	Cacao market availability	Market price Price stability	Pattiasina-Suripatty& Mussa <sup>20</sup> , Charisma <sup>14</sup> Iqbal & Dalimi <sup>24</sup>
8	Cacao production	Cacao production (Quantity) Quality of cacao	Pattiasina-Suripatty& Mussa <sup>20</sup> , Jaudaet al. <sup>18</sup> Soemartoto <sup>19</sup>
9	Cacao farmer's welfare	Income from cacao Other income	Charisma <sup>14</sup> Charisma <sup>14</sup>

### III. Results Findings

The cacao production model in this study was tested for the goodness of fit (GOF) between the collected data and the proposed model. The results of the GOF test showed that the RMSEA value of the proposed model was 0.076 (< 0.08), which indicates that the model is acceptable model fit<sup>31</sup>. The other index tested for GOF also shown the acceptable model fit, hence the model proposed in this study is appropriate to be used for further confirmatory factor analysis (CFA).

**Table 2.** Goodness of Fit (GOF) Index of The Cacao Production Model

No	GOF Index	Standard Value	Model Value	Level of GOF
1	RMSEA ( <i>root mean square error of approximation</i> )	≤ 0,08	0,079	good fit
2	GFI ( <i>goodness of fit index</i> )	≥ 0,90	0,95	good fit
3	CFI ( <i>comparative fit index</i> )	≥ 0,90	0,96	good fit
4	NFI ( <i>normed fit index</i> )	≥ 0,90	0,94	good fit
5	NNFI ( <i>non-normed fit index</i> )	≥ 0,90	0,93	good fit
6	RFI ( <i>relative fit index</i> )	≥ 0,90	0,89	good fit
7	IFI ( <i>incremental fit index</i> )	≥ 0,90	0,96	good fit
9	AGFI ( <i>adjusted goodness of fit</i> )	≥ 0,90	0,91	good fit

### Construct Variables Affecting Cacao Production in Indonesia

The results from the SEM showed that all construct variables tested in this study was positively correlated to the cacao production in the study regions. In turn, the cacao production is positively correlated to the cacao's farmer welfare (Table 2). In general, the cacao production model and the subsequent factor affecting the model is presented in Figure 1. Based on the standardized loading factor value presented in Table 2, of the seven construct variables tested in this study, there were two construct variables that showed high value (> 0.2) compared to the other variables. These two construct variables were 1.) natural resources capital; and 2.) economical capital.

The higher standardized loading factors value indicated the strong correlation between the corresponding construct variables and the measured indicators<sup>31</sup>. Hence, in this model, it can be suggested that the natural resources capital and the economical capital were the two dominant variables that affecting the cacao production in the study regions. Previous study also confirmed that the production of cacao in Indonesia was strongly influenced by the natural resources capital<sup>17,21</sup> and the stability of economical capital from the farmers<sup>15,17</sup>.

**Tabel 2.** The Structural Model Correlation Coefficients

Construct Variables	Standardized Loading Factor	t-value	Correlation Significance
Natural resources capital → Cacao production	0.26	5.71*	Significant at 0.05 level
Human resources capital → Cacao production	0.08	2.02*	Significant at 0.05 level
Cacao technological input and infrastructures → Cacao production	0.09	2.99*	Significant at 0.05 level
Stakeholders and institution → Cacao production	0.14	4.08*	Significant at 0.05 level
Government policies → Cacao production	0.12	2.26*	Significant at 0.05 level
Economical capital → Cacao production	0.48	12.70*	Significant at 0.05 level
Cacao market availability → Cacao production	0.14	2.44*	Significant at 0.05 level
Cacao production → Cacao farmer's welfare	0.46	9.45*	Significant at 0.05 level

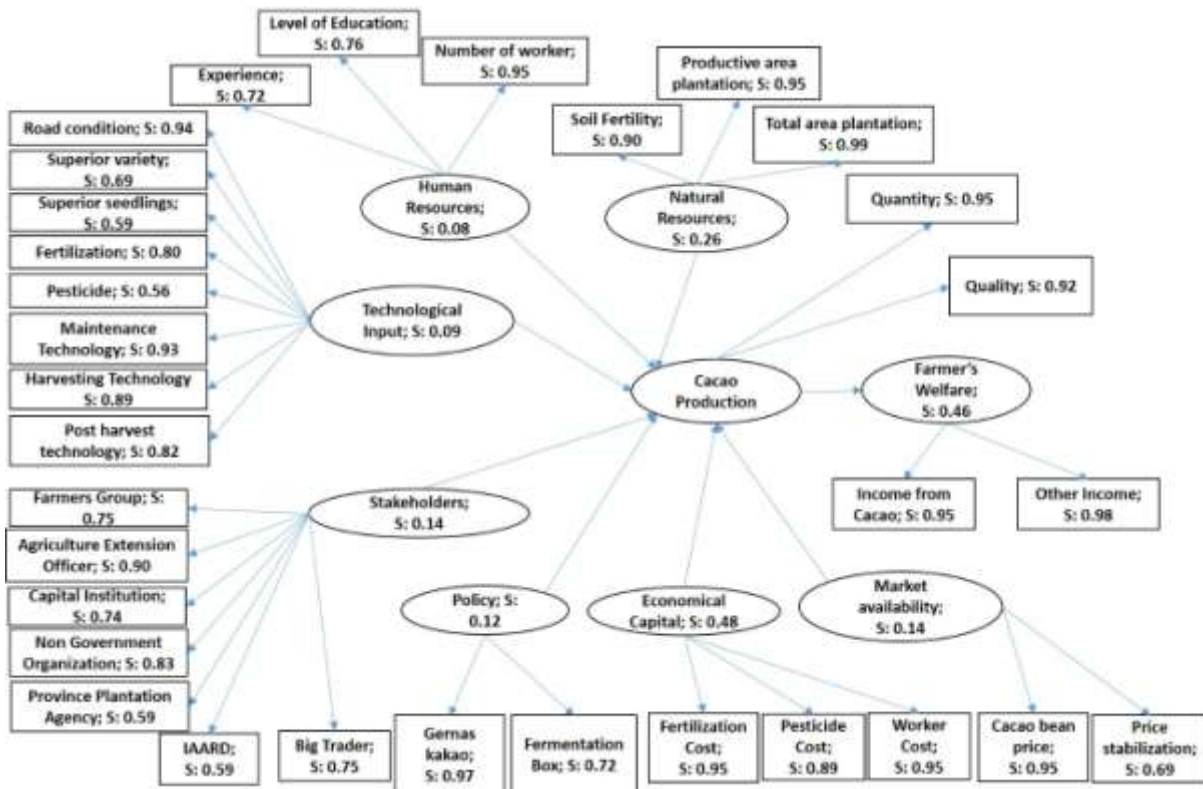


Figure 1. Cacao Production Model (S: standardized loading factor)

**Factors Correlating to Cacao Production in Indonesia**

**Farmer's Economical Capital**

The results from this study showed that cacao farmers in the study regions are considering the economical capital as the primary construct variables that influencing the cacao production. The capital income in this study is related to the input for cacao production, including the fertilization, pesticide, maintenance, and harvesting. There are three main cost that important in cacao production, the fertilization cost, pesticide cost and worker cost. The results from the CFA showed that both the fertilization cost and worker cost are having the same standardized loading factor of 0.95, while the pesticide cost is having lower standardized loading factor of 0.89 (Figure 1). Previous studies by Rinaldi *et al.*<sup>15</sup> and Saputra<sup>17</sup> also suggested that the cost of fertilization, pesticide and worker are integral to the production of cacao in Indonesia.

The results from survey conducted to the respondent showed that in average, farmers in the study regions paid the worker cost around 2-4 million Rupiah per year, while the fertilization cost 1-2 million Rupiah, and the pesticide would cost them 500 thousand to 1 million Rupiah per year. With the average income of small holder cacao farmers in the study region less than 6 million Rupiah per year, it is not surprisingly that farmers decide to independently work his/her own farm to minimize the cost of worker and fertilization. Therefore, because of low production input, the cacao production was not optimum dan even declining every year.

The results from this study further corroborated results from Rheza and Karlinda<sup>32</sup> and Yanuardy<sup>33</sup>, which suggested that lack of economical capital from the small holder's cacao farmers is the main reason to the decrease in cacao production. Furthermore, Yantu<sup>11</sup> found that many small holder's cacao farmers are borrow money to the big cacao trader, thus increase the dependency of farmers to those traders. To formulate a better strategy to support the cacao production in Indonesia, special attention is needed in regard to strengthening the farmer's economical capital.

**Natural Resources Capital**

Natural resources capital is one of the important capital, other than economical and human resources, in the farming system<sup>34,35</sup>. In this study, the natural resources capital comprises of: 1.) total cacao plantation area; 2.) productive cacao plantation area; and 3.) soil fertility. Previous study by Farid<sup>21</sup> and Saputra<sup>17</sup> also confirmed that the total and productive cacao plantation area is directly corelated to the cacao production in Indonesia. The results from this study highlighted the importance of soil fertility as part of natural resources capital that influence the cacao production in Indonesia. Based on the CFA, all three indicator of natural resources capital have a high value of standardized loading factor (> 0.9; Figure 1). The dominant factor is the total cacao plantation area, followed by the productive cacao plantation area, and the soil fertility status. This results further

confirmed that the total area of cacao plantation is becoming the most important factor in the production of cacao in Indonesia.

The field observation analysis showed that most of farmers in the study regions have a total cacao plantation area of 0.5 – 1 ha, which contain 500 – 1000 cacao trees and produce 300 – 600 kg raw cacao bean per year. This productivity ( $600 \text{ kg}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ ) is far below that the optimum productivity that could be achieved by farmer ( $798 \text{ kg}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ ). Hence, it is indicating that most of the cacao trees planted in the study regions are unproductive, and efforts are needed to revitalize the cacao plantation. The field observation also found that many cacao plantations has been converted to other crops, such as maize and rice. These crop conversions happened because farmers need a steady income, while cacao only gives them income after harvest season. Furthermore, many cacao plantations in the study region are mixed with other annual trees such as cloves, pepper and rambutan. Thus, many of the cacao plantation in the region have a lower number of productive cacao trees than before. As already noted above, the decline in soil fertility status is also become a concern for the farmers in study regions. To increase the cacao productivity, it needs strategies that includes the improvement of soil fertility through fertilization and organic matter amendment.

### **Stakeholders and Institution**

The results from SEM analysis showed that the stakeholders and institution are significantly correlated to the cacao production, though these variables are not dominant variables in the model. According to Paranata *et al.*<sup>36</sup>, stakeholders and institution are not directly related to the production of cacao. However, stakeholders and institution are considered as supporting variables that can improve the cacao production in Indonesia. The support from stakeholders and institution can be in the form of coalition between farmers groups to strengthening the working atmosphere in the region<sup>37,38,39</sup>. The results from CFA showed that the Agricultural Extension Officer is the main stakeholder/institution that influence the cacao production in the study regions, followed by the NGO, Farmers Group, Big Trader and Economic Capital Institution. The Governmental agencies such as IAARD and Province Plantation Agency showed the lowest standardized loading factor (Figure 1), hence farmers acknowledge that both institutions are considered less important to the production of Cacao in the study regions.

Farmers within the study regions agree that the Agricultural Extension Officer (AEO) is important institution that support the cacao production. Farmers considered that the AEO is directly in contact with the farmers, hence becoming the main source of information regarding any problems occurred in the cacao farming system. However, it should be noted that farmers also complaining that sometime the AEO is very difficult to be reach, either because of the lack of AEO in the study regions and the commitment from the AEO to the farmers.

One of the stakeholders that have a pivotal role to the small holders' cacao farmers in the study regions is the big traders. These big traders have a better bargaining position compared to the farmers, especially since a lot of farmers borrowing money from the traders<sup>11</sup>. There were some agreements regarding the price of cacao bean between the traders and to the farmers. These agreements obviously were not in favour to the farmers, but the farmers could not make a positive bargaining due to the high dependency to the trader for a quick cash. Farmers usually borrow money from the trader prior the harvest season, not only to manage their plantation, but also for other needs<sup>11</sup>. Therefore, there is a need of intervention from the government to protect the small holders' cacao farmers from these types of predatory lending from the traders<sup>11</sup>.

Activities that can be accomplish through the institutional building are seedling, information and market sharing, pest and disease control, farmers' training, and cocoa bean quality standardization<sup>40,12</sup>. Without an independent and supportive institution, and positive stakeholder engagement, it is impossible for those activities to be achieved<sup>12</sup>. Therefore, in formulating strategies to increase the cacao production in Indonesia, institution and stakeholder engagement must be considered.

### **Cacao Market Availability**

The results from this study indicates that the cacao market availability is significantly correlated to the production of cacao in the study regions (Table 2). There are two indicators that comprise this construct variable, namely the price of raw cacao bean in the market, and the price stability (Figure 2). The CFA results showed that farmers are more concern to the price of raw cacao bean in the market, compare to the price stability. The results from field survey reported that majority of the farmers in the study regions (53.4%) received the price of raw cacao bean per kg of 21 -24 thousand Rupiah, while 35.8% of farmers received 18 -21 thousand Rupiah per kg. The difference in price of raw cacao bean might be a problem, because it could hamper the farmers' motivation to continue growing cacao in the regions. As mention before, the traders have some kind of agreement to the farmers, especially farmers that borrow money from the trader. Thus, the traders have a better bargaining position to set the price of raw cacao bean in the market. Therefore, there is a need of intervention from the government to protect the small holders' cacao farmers from the manipulation of raw cacao bean in the market<sup>11</sup>.

### **Government Policies**

Government policies in agriculture are intended to increase the farmers productivity, as well and product efficiency, thus in turn will increase the farmers' welfare<sup>35,41</sup>. In this study, based on the Indonesian Ministry of Agriculture, there are two policies that intended to increase the cacao production in Indonesia. Those two policies are the GernasKakao (Cacao National Movement) and the fermentation box policy<sup>7,8</sup>. The CFA results from this study showed that farmers in the study regions considered the GernasKakao policy is more important compared to the fermentation box policy in regard to the cacao production.

The GernasKakao policy are intended to improve cacao farmers capacity to increase the production of cacao through technological improvement and government aid to increase production input by the farmers. Study by Hafid's study<sup>44</sup> showed that the GernasKakao policy is supported by the industrial sector and starting 2015 the GernasKakao policy has been upgrade to the Sustainable Cacao Programmes by the Indonesian Ministry of Agriculture. The sustainable cacao programmes will actively involve industrial and private sector to help the small holder's cacao farmers in Indonesia.

Farmers in the study regions are less interested in the fermentation box policy introduced to them. In general, farmers in the study regions are agree that by doing fermentation, farmers will improve the quality of the cocoa bean, hence it will increase the price of the fermented cacao bean. However, during the field survey, most of the fermentation box was abandon by the farmers. Moreover, study by Hafid<sup>42</sup> found that the reluctance of farmers in doing cacao bean fermentation may resulted from the low incentive from the government and the trader for the fermentation process.

The results from the cacao bean value chain study by USAID<sup>43</sup> recommend that cacao farmers in Indonesia to start considering fermentation cacao bean in their production. However, due to higher cost of the fermentation process<sup>43</sup> and the lack of incentive for the fermented cacao bean<sup>42</sup>, small holders' cacao farmers in Indonesia were not interested to doing the fermentation. However, in order to improve the quality of cacao bean, the fermentation process must be considered when formulating strategies to increase the Indonesian cacao production.

### **Cacao's Technological Processing**

The result from the SEM analysis showed that factors included in the technological input such as, road condition, fertilization, maintenance technology, harvesting technology and post-harvest technology have standardized loading factor value  $> 0.8$ , hence those factors have a strong correlation to the cacao production compared to other factors (Figure 1). Results from field survey showed that farmers agree that the road conditions are important for them to bring cacao beans to market. Observations at the study sites show that roads condition is in poor condition. Due to these conditions, many farmers only came to the garden once a day and only for a few hours. Thus, the maintenance of the cacao plantation becomes limited, and cacao production is not optimum.

Although most farmers in the study regions do not regularly maintain the cacao trees, farmers still believe that the appropriate gardening, harvesting and post-harvest treatments are important. This results in accordance with the results of previous research by Rinaldi et al.<sup>15</sup> in small holder's cacao farmers in the Bali Province of Indonesia. The Increase in cacao production is more likely to be influenced by the plant maintenance, especially to maintain moisture levels. Cacao trees need a moderate amount of sunlight to avoid pest and diseases attacks that abundant when cacao trees in a humid condition<sup>15</sup>. The relatively small influence of pesticide, superior seeds, and improved varieties (standardized loading factor value  $< 0.7$ ; Figure 1) showed that the farmers in the study regions do not really understand the advantages of using superior seeds and improved varieties. Farmers consider that the seeds and varieties they used so far are already good varieties. The common varieties of cacao seedlings in the study regions area Sulawesi 1, Sulawesi 2 and local varieties.

Results from the Interview with experts at the Indonesian Directorate General of Plantations showed that actually there were many technologies in the cacao plantation that has been produced by the IAARD. The challenge for the IAARD and the Province Plantation Agency is to disseminate these results of to the cacao farmers. Hence, the role of AEO and field staff is important, and this suggestion is in line with the opinion of farmers who mention that AEO is the most important institutional in cacao farming.

### **Human Resources Capital**

The characteristics of farmers in the study regions including the amount of worker, education level and the experience of cacao farming. The importance of worker, education level and experience were confirmed by Pattiasina-Suripatty and Mussa<sup>20</sup>, Rinaldi et al.<sup>15</sup> and Saputra et al.<sup>17</sup>. The result from CFA showed that the amount of worker has the highest standardized loading factor (0.95) compared to the level of education and experience (Figure 1). These results indicate that the factor of employment is more related to cacao production in the study regions.

The survey results showed that the majority of cacao farmers in the study regions only employ 1 person (33.3%) and two workers (32.62%) in their plantation. Farmers who only have one worker are doing all the work in the plantation by themselves, while those with two workers are usually together with their wives, or one of the children who live in the house. The results of Rinaldi *et al.*<sup>15</sup> also asserted that labor input positively affects the increase of cacao production to cacao farmers in the Bali province. Furthermore, Saputra *et al.*<sup>17</sup> explains that increased cacao production will require a larger labor, thus longer number of working days and increased cost of farming.

The survey results showed that the majority of cacao farmers in the study regions were aged 41-50 years (31.2%), elementary school educated (48.7%) and have experience of working 16-20 years (25.4%) in the cacao plantation. These results indicate that the respondent's farmers are at productive age. Although the education level is not considerably high, but the experience of farming has been long enough (16-20 years). Taking into account the characteristics of farmers who are in the productive age and have no experience for a while, it becomes rather unfortunate to see the majority of cacao farmers currently lacking enthusiasm for garden maintenance. This is also due to the high cost for cacao plant maintenance which is an important factor in the economical capital variables (Figure 1). Although the majority of cacao farmers are in productive age, there are also a substantial amount of elderly people between the age of 51 to 60 years old (24.4%) that work in the cacao plantation. This result suggests the need for regeneration of cacao farmers, as many older cacao farmers will retire in the next 5-10 years, while at the moment there are very few young farmers that are willing to work as cacao farmers.

#### **IV. The Correlation between Cacao Production and Farmer's Welfare**

The results from this study showed that the cacao production was significantly influence the welfare of cacao farmers. From the two production indicators included in the analysis, the CFA result shows that the production level (quantity) has a greater correlation than the quality level to the production of cacao (Figure 1). This result suggests that cacao farmers in the study regions considered quantity over quality when talking about the production of cacao beans.

Other revenue indicators show greater influence than cacao acceptance indicators to represent welfare variables (Figure 1). In this study, interestingly, the cacao farmers agree that their welfare is more influenced by other source of income, rather than income from the cacao plantation. The results of this study differ to the study by Charisma<sup>14</sup>, but in accordance to the study by Dewi<sup>26</sup> which showed that other income sources bring improvements in the income structure of small holder's cacao farmers. This results further confirm the suggestion that most of the cacao farmers considered cacao as less profitable, thus many farmers starting plant other crops in their land, including rambutan, cloves, and pepper.

The results from focus group discussion with expert suggested the importance to increase cacao production. Due to higher demand of cacao bean from the local chocolate industry, there is an urgency to improve cacao production, and in turn will help improve farmer's welfare. There is scepticism that if farmer lost interest in the cacao farming and convert their cacao plantation into other crops, there will be shortage of cacao bean supply. The local chocolate industry then will increase the import of cacao beans and will cause the domestic cacao beans to become less competitive, Therefore, it is important to consider the appropriate strategies to further improve cacao production in Indonesia.

Based on the results from this study, it can be recommended to formulate strategies to increase cacao production by considering the key factors affecting the production of cacao. One of the key factor for increasing cacao production is by strengthening the factors that strongly influence cacao production, namely economy capital and natural resources. In contrast to the previous research by Rinaldi *et al.*<sup>15</sup> and Saputra *et al.*<sup>17</sup>, the results from this study recommend the accessibility of affordable capital and strengthen policy capacity that supports the increased production and quality of cacao beans. In line with the study by Hafidet *et al.*<sup>42</sup>, the involvement of cacao industry to assist cacao farmers is very important to increase the production and quality of cacao in accordance with market demand.

#### **V. Conclusion**

The strategies that needed to increase the production of Indonesian cacao beans must consider the access to economical capital, land expansion, institutional strengthening, and marketing accessibility to the farmers. Furthermore, policy implementation, technology dissemination and capacity building of small holder's cacao farmers also important.

There are few recommendation: (1) helping farmers to gain access to affordable capital; (2) improving cacao crops by increasing the productive cacao plantation; (3) establishing cacao farmer institutions that involves AEO, NGOs, and farmer groups; (4) encouraging partnership building between farmers and traders or industry; (5) continuing the upstream policy that has been well implemented so far, such as the GernasKakao program; (6) encouraging the implementation of good cacao cultivation practices; and (7) providing AEO to

provide assistance to farmers, especially in applying technology and encouraging farmers to conduct routine garden maintenance.

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