

## The Poverty Reality of Coastal and Agriculture: How Severe the Seaweed Farmers and Cocoa Smallholders Are?

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*(Received: Jul 08, 2014; Reviewed: Aug 09, 2014; Accepted: Oct 10, 2014)*

**Abstract:** This paper examines rural coastal-agricultural poverty by extracting and comparing poverty causal of seaweed farmer and cocoa smallholder households as a long standing issue in developing countries. The research employed (1) Foster-Greer-Torbecke (FGT) poverty indices for describing poverty situation, (2) Regression Analysis for extracting effects of explanatory variables on Poverty, and (3) Paired-Samples T Test to evaluate income differences. Some important findings are; (1) the degree of poverty between Seaweed Farmers and Cocoa Smallholders is significantly different, meaning they have a differentiation in income structure indicating the causes of poverty are different. FGT indices reveal that the depth of poverty in seaweed farmers household is, however, severer than cocoa smallholders. In broad sense, this leads to argue that rural coastal poverty is truly severer than rural agriculture poverty; (2) the orientation of coffee, cashew-nut and livestock productions in agricultural economic activity is strong and directly associated with the poverty of cocoa smallholders. Meanwhile, the orientation of seaweed production in economic activity is strong and directly associated with the poverty of seaweed farmers. These imply that, encouraging coffee, cashew-nut and livestock productions for cocoa smallholders and seaweed production for seaweed farmers by improving access to primary input/seeds in particular (for local government policy), can be strongly expected to reduce poverty directly; (3) there are also common factors responsible for the poverty that requiring general policy options (national government). The options are expanding cultivated land area for cocoa smallholders and stretching length area for seaweed farmers, providing transfer-source income, and stepping up agriculture/aquaculture & non-agriculture extensions (technology, market and input information) can also help poverty reduction efforts.

**Keywords:** Coastal; agriculture; rural poverty; seaweed farmers; cocoa smallholders

## 1. Introduction

Poverty is a worldwide problem hit developing countries seriously. Seaweed farmers and cocoa smallholders are a part of the problem to solve, indicating that it have been facing rural coastal and agricultural poverty as long term issues. Needless to say, the issue was (and still is) stretched out from rural agriculture to rural coastal area and this is a reason why rural poverty cannot be neglected in these countries, needs to pay strong attention on it, in other words. It was already pointed out in elsewhere that, poverty needs specific commitment and political will to attack. Islam (2006) noted that, poverty is multidimensional; it encompasses not only what is called income poverty, i.e. deprivation of income/consumption such as the satisfaction of minimum level of food and other basic needs, but also limited access to health, nutrition, and education services, which aggravates the impact of income poverty, resulting in child mortality, short life expectancy, and illiteracy.

The proportion of cocoa smallholders whose income is below the poverty line is still cyclical. Firstly, the smallholders are originally poor. Secondly, the smallholders were moving out of poverty then fell back into poverty, causing low purchasing power (Arsyad and Kawamura, 2009) impacting poverty severity. In other words, it is very difficult to dream how to increase smallholder welfare without having political will to break out their poverty trap. At the same time, a remaining crucial issue deals with cocoa smallholders welfare is exacerbated by a very weak farming institutional. This is not without clear arguments. Poverty

trap of cocoa smallholders is a result of: (i) the low quality of human resources, (ii) lack of agricultural assets, (iii) lack of access to social facilities, information and communication, and (iv) lack of income gained in economic activity. All this cannot be, however, separated from the weak role and inter-agency coordination creating ego-sector, horizontal and vertical conflicts among institutions, indicating the weak of smallholders institutional (see Arsyad, Nuddin, and Yusuf, 2012). The difficult access to social facilities such as education, public health services and clean water resources causes low quality of their human resources in terms of education attainment and health. Walle (1992) identified that access to and utilization of public services has been a long standing issue in many developing countries. The lack of access to market price information, agricultural extension services, brings about in more severity daily life to get non-agriculture income opportunity. One of the possible negative consequences of these aspects is that, the smallholders are not able to expand their plantation area to improve their income.

As on land, so too in the sea are many natural resources gathered or hunted, and especially in coastal areas, but there are limits to which these resources can be harvested sustainably. Overexploitation of scarce resources by hunting and gathering may become a problem when management regimes do not effectively regulate levels of extraction (Bryceson, 2001) has a high potential to exacerbate coastal poverty. As with the development of agriculture on land, so too the development of aquaculture has

brought about prosperity and increased food security for many people all over the world: production can be planned and managed to a greater degree (Bryceson, 2001) by noting that production sector (farmers) have to meet their daily life desires in production system. It is important to note (Zamroni, Yamao, 2011) that, the reasons fishermen choose seaweed farming as an alternative livelihood is its introduction by the government through livelihood and income augmentation projects that aim to improve the general economies of coastal communities. Secondly, according to the respondents, seaweed farming involves relatively low operational costs. Thirdly, seaweed farming requires only easy maintenance that will allow some time to engage in other income generating activity, and finally, farmers can realize more profit from farming than from fishing. Seaweed farming is frequently promoted as a lucrative alternative occupation for artisanal fishers in Southeast Asia (Nicolas, Hill, Rowcliffe, Koldewey, Milner-Guilland, 2011). In Indonesia for example, coastal villages traditionally strongly depend on artisanal fisheries. With increasing population density (and hence fishing pressure), alternative sources of income become more important. One possible economic activity is seaweed farming, which has been introduced in many communities since the 1980's (Blankenhorn, 2007). Therefore, corporate commitment is at the core to translate the concept of seaweed farming into tangible benefits to the farming community through social corporate responsibility (Krishnan, Narayanakumar, 2010) as well as government intervention are also needed to help farmers move out

poverty.

Seaweed farming based primarily on the culture of *Kappaphycus* and *Eucheuma* species has grown significantly in the Philippines and Indonesia over the last two decades, with growth also taking place at a smaller scale in Tanzania, India and a few other developing countries. Unlike other forms of aquaculture, seaweed farming foregoes the use of feed and fertilizers and has minimum technological and capital requirements. In addition, growout cycles are short, normally lasting less than two months. Given these unique characteristics, seaweed farming has generated substantial socio-economic benefits to marginalized coastal communities in developing countries, most of which have reduced access to alternative economic activities. In some communities, seaweed farming has emerged as the most relevant livelihood strategy (Valderrama, 2012) to help poverty reduction of the remote rural-coastal communities. In addition, seaweed farming can be expected to encourage seaweed-based industries and developing at a moderate pace. These are seaweed cultivation and the production of semi refined carragenan from seaweed. Beside the government agencies focusing on socio-economy development for rural peoples, there are private local companies venturing in seaweed processing and cultivation at larger scale (Sade, Ali and Ariff, 2010). Even though it has to be understood that one of the major problems dealing with seaweed farming is the negative effect of large scale monoculture of seaweeds on natural benthic biocenoses (Titlyanov and Titlyanova, 2010), including the importance

of utilizing local ecological knowledge in marine spatial planning, and emphasizes the need for follow-up studies, monitoring and enforcement of environmental regulations to ensure that negative impacts do not emerge in island communities as a result of mariculture development (Szuster and Albasri, 2010) and combining seaweed farming and conservation efforts, it is argued, a rational and sustainable utilization of marine resources can be achieved (Trono, 1990).

It is a fact that, coastal poverty solution is also still in a question. Seaweed farmers have been facing several accessibility problems, just like cocoa smallholders described above. The majority of seaweed farmer households are having income below the National Poverty Line, including in the Philippines and Indonesia even though they are the largest seaweed producer in the world. Simply because farmers households have low quality of human resources, lack of farming assets, lack of access to social facilities such as education, health and clean water resource, information and communication. A current serious difficulty for their production system is getting seaweed seeds causing a limitation of expanding length of farming area. See for example (Zamroni and Yamao, 2011) that, the market chain of dried seaweed, which extends from producers to consumers, is still a long one. These systems provide employment opportunities at every step for the communities and facilitate marketing for producers, but the producers mostly receive low prices. Market channels at the local level start with seaweed farmers and then go on to include traders, wholesalers, warehouse/

exporters and the factory and processing industries.

Both agriculture and aquaculture are potentially highly beneficial both socially and economically, but they may also give rise to environmental and social problems if not planned and managed in a sustainable way. Pollution of surrounding habitats or impoverishment due to loss of access rights are examples of negative tendencies that may create problems in the context of agricultural or aquacultural development (Bryceson, 2001). Given the current situation, it is really necessary to construct the research on poverty of seaweed farmers and cocoa smallholders as a challenging issue in combating rural poverty. Two specific purposes of the paper are. The first is to measure the proportion of cocoa smallholders whose income is below the poverty line and how severe the poverty situation is. The second is to compare the poverty situation between seaweed farmer and cocoa smallholder households.

## **2. Materials and Methods**

### *2.1 Research Site and Data Collection*

The research was conducted in Maddenra Village, Sidrap District, South Sulawesi Province for collecting cocoa smallholders data and Palabusa Village, Baubau City, Southeast Sulawesi Province for collecting Seaweed Farmers data in Indonesia. 82 households in Maddenra (28.20% of the total cocoa smallholder households) and 74 households in Palabusa (26.40 % of the total seaweed farmers households) were interviewed, so that the total sample was 156 households.

## 2.2 Analysis Methods

### 2.2.1 Head count and poverty gap indices

The proportion of cocoa smallholders is living below the Poverty Line and how severe the poverty situation is analyzed by using the Foster-Greer-Torbecke poverty indices. They are the Head-Count Index (HCI) and the Poverty Gap Index (PGI):

$HCI = \frac{A}{N}$ , where  $A$  is the number of household are below the poverty line,  $N$  is the number of total households.  $PGI = \frac{A}{N} \sum_{i=1}^A \left[ \frac{Z - I_i}{Z} \right]$ , where  $Z$  is the Poverty Line (PL) and  $I_i$  is average income of the households below the PL.

The analysis employs the Poverty Line (PL) by province for Indonesian rural area. They are 98,946.00 IDR per capita per month for South Sulawesi Province and Rp.191,195.00 IDR per capita per month for Southeast Sulawesi Province issued by CBS (Central Bureau of Statistics).

### 2.2.2 Multiple regression

A multiple regression equation is a linear model constructed by a dependent variable and a set of explanatory variables (Kawamura, 1978:228) to represent reality which can be formulated based on both theoretical framework and empirical evidence. The general model of regression;  $Y_t = \beta_1 X_{1t} + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + E_t$ , for  $Y_t, X_{it}$  are standardized and  $t = 1, 2, \dots, n$  yields the following form:

$Y_t = \left( \sum_{q=1}^k \beta_q X_q \right) + E_t$  in which the direct impact of the independent variables. The above equations yield a general form,  $X_j = \left( \sum_{q=1}^k P_{jq} X_q \right) + E_j$  for  $(k < j)$ ; where  $P_{jq}$  is regression coefficient of the independent variables and  $E_j$  is error terms.

The estimated values in the equation can be obtained by the formula  $\hat{X}_j = \sum_{q=1}^k \hat{P}_{jq} X_q, (k < j)$ ; where a hat (^) indicates an estimated value. Thus, a regression coefficient  $P_{jq}$  is a standardized regression coefficient, which is  $b_{jq} * (S_{xj} / S_{xq})$ . In this case,  $b_{jq}$  is an unstandardized regression coefficient, while  $S_{xj}$  and  $S_{xq}$  are, respectively, the standard deviation of  $X_j$  and of  $X_q$  (see Kawamura, 1978). This solution leads us to test a Null Hypothesis ( $H_0$ ) that “there is no significant impact of independent variables on dependent ones”.

### 2.2.3. Test for goodness of fit and significance of regression coefficient

For testing goodness of fit and regression coefficient, we estimate all indices on the Poverty. The analysis used the advantage of SPSS Program in calculating the observed F-value and coefficient of determination ( $R^2$ ) in testing for goodness of fit. The higher  $R^2$ , the better estimates meaning the model is fit. From this perspective,  $R^2$  heavily depends on the ability of equation specification in explaining reality. If the observed F-value exceeds the criterion ones, it rejects  $H_0$ . The next stage was the test for significance of regression coefficient, whether the observed regression coefficients differs statistically from zero ( $\alpha = .10$ ) by using the t-ratio. In obtaining the t-value, it estimated the standard error of the regression coefficient ( $S_{bi}$ ) along with regression coefficient ( $P_{jq}$ ) for each variable. If  $P_{jq} / S_{bi}$  exceeds the t-distribution, it concludes that ( $P_{jq}$ ) differs significant from zero.

### 3. Results and Discussion

#### 3.1. Test for Goodness of Fit and Significance of the Regression Coefficient

The overall test persuasively resulted in the rejection of  $H_0$  that “there is no significant impact of independent variables on dependent ones”. This could be proved that all regression coefficients in the equation are zero. The regression results show  $R^2$  of equation in Maddenra Village (cocoa smallholders) reached 0.814. It means that, 81.40% of the total variance of “Household Income” in general, can be explained so fairly robust by all explanatory variables. Meanwhile,  $R^2$  of equation in Palabusa Village (seaweed farmers) is 0.329. It means that, at least 32.90% of the total variance of “Household Income” can also be explained by all explanatory variables. Thereby, we may say that the model constructed through the six dimensions in the research is adequate in explaining the poverty situation of cocoa smallholders and seaweed farmers. In other words, all six dimensions constructed (Household Human Resource, Agricultural/Fisheries Asset, Access to Social Facility, Access to Information, Agricultural/Fisheries Economic Activity, and Non-Agricultural/Fisheries Economic Activity) could be the important dimensions for the rural coastal-agricultural poverty. This also leads us to argue that all significant variables collected could be the better direction for policy formulation dealing with poverty reduction in Indonesian rural area. The last test was T Test for evaluating mean income differences.

#### 3.2. Seaweed Farmers and Cocoa Smallholders: How Poor They Are?

This section deals with a comparison

of the poverty situation between seaweed farmers and cocoa smallholders households. The calculation reveals that Head Count Index (HCI) of Poverty in Seaweed Farmers is .9989. It means that around 99.89% of the seaweed farmer households have an income/capita/month below the Poverty Line (PL). Meanwhile the Poverty Gap Index (PGI) of the analysis is .52. It indicates that, the average income of seaweed farmer households falls far of the PL, meaning there is a severe poverty gap in the community. This situation is different from cocoa smallholder households. The calculation reveals that HCI in cocoa smallholders is .0731 meaning that less than 10% of the cocoa smallholder households are having income/capita/month below the PL. In fact, the average income of all smallholder households is above the PL resulting in PGI of zero (0), meaning there is no poverty gap in the community. However, it is important to emphasize that this finding should not be interpreted to mean that there are no poor people there at all (as HCI revealed). The indices of PGI reveal that the depth of poverty of seaweed farmers is, however, severer than cocoa smallholders. In broad sense, this leads to argue that, rural coastal poverty is more severe than rural agricultural poverty.

At least, there are three ways to compare the poverty situation between two communities (seaweed farmers and cocoa smallholders) as well as identifying important causal factors. The first is identifying the common factors responsible for the poverty of two communities. In Table 1, it is clearly displayed that the variable “Government Transfer-Source Income”

appears to be a common factor in each of the two communities. The meaning of variable Government Transfer-Source Income is household income from the government (government transfer). It is true that Indonesian government has been providing, not only financial support (cash transferred) to the poor household such as Social Safety Net Program including Highest Oil Price Compensation to help daily life desires, but also the government subsidizes agricultural inputs such as fertilizer and chemical pesticide, seeds for seaweed to the rural coastal-agricultural farmers, in which these two communities (Seaweed and Cocoa) are no exception. The important question to be answered here is that, in which community the variables have greater (important) effects on the poverty. As clearly depicted in Table 1, "Government Transfer-Source Income" appears to be a significant common factor in explaining the poverty situation in two communities. It indicates that the positive effect of "Government Transfer-Source Income" can be expected to reduce poverty for seaweed farmers and cocoa smallholders, rural coastal-agriculture poverty in other words. Just like Kakwani and Krongkaew (2000) pointed out that, several East Asian economies still faced poverty and income inequality, but they were attempting to solve these problems by coupling economic growth with specific antipoverty and income redistribution policies. In other words, poverty prevention has come from both economic growth and government transfers, however, inequality in economic growth has contributed to poverty (Hill, 1985). However (in terms of direct effect), seaweed households

receives positive effect of "Government Transfer-Source Income" six times higher ( $\beta=.933$ ) than its effect for cocoa households ( $\beta=.147$ ). This implies that, it is true the role of "Government Transfer-Source Income" in reducing poverty in seaweed households (coastal poverty) is more important than cocoa households (agriculture poverty). However, it is also true that (Besharov and Call 2009) reducing income inequality cannot be accomplished through income transfers alone.

However, specifically (Table 1), the orientation of seaweed production (harvesting, in other words), in fisheries economic activity is strong and directly associated with the poverty in seaweed households ( $\beta=.983$ ), while for coffee, cashew-nut and livestock productions are in cocoa households ( $\beta=.674$ ). A major implication of this finding is that, encouraging seaweed production in seaweed households and coffee, cashew-nut and livestock productions in cocoa households in particular, can be strongly expected to reduce poverty directly. Put it general ways. The variables that have the strongest positive impacts directly in reducing poverty of farmers are "Seaweed Production" in Palabusa Village and "Coffee, Cashew and Livestock Productions" in Maddenra Village. It conveys an important message that, in broad sense, the orientation of agricultural and aquaculture productions in economic activity (agricultural and aquaculture sector) is strong and directly associated with rural poverty phenomenon. This leads us to argue that even if the agriculture sector is not a single factor to reduce poverty, the sector

is considerably important in reducing rural poverty directly.

The second important comparison way is focusing on the variable which is identified to influence poverty of seaweed households, but it is unidentified and/or insignificant for cocoa households (the variable Family Transfer-Source Income, for instance). The definition of variable Family Transfer-Source Income is household income coming from others household members who are

working outside the country especially Malaysia (resulting remittances) and the members who are working outside the hometown for earning money. However, the family transfer-source income for seaweed household is more diversity, not only having the members who work in Malaysia, but also other family members who have different type of economic activities in hometown (such as craftsman, fish capture and non-fishery income, etc).

**Table 1.** Poverty Causal Comparison between Seaweed and Cocoa Households

No	Variable	( $\beta$ weight) on Poverty	
		Seaweed Households	Cocoa Households
1	Government Transfer Income	.933	.147
2	Family Transfer Income	.277	**
3	Cultivated Area/Length Area	.061	.373
4	Social Service Utilization	.999	.444
5	Agriculture/Fisheries and Non-Agriculture Extensions	.576	.276
6	Seaweed Harvesting	.983	*
7	Coffee, Cashew and Livestock	*	.674

Note: \* unidentified; \*\*insignificant; shaded area is common causes

Unlike seaweed households, the family transfer-source income for cocoa household is more limited by having the only remittance and to be farm laborers wage, resulting in number of smallholders who received family transfer-source income in two communities is also different, as clearly depicted in frequency distribution of Table 2. It is obviously that fifty-nine out of seventy-four (59.00%) of smallholder households have family transfer-source income in seaweed households, while thirty-four out of eighty-two (41.47%) in cocoa households. Thus, in terms of percentage of household which have a family transfer-source income, seaweed households is higher

than cocoa. This then, enables “Family Transfer-Source Income” also appears to have an impact ( $\beta$ weight) on the poverty of smallholders in cocoa households, even though it is insignificant. This is a reason why even though “Family Transfer-Source Income” can be one of the causal factors of poverty in seaweed and cocoa households (since the variable was identified in two communities), however, the variable has a significant positive impact on seaweed’s households only ( $\beta$ weight = .277 in Table 1). It is important to note that “Family Transfer-Source Income” was also identified in cocoa households, but insignificant meaning that it still has an impact but insignificant. It doesn’t



mean that there is no impact at all. For this justification, it is reasonable to say that, variable “Family Transfer-Source Income” is also a common factor influences poverty

in both communities, but the degree of the impacts are different. This implies that, diversity of family transfer-source income can also be expected to reduce poverty.

**Table 2.** Frequency Distribution of Family Transfer Income of Seaweed and Cocoa Households

Family Transfer Income	Seaweed Household		Cocoa Household	
	Frequency	%	Frequency	%
Yes	59	79.70	34	41.47
No	15	20.30	48	58.53
Total	74	100.00	82	100.00

The other important variables to compare are “Cultivated Land Area”, “Agriculture/ Fisheries & Non-Agriculture Extensions” and “Social Service Utilization”. It is clearly depicted in Table 1 that, the variable Cultivated Land Area/Length Area of Seaweed has a direct positive effect on the poverty of seaweed ( $\beta=.061$ , a weak effect) and cocoa households ( $\beta=.373$ , a moderate effect). A principal implication of this finding is that, expanding seaweed length area and cocoa cultivated land area could be expected (weak-moderately) to reduce poverty directly in both communities.

The last common poverty causal factor (see Table 1), is “Agriculture/Fisheries & Non-Agriculture Extensions”. It has direct positive effect in increasing household income of seaweed farmers ( $\beta=.576$ , a strong effect) and cocoa smallholders ( $\beta=.276$ , a moderate effect) meaning reducing poverty in both communities. It is possible to say that, the higher the frequency of getting the information of technology/agriculture/ fisheries extension, training for growing

seaweed and cocoa, non-agriculture/fisheries jobs information and market information for input-output in agriculture/aquaculture, the higher the crops or seaweeds productions (agriculture/aquaculture income) as well as non-agriculture/aquaculture income will be gained, the more total household income will have, meaning reducing poverty situation. This is in line with study conducted by Janvry, Sadoulet, Zhu (2002) that rural poverty reduction is generally sought in the role of agriculture in contributing to farm incomes. However, non-farm employment in rural areas can also be a major contributor. This indicates that, rural communities need non-farm income/ employment information outside of agriculture/aquaculture (Arsyad, Kawamura, 2010). In addition, CRIEC-World Bank (2002) also reveals the importance of information availability. It was found that 30% of the households surveyed receive an income just sufficient for food requirement. The poor usually come from farmers who are having lack of asset both land and equipment as well as

information (market, technology, capital and business opportunity). Then the bank classified that the main factors determine the gap between the poor and the rich are access to information. All these indicate that, “Agriculture/Fisheries & Non-Agriculture Extensions” can also be expected to be the next important variable in reducing poverty directly. This is a reason why agricultural extension services are supposed to fulfill many aims, from reducing rural poverty and improved livelihoods for rural households to increasing the overall production and contributing to foreign exchange earnings from exports. However, the level and percentage of this contribution may vary from one situation to another (Mahaliyanaarachchi and Bandara, 2006). Agricultural extension agents are also expected to play a key role in linking smallholder to agricultural scientist and researchers (Haile and Abebaw, 2012) and extension’s role in advancing both development and women’s empowerment (Rivera and Corning, 1990). In order to increase farmer households’ income and to alleviate the rural poverty, it is necessary to help farmers to attain more education, to give farmers useful off-farm skill training, and to supply more recruitment information service (Gonghua and Zhijun, 2014). There is, therefore, an alarming need to improve agricultural extension activities with the involved farmers through training (Tesfaye *et al.*, 2010), including to plan activity for improving agribusiness productivity, to implement and obey agreement with other institution and to apply technology, information and team work (Rustam, 2009). The important implication of these

findings is that, stepping up agriculture/aquaculture and non-agriculture extension services in seaweed (rural coastal) and cocoa households (rural agriculture) could be the next important route to move people out of poverty.

#### 4. Conclusion

Head Count Index (HCI) of Poverty in Seaweed Farmers household is .9989. It means that around 99.89% of the seaweed farmer households are having income/capita/month below the Poverty Line (PL). Poverty Gap Index (PGI) of the analysis is .52. It indicates that, the average income of seaweed farmer households falls far of the PL, meaning there is a severe poverty gap in the community. This situation is different from cocoa smallholder households. HCI in cocoa smallholders is .0731 meaning that less than 10% of the cocoa smallholder households are having income/capita/month below the PL. In fact, the average income of all smallholder households is above the PL, resulting in PGI of zero (0), meaning there is no poverty gap in the community. However, it is important to emphasize that, this finding should not be interpreted to mean that, there are no poor people there at all (as HCI revealed). Finally, the indices of PGI persuasively reveal that, the depth of poverty of seaweed farmer households is, however, severer than cocoa smallholders. In broad sense, this leads to argue that, rural coastal poverty is more severe than rural agricultural poverty. Specifically, the orientation of coffee, cashew-nut and livestock productions in agricultural economic activity is strong and directly associated with the poverty of cocoa

smallholder. Meanwhile, the orientation of seaweed production in economic activity is strong and directly associated with the poverty of seaweed farmers. These imply that, encouraging coffee, cashew-nut and livestock productions for cocoa smallholders and seaweed production by improving access to primary input/seeds for seaweed farmers in particular (local government), can be strongly expected to reduce poverty; (3) there are also common factors responsible for the poverty that requiring general policy options (national government). The options are expanding cultivated land area for cocoa smallholders and stretching length area for seaweed farmers, providing transfer-source income, and stepping up agriculture/fisheries & non-agriculture extensions (technology, input-output market information) can also help poverty reduction efforts.

### Acknowledgements

I would like to extend my sincere thanks to Professor Yoshio Kawamura (Senior Fellow of Ryukoku University, Kyoto) for his valuable solutions in employing Path Analysis. I especially also thank to Temesgen Tilahun (Faculty of Agriculture and Environmental Sciences, Bahir Dar University, Ethiopia) for his lively discussions on the comparison. I wish to thank Directorate General of Higher Education of Indonesian Government for financial supports allowing me presented early drafts of this paper at “The 3rd Annual World Congress of Agriculture - 2013 (Track 7-5: Desertification, Drought and Poverty in Agriculture)” on September 23-15, 2013, Hangzhou, China.

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