

DETERMINANT ANALYSIS ON TRANSFERING COCOA PLANTS INTO PALM OIL BY FARMERS IN ASAHAN

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Abstract: *Plantation is one of the agricultural sub-sectors that contribute significantly to the national economy. One type of prime plantation commodities so far is the palm; accordingly, many farmers who were initially seeking commodity from other plantations, such as cocoa currently switch into palm oil commodity. The most important factors that lead to the switch over is the efficient use of production factors. In this research, the sampling technique is nonprobability purposive sampling. The data used in this research is primary data obtained through questionnaires originating from respondents. Data are analyzed using linear regression. The results shows that the cost of production, labor, total production and prices significantly affect on the income of farmers both in oil palm plantations and the cocoa crop simultaneously. The coefficient of determination in oil palm plantations is as much as 0.733 and simultaneously the cocoa crop as much as 0.596. This suggests that the variables of the research apply more efficient on oil palm plantations compared to the cocoa crop. Partially, in the oil palm plantations the labor variable affects negatively on the income of farmers insignificantly; while in the brown plantation group variables of production costs and labor do not affect on the income of farmers significantly.*

Keywords: *commodities, efficiency, revenue, switching*

I. INTRODUCTION

The fact has proved that oil palm plantations to be one of the foundations for the growth and development of oil palm agribusiness system. Oil palm agribusiness system is a combination of subsystems means of agricultural production (upstream agro-industry), agriculture, downstream industries, and marketing quickly weave the entire subsystem to achieve economies of scale (Pahan, 2008). In the last 10 years, the palm oil industry is booming and can create jobs and generate foreign exchange and state tax. Due to the expansion of oil palm plantations in Indonesia, which has reached an average of 315,000 ha/year causes a lot of agricultural land are converted into oil palm plantations because of greater benefits and high economic value (Pahan, 2008). Agricultural census data from the period 2003-2013

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the government has noted that there has been a conversion of agricultural land into other land mainly into oil palm plantation of 100,000 hectares per year (CBS, 2013).

North Sumatra is one of the centers of oil palm plantations in Indonesia, and one of the areas in North Sumatra as a center of oil palm commodity is Asahan. The development of plantation area and production of oil palm in Asahan people in the last five years constantly increases. This increase is due to the farmers in Asahan converting agricultural land into oil palm plantations. Land development and the production of palm oil as a people in Asahan which is shown in the following table.

No.	Year	Land Width		Production	
		Ha	+/- (%)	Ton	+/- (%)
1.	2008	61.087,70		83.887,64	
2.	2009	69.161,48	13,22	213.049,00	153,97
3.	2010	70.455,47	1,87	939.305,91	340,89
4.	2011	72.046,39	2,26	1.015.157,86	8,08
5.	2012	72.046,39	0	1.015.157,86	0

Source: Dinas Kehutan andan Perkebunan Kabupaten Asahan, 2013

As a matter of fact the opposite happened cocoa plants within the past five years decreased land area and production Cocoa people in Asahan this is due to the cacao farmer shave converted their land into oil palm plantations. Land development and production plant in Asahan Cocoa people as in the following table.

No.	Year	Land Width		Production	
		Ha	+/- (%)	Ton	+/- (%)
1.	2008	9.333,18		7.457,21	
2.	2009	7.221,65	-22,63	5.770,10	-22,63
3.	2010	7.288,16	0,92	5.823,24	0,92
4.	2011	3.040,91	-58,28	2.429,69	-58,28
5.	2012	2.920,24	-3,97	1.534,27	-38,85

Source: Dinas Kehutan andan Perkebunan Kabupaten Asahan, 2013

Some of the causes of land conversion to oil palm cocoa are

- (a) decline in the quality and quantity of cocoa production due to aging trees;
- (b) pests and disease that has reduced the income of cocoa farmers. The desire of farmers to increase their income is causing some farmers transfer enable cocoa land into oil palm is considered more advantageous (Sempurnajaya, 2012). In relation to the research topic, the factors to be evaluated in relation to the efficiency of production factors, is the cost of production, labor, production, and price-to-income farmers.

II. RESEARCH METHOD

The study was conducted in Asahan with survey and field observation method, the two districts. Data collected through questionnaires to respondents. The sample sizes determined using Slovin formula.

Table 3
Research Location and Sample Size

<i>Location</i>	<i>Population</i>	<i>Sample</i>
<i>Kecamatan Air Joman</i>		
1. Desa Air Joman	186	26
2. Desa Pasar Lembu	129	18
3. Desa Banjar	79	11
<i>Kecamatan Silau Laut</i>		
1. Desa Lubuk Palas	51	7
2. Desa Silo Lama	69	10
3. Desa Silo Bonto	108	15
Total	622	87

The research variables are measured by ordinal scalar ranging from 1 to 5. Data were analyzed using multiple linear regression, both for commodity and oil palm for cocoa. Farmers' income as the dependent variable, while the cost, the amount of labor, production and price as the independent variable. Regression models used are:

$$v = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + e$$

Where:

v = Income of farmers

a = intercept

b_1, \dots, b_4 = coefficient of regression

X_1 = cost of production

X_2 = Labor

X_3 = production total

X_4 = price

e = error

then equipped with the F and t tests with the level of significance (α) as much as 5%.

III. ANALYSIS AND DISCUSSION

3.1 Descriptive Analysis

Data that have been tabulated and analyzed descriptively to determine the condition of each variable either at the plant palm oil, and cocoa plants is as follows.

Table 4
Descriptive Analysis

Variables	Palm		Cocoa	
	Mean	Std. Deviation	Mean	Std. Deviation
Y	3,7165	.31734	3,6705	.30802
X1	3,8046	.48238	3,6341	.50376
X2	3,7356	.50462	3,7192	.52937
X3	3,9507	.49670	3,7783	.42899
X4	3,6916	.42265	3,6648	.51244

Source: Primary Data, 2014

Based on these data above we can see the value of each variable is higher in oil palm plantations than cocoa plants. This indicates that the value of these variables is better to plant palm oil rather than cocoa plant.

3.2 Parsial and Simultan Hypothesis Testing

F Testing (Simultan Hypothesis Testing) for Palm Plantation

Table 5
F testing

Model	Sum of Squares	df	Mean Square	F	Sig.
1. Regression	6.346	4	1.587	56.218	.000 ^a
Residual	2.314	82	.028		
Total	8.661	86			

a. Predictors: (Constant), X4, X3, X1, X2

b. Dependent Variable: Y

Source: Primary Data 2014

Based on the above table independent variables, namely the cost of production (X1), labor (X2), total production (X3) and price (X4) affect the income of palm oil farmers (Y) significantly since the significance level as much as $0,000 < 0,05$.

F Testing (Simultan Hypothesis Testing) for Cocoa Plantation

Table 6
F testing

Model	Sum of Squares	Df	Mean Square	F	Sig.
1. Regression	4.861	4	1.215	30.208	.000 ^a
Residual	3.299	82	.040		
Total	8.159	86			

a. Predictors: (Constant), X4, X3, X1, X2

b. Dependent Variable: Y

Source: Primary Data 2014

Based on the above table independent variables cost of production (X1), labor (X2), total production (X3) and price (X4) affect the income of cocoa farmers (Y) significantly since the significance level as much as $0,000 < 0,05$.

3.3 Partial Test

Palm Oil Plantation

Table 7
t values

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1. (Constant)	1.217	.168		7.256	.000
X1	.189	.064	.287	2.968	.004
X2	-.092	.074	-.146	-1.245	.217
X3	.177	.055	.278	3.239	.002
X4	.386	.092	.513	4.193	.000

Source: Primary Data 2014.

From the calculation we can make multiple regression equation as follows:

$$Y = 1,217 + 0,189X_1 - 0,092X_2 + 0,177X_3 + 0,386X_4$$

Regression coefficients of the independent variables gives the following meanings:

- (a) X1 is positive regression coefficient meaning that the additional production costs will increase farmers' income palm, otherwise if the production cost is reduced, then the income of oil palm growers will also be reduced. The t value of 2.968 with 0.004 significance, meaning that the variable cost of production significantly influences the income of oil palm farmers.

- (b) X2 is negative regression coefficient meaning that more labor will reduce the income of oil palm growers, otherwise if labor is reduced, then the oil palm farmers' income will also increase. The *t* value of 1.245 with 0.217 significance, meaning that the variable labor does not significantly affect on oil palm farmers' income.
- (c) X3 is positive regression coefficient meaning that if the total production increases, the oil palm farmers' income will also increase, otherwise if total production is reduced, then the income of oil palm growers will also be reduced. The *t* value of 3.239 with 0.002 significance, meaning that the total variable significantly affect on the production of oil palm farmers income.
- (d) X4 is positive regression coefficient meaning that when the price increases, the oil palm farmers' income will also increase, otherwise if the selling price decreases, then the income of oil palm growers will also be reduced. The *t* value of 4.193 with 0.000 significance, meaning that the variable significantly affect on the selling prices of palm oil farmers' income.

Cocoa Plantation

Table 8
***t* Values**

<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>		
	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>t</i>	<i>Sig.</i>
1 (Constant)	1.500	.199		7.530	.000
X1	.033	.077	.054	.433	.666
X2	.045	.074	.077	.602	.549
X3	.350	.079	.488	4.439	.000
X4	.153	.055	.254	2.771	.007

Source: Primary Data 2014.

From the calculation we can make multiple regression equation as follows::

$$Y = 1,500 + 0,033X_1 + 0,045X_2 + 0,350X_3 + 0,153X_4$$

Regression coefficients of the independent variables gives the following meanings:

1. X1 is positive regression coefficient meaning that the additional production costs will increase the income of cocoa farmers, otherwise if the production cost is reduced, then the income of cocoa farmers will also be reduced. The *t* value of 0.433 with 0.666 significance, meaning that the variable production costs does not significantly affect on the income of cocoa farmers.

2. X_2 is positive regression coefficient meaning that more labor will increase the income of cocoa farmers, otherwise if labor is reduced, then the income of cocoa farmers will also be reduced. The t value of 0.602 with 0.549 significance, meaning that the variable labor does not significantly affect on the income of cocoa farmers.
3. X_3 is positive regression coefficient means that if the total production increases, the cocoa farmers' income will also increase, otherwise if total production is reduced, then the income of cocoa farmers will also be reduced. The t value of 4.439 with 0.000 significance, meaning that the total variable production significantly affects on the income of cocoa farmers.
4. X_4 is positive regression coefficient means that when the price increases, the income of cocoa farmers will also increase, otherwise if the selling price decreases, then the income of cocoa farmers will also be reduced. T t value of 2.771 with 0.007 significance, meaning that the selling price variable significantly affects on the income of cocoa farmers.

3.4 Discussion

1. Effect of production costs (X_1) on the income of farmers (Y) Based on the results of multiple linear regression analysis it can be determined that the variable cost of production (X_1) positively affects on farmers' income (Y), either at the plant or on the oil palm and cocoa plant. Never the less, the difference is that the cocoa crop production costs show no significant effect, while the coconut palm plant has significant effect. Judging from the allocation of the cost of production, it can be interpreted that the use of production costs in the oil palm plant is more efficient than the cocoa plant. This is also consistent with the results of the descriptive analysis shows that better use of the production costs in oil palm plantations than cocoa plants. From the above results this indicates that the cost of production in the area of research significant effect on the income of oil palm growers. Optimal use of the production costs of farmers that are tailored to the needs of its impact crop plants can significantly increase the amount of production so that farmers' income also increased. According Suratiah (2008), the cost of production as supporting all the activities there because it involves crop productivity and profitability for farmers. Production expenses that are optimal for the plant is able to increase crop production so farmers' income also increased.
2. Effect of labor (X_2) on farmers' income (Y) Based on the results of multiple linear regression analysis it can be determined that the variable power (X_2) has no significant effect on the farmer's income (Y), either in oil palm plantations and the cocoa crop. Never the less the difference is that the

cocoa plant workers has positive effect, while the negative impact of oil palm plantations. Judging from the allocation of labor, it can be interpreted that the employment in the oil palm plantations are now in excess of what is needed, so a negative effect on farmers' income. In contrast to the cocoa plants that use labor force is still lacking to support increased production. Descriptive analysis showed that a better use of labor in oil palm plantations than cocoa plants.

In the effort of farmers generally use their own workforce with the family. According Mubyar to (2002), the use of labor alone with family members in carrying out their farming can reduce costs so that farmers' income can be increased.

According to the Center for Technology Assessment and Development of Agriculture (2008) for the cocoa plantations of the people (Plants Produce/ TM), the labor requirements per hectare is 105-120 HOK. This source of labor in general is labor in the family. As for palm plantations (TM), according Sarwani (2008) the labor requirements per hectare is 80-90 HOK, which is generally a labor in the family.

Therefore, the labor requirements for the cocoa crop more than the oil palm plantations. The difference in the number of workers in general due to the cocoa crop required labor and post-harvest maintenance more. In the oil palm plantations, workers are relatively very little maintenance and post-harvest labor does not exist.

3. Effect of total production (X_3) on farmers' income (Y) Based on the results of multiple linear regression analysis it can be determined that the total variable production (X_3) has positive and significant impact on farmers' income (Y), either in oil palm plantations and the cocoa crop. Judging from the results of descriptive analysis shows that better use of total production in the oil palm plantations than cocoa plants. According to Soekartawi (2002) that the production is a major element of the income of farmers, where the use of production factors is an effort to increase production, because the higher the production, the farmers' income will also be higher. It is also made clear by Suratiyah (2008), that the purpose of farming is to obtain maximum production, since production is what will be the determinant of farmers' income. Therefore, the higher the production (at a fixed price), then the farmers' income will also increase.
4. Effect of price (X_4) of the incomes of farmers (Y_G) Based on the results of multiple linear regression analysis it can be determined that the variable price (X_4) has positive and significant impact on farmers' income (Y), either in oil palm plantations and the cocoa crop. Descriptive analysis

showed that the selling price is better to plant palm oil rather than cocoa plants. Price is the deciding factor income of farmers which are beyond the control of farmers. According Soekartawi (2002), farmers expect agricultural commodity prices to rise so that income is also increased. The higher the selling price, the farmers' income will also increase. The same thing also expressed by Suratiah (2008), that the same level of production, the selling price be the deciding factor ups and downs of farming income.

5. Variables that affect more dominant on the income of farmers Judging from the value of the regression coefficient, the more dominant variable affecting farmers' income in oil palm plantations is the price (X_4), whereas the total production of the cocoa plant (X_3) is less. Based on this it can be interpreted that the total production of the oil palm crops by farmers has reached the optimum, so that factors that more affect on earnings is the price. While in the cocoa plant, the production is still not optimal so as to increase farmers' income, still need to boost production.
6. The coefficient of determination Judging from the magnitude of the coefficient of determination on each plant species, *i.e.* 0.733 in oil palm plantations and 0.596 on the cocoa plant. Based on that it can be interpreted that the variable cost of production, labor, total production and the price is more efficient on oil plants oil compared with the cocoa plant. According to Soekartawi (2002), that farming is done by allocating existing resources effectively and efficiently in order to obtain high profits at a given time. Said to be effective if farmers can allocate their resources as well as possible, and the efficient utilization of these resources when generating expenditure (output) which exceeds revenues.

Based on the difference in the coefficient of determination, the determinant factor that caused the conversion of cocoa land into oil palm plantations is the cost of production, labor, total production and the price is more efficient on oil palm plantations. Judging from the coefficient of determination which is higher in oil palm plantations, meaning that the variable cost of production, labor, total production and the price of bigger influence on farmers' income. This in turn causes the income of farmers from farming oil palm higher than cocoa farming. Bhaskara research results, *et. al.* (2012) showed that the major factor in the transformation of agricultural land into oil palm plantations is higher income from oil palm plantations compared to other farming. After cultivate oil palm plantations, farmers' income increased almost two-fold (98%). Increased revenue is then shown to improve the welfare of farmers.

IV. CONCLUSION AND SUGGESTION

4.1 Conclusion

1. The analysis showed that the simultaneous production cost, labor, total production and the price have significant effect on the income of farmers both in oil palm plantations and the cocoa crop.
2. The coefficient of determination in oil palm plantations amounted to 0.733 and the cocoa crop at 0.596. This suggests that the variables more efficient in research on oil palm plantations compared to the cocoa crop.
3. Partially, in the oil palm plantation study only variable labor shows negative effect and is significantly on the income of farmers, while the cocoa tanama variable production costs, labor do not significantly affect the income of farmers.
4. The analysis result proves that the determinant factors that cause the conversion of cocoa land into oil palm plantations is the cost of production, labor, total production and the price which is more efficient in oil palm plantations.

4.2 Suggestion

1. In doing oil palm farming farmers have to pay attention to the factors that affect farmers' income so as to achieve efficiency in order to increase their income.
2. It is expected that the Government of Asahan District is expected to provide convenience facilities and infrastructure to support the cultivation of oil palm so that productivity can increase.
3. Forestry and Plantation office in Asahan should educate farmers about farming according to region.

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