http://journal.uir.ac.id/index.php/JGEET

E-ISSN : 2541-5794
P-ISSN : 2503-216X

Journal of Geoscience,
Engineering, Environment, and Technology
Vol 04 No 01 2019

RESEARCH ARTICLE

Regression Model in Transitional Geological Environment For Calculation Farming and Production of Oil Palm Dominant Factor in Indragiri Hilir Riau Province

Heriyanto [1,]*, Detri Karya[2], Tiggi Choanji[3], Asrol[1], Djaimi Bakce[1], Elinur[4]

[1] Department of Agribussines, Universitas Islam Riau, Jl. Kaharuddin Nasution No.113 Pekanbaru, 28284. Indonesia.
[2] Department of Economics, Universitas Islam Riau, Jl. Kaharuddin Nasution No.113 Pekanbaru, 28284. Indonesia.
[3] Department of Geological Engineering, Universitas Islam Riau, Jl. Kaharuddin Nasution No.113 Pekanbaru, 28284. Indonesia.
[4] Department of Agribussines, Universitas Riau, Jl. Bina Widya KM 12,5 Simbang Baru. Pekanbaru, 28293. Indonesia.

* Corresponding author : heriyanto@agr.uir.ac.id
Tel. 082388011877
Received: January 1, 2019; Accepted: February 20, 2019.
DOI: 10.25299/jgeet.2019.4.1.2600

Abstract

Palm oil commodity is plantation sub-sector commodity which can increase the income of farmers and communities, providers of raw material processing industries that create added value. Cultivated by smallholders self consists of land area, peatlands tidal, coastal peatlands and coastal lands. Differences typology of this land will contribute to the different productions. Generally, this study aimed to analyze the factors of production and farming oil palm, according to the typology of land Specifically aimed to analyze the production and cultivation of oil palm as well as the dominant factor affecting the production Kalapa smallholders' according to the typology of the land and to formulate policy implications of oil palm development patterns of the people in Indragiri Hilir in Riau province. To answer this research analyzed with descriptive statistics and build a multiple regression model with dummy variables Ordinary Least Square method (OLS). Memperlihatan research results that palm oil production and farming on land typology highest compared with tidal peat, peat coast, and coastal lands. Oil palm farming income on a non-pattern land typology best compared with other lands (peat tides, coastal peatlands, and coastal land). The dominant factor affecting the production of palm oil in Indragiri Hilir is the amount of fertilizer, labor, plant age, herbicides, and soil typology dummy land. Policy Implications development of oil palm plantation in Indragiri Hilir in order to increase production, productivity and farm income oil palm can be through the construction of roads production, provision of means of production and palm oil processing industry to shorten the distance and shorten the time of transport that TBS of oil palm plantations to the factory. Furthermore, the use of fertilizers, labor and land typology is very responsive to TBS production. Therefore, in the farming of oil palm cultivation should follow the recommended technical.

Keywords: Dominant Factor, Palm Oil, Farm, Land Typology, Geological Transitional Environment

1. Introduction

Development in the plantations directed to further accelerate the pace of production growth both from estates, Private and state plantations and nucleus estates of the people as well as plantations that are managed independently to support the construction industry, as well as improving the use and preservation of natural resources in the form of land and water , The role of such a large plantation sector to the increased use of farmers and provision of raw materials for the domestic industry as well as a source of foreign exchange (Heriyanto, 2017).

Sub particularly palm oil plantation sector has a tremendous opportunity to be a mainstay on exports as a source of foreign exchange, increase the income of farmers and communities, providers of raw material processing industries that create added value. Also, oil palm plantations are also a significant source of food and nutrition in the menu of the population, so that their scarcity in the domestic market was highly significant in the economic development and welfare of the community (Laelani, 2011).

Riau Province as one of the provinces that have the most significant oil palm plantations in Indonesia, in 2017 extensive farming area reached 2.7765 million ha with a production of 9.0714 million tons spread over twelve districts and the City (Badan Pusat Statistik, 2017). The plantations are managed in the third form of business entity are: (1) large estates managed by the State-Owned Enterprises which is managed by PT. Perkebunan Nusantara V, (2) national estate plantations managed by large private companies, and (3) community plantations managed by households in the form of individual businesses or generated independently.

Oil palm plantation in Indragiri Hilir keep fifth place in Riau Province. According to the statistic plantations of oil palm in Indragiri Hilir in 2013 covering an area of 109 017 ha with a production of 249 604 tonnes and in 2017 increased to an area of 117 820 ha with a production of 721 084 tonnes grown by 79 545 heads of families spread across the region Indragiri Hilir and supported by 12 palm oil mills (PKS). District which has the largest oil palm plantation is the District-wide Kemuning with 39.388 ha with a production of 117.243 tons of which are managed by 34 363 heads of households, while the district has an area of oil palm plantation is the smallest sub-district of Kuala Indragiri 39.00 ha area with production 57.00 ton managed by the 35 heads of households (Badan Pusat Statistik, 2016a, 2016b).

It is based overlaying (overlay) Spatial Plan map Riau Province SK. 673 dated 29 September 2014 primarily to Map Spread Plantation that the spread of plantations folk/self-help in Indragiri Hilir is in the status of forest and non-forest. In the non-forested area that is in the Tutorial Use Other, the which is an area that is free to use, while in forest areas items, namely in the area of conversion forest and Production Forest the use of the which is governed by forest legislation is so difficult, getting legality or proof of ownership of land.

Problems faced by oil palm farmers self-help in Indragiri Hilir is a matter of technical and socio-economic problems. Technically oil palm plantation development in wetland areas, especially land is wetlands including marginal land, the land synonymous with acid sulfate, has the nature of physics, chemistry and biology are worse than the mainland. Constraints on the development of wetlands, among others, land conditions are not uniform and dispersed locations, making it difficult to control pests and diseases as well as control the pattern of water. Wetlands have lower productivity and extremely low compared to the mainland (Tim IPB, 1192; Hardjoso dan Darmanto, 1996 in Noor, 2004).

Socially and economically that the cost of development and maintenance of the garden in a swamp area is more significant than in the mainland, in a swamp area is identical to the high cost of transport for the transport rely on water, high prices of inputs of production factors, the high cost of care and maintenance as well as the inexpensive price of fresh fruit Bunches of oil palm independent smallholders. The factors of production influence production of palm oil, the optimal use of production factors will provide the optimal production.

Oil palm plantations is different from other commodities, because it requires the plant close to farmers, so that the fruit produced can be immediately sent to a factory (within ± 24 hours) so that the quality of the oil does not contain a high fatty acid (Gatto et al., 2017; Harahap et al., 2017). The existence of palm oil mills in Indragiri Hilir not fully able to be reached by the farmers, the majority of factories are in the typology of land so that farmers typology of wetlands (peat tides, coastal peat and coastal), which still relies on water transportation and land takes longer and greater costs.

As for the factors of production in oil palm farming consists of: natural or land, means of production and labor. Cultivated by smallholders self consists of land area, peatlands tidal, coastal peatlands and coastal lands. The typology of this land will contribute to a different production to the unquestionable factors that influence the pattern of non-oil palm production.

Based on the review above in general, this study aims to farm and dominant factor Production On Environmental conditions Precipitation Geological Transitions in Indragiri Hilir Riau Province Specifically aimed to analyze production and farming oil palm, the dominant factors affecting the production of oil palm according to the typology of land and formulate policy implications of oil palm development patterns of the people in Indragiri Hilir Riau Province.

2. Plantation Development and Land Typology

2.1 Plantation Development Concept

The concept of agricultural development includes land resources, plasma nuftah, water, technology, and finance and human resources. Agricultural development aims to improve the income and welfare of farmers through increased agricultural production. Besides increasing agricultural production to meet the raw material in the domestic industry that continues to grow also aims to increase foreign exchange earnings from agricultural exports. As one of the steps that can be done to enhance the contribution of agriculture sector is the plantation crop production (Soekanda, 2001).

Development in agricultural covering several developmental stages, namely: (1) traditional agriculture, ie agriculture is still extensive and not maximizing current input (2) agriculture transitional, which is a step in the transition from traditional agriculture (subsistence) to agriculture modern and (3) dynamics agriculture (modern) agriculture is already doing specialization of certain plants using capital intensification, with the production of labor-saving technologies pay attention to economies of scale (economies of scale), i.e. with how to drink it cost to get certain advantages.

2.2. Land Typology Concepts

Land can be defined as an area on the surface of the earth, covering all components of the biosphere that could be considered permanent or cyclical located above and below the region, including the atmosphere, soil, parent rock, relief, hydrology, plants and animals, as well as any consequences caused by human activity in the past and now all of which affect the land use by humans in the present and future (Brinkman and Anthony, 1973; Champ and Charles Edward Date, 1976). The land could be seen as a system composed of (i) the structural components are often called land characteristics, and (ii) a functional component that is often called the land quality. Land quality is essentially a group of elements of land (multiple attributes) that determine the level of capabilities and suitability.

The use of land for agriculture, in general, can be divided into land use annuals, annual, and permanent. Land use seasonal crops mainly for seasonal crops in the rotation pattern can be with or intercropping and harvest each season with a period typically less than one year. The annual cropland use is the use of long-term crop as the results of the plant are the no longer productive economy, such as in plantation crops.

Directed permanent land use on land that is not cultivated for agriculture, such as forests, conservation areas, urban, rural and ingredients. Agricultural land according to the physical form and its ecosystem can be divided into two major groups, namely wetlands and dry land.

2.2.1 Dryland

Dryland is land that is used for agricultural business using limited water and usually expects from rainfall. This land has diverse agro-ecosystem conditions, generally sloping with conditions of land stability that are less or sensitive to erosion, especially if processing does not pay attention to the principles of soil conservation. Dryland is generally in the highlands (mountainous areas) which are characterized by undulating topography and are recipients and infiltrants of rainwater which are then channeled into a low level, either through the surface of the land (river) or through the earth's groundwater network.

Dryland farming according to physical conditions can be distinguished:

a. The fields, the fields are dry farming land that is moving. The fields can be concluded in the fields of land a farmer has not made the preservation of soil fertility. The increase in land productivity occurs naturally only, therefore if productivity returns are not going well, then generate grassland widely. Farming business system (shifting cultivation) This is one attempt waste of natural resources of land
b. Upland, the moor is a continuation of the farming system; this happens if the forest that may be opened for agricultural business activities is no longer possible. The upland farming properties are already settled.
c. Gardens, gardens are permanent farms/farms, which are planted permanently / permanently, both in kind and in mixed.
d. The yard, the yard is a piece of farming land that is around the house which is limited by a live hedge or dead fence.
e. Ponds, ponds are one of the wet business fields but are in dry environments. Ponds can be divided into two types, namely a pool of still water and running water. Farming in ponds is usually carried out continuously with a production period of around 3-6 months. Fish farming in ponds is commercial and there are also only for family purposes.

2.2.2 Wetlands

Wetlands or lowlands are areas where the soil is saturated with water, either permanent or seasonal. According to (Noor, 2004), wetlands or lower lands are a swamp, brackish, peat, or other water bodies either naturally or artificially whose water flows or is inundated are fresh, brackish, saline including marine areas which are low in water at low tide no more than six meters. Within the limits of the Ramsar convention that reservoirs, ponds and rice fields are included in the wetland group. According to (Noor, 2004) which is included in the wetland group is:

a. Swamp
   Swamp/marsh is a wetland area that is always flooded naturally because the drainage system is not good or is located lower than the surrounding area. Swampland, scientifically continuous or seasonal stagnant water either naturally or man-made, including marine areas that are less than 6 m in water during low tide, namely swamps and tidal land).
b. Peatlands
   According to the epistemology, peat is a type of material or organic material that is naturally buried in a wet or saturated state. Pedologically, peat is a form of terrestrial land whose morphology and characteristics can be influenced by organic matter (Ananto, 2017; Ananto and Pasandaran, 2007; Ardi and Teddy, 1992; Daryono, 2009; Noor, 2010; Safriyani et al., 2016; Sodik et al., 2016; Sulaeman and Abdurachman, 2002; Suriadikarta, 2009, 2012, 1969; Yuliani and Selatan, 2014; Zurich and Purba, 2014). Technically and practically, peatlands can be used as agricultural land, plantation land, mining materials, swamp forests, and industrial materials and materials. Peat is a type of wetland ecosystem that has various functions and benefits, especially hydrological functions. Naturally, the peat ecosystem is always in a state of waterlogging, has a low pH (acid), and nutrient poor.
c. Coastal land
   The coastal area is a meeting area between land and sea, towards the land covering parts of the land which are still influenced by the characteristics of the sea such as tides, sea breeze and salt intrusion, while towards the sea covers the sea which is still influenced by natural processes in land such as sedimentation and freshwater flow and areas affected by human activities on land. The above shows that there are no real boundaries so that the boundaries of coastal areas are only imaginary lines which are determined by local circumstances.

2.3. Farming concept

Farming is one of the activities of organizing or managing assets and natural way of farming. Farming is a business activity of man to cultivate the land to obtain the results of plant or animal without causing a reduction in the ability of the land in question to obtain further results. Farming can also be interpreted as an activity which organizes agricultural inputs and technologies in a business related to agriculture, in farm income, there are two elements have used that element of the income and expenditure of the farm. Acceptance is the result of multiplying the number of products in total with the unit selling price, while the expenditure or costs intended as the value of the use of production facilities and others issued in the production process (Ahmadi, 2001). Production is related to revenue and production costs, the acceptance is received by farmers because it still has to be reduced by production costs, namely the overall costs used in the production process.

Reception on agriculture is a production that is expressed in the form of money before deducting expenses for farming activities (Mosher, 2002). Next (Suratiyah, 2008), income is derived from the proceeds less the total cost, with the following formula:

$$I = TR - TC \qquad (4)$$

Where:
I = Income (Rp),
TR = Total Revenue (Rp), dan
TC = Total Cost (Rp)

Farming costs are all expenses that are used in farming. Costs of farming are divided into two, namely fixed costs and variable costs. Fixed costs are costs that magnitude does not depend on the size of the production that will be produced, while variable costs are the costs that the size is influenced by production volume. Oil palm farm income analysis is done by calculating the cost of investment in fixed costs, variable costs, production, gross price revenue, and net revenue farming. Interest expense, income tax expense, and the rent would be calculated if the cost of farming has been set. Analysis of farming using the formula (Soekartawi, 2005):

$$TR = Q \times P \qquad (5)$$

Where :
TR = Total Revenue (Rp.)
Q = The resulting total production (Kg)
P = price (Rp.)

$$\Pi = TR - VC - FC \qquad (6)$$

Where :
Π = Profit (Rp)
TR = Total Revenue (Rp)
VC = Variable Cost (Rp)
FC = Fixed Cost (Rp)

Mathematically to calculate farm income can be written as follows:

$$\pi = Y.Py - \Sigma Xi.Pxi - BTT \qquad (7)$$

Where :
π = Income (Rp)
Y = Production result (Kg)
Py = Prices of production (Rp)
Xi = factors of production (i = 1,2,3,....,n)
Pxi = The price of production factors to-i (Rp)
BTT = Total fixed costs (Rp)

2.4. Dominant Factors Affecting Productivity Palm Oil

There are several factors that affect the productivity of oil palm plantations, the climate, the shape of the area, soil conditions, planting materials, and cultivation techniques (Pusat Penelitian Kelapa Sawit, 2006). Growth and palm productivities influenced by many factors both factors that influenced natural or human-influenced factors.

Table 1. Total Sample Oil Palm Farmers Governmental According to Land and Rural Typology in Indragiri Hilir

No	Land Typology	Sub-District	Village	samples
1	Mainland Region	Kemuning	Sekara	10
			Kemuning Muda	11
			Limau Manis	9
			Tuk Jimun	2
		Keritang	Pancur	2
2	Peat region Tidal	Kemuning	Limau Manis	1
			Lubuk Besar	3
		Keritang	Sencalang	6
			Pancur	1
		Kempas	Rumbai Jaya	3
			Harapan Jaya	4
			Harapan Tani	4
			Pekan Tua	4
		Tempuling	Tempuling	2
			Karya Tunas Jaya	4
3	Coastal Peat region	Enok	Syuhada	2
		Tempuling	Sungai Salak	2
		Batang Tuaka	Tanjung Siantar	2
		Reteh	Sungai Undan	2
			Sungai Terab	2
			Sanglar	3
		Gaung	Rambaian	2
4	Coastal Areas	Anak Serka	Sungai Empat	2
		Pulau Burung	Pulau Burung	3
		Pelangiran	Tanjung Simpang Kateman	4
		Concong	Kampung Baru	2
Total Sample				92

Factors that affect the productivity can be grouped into three factors, environmental factors, factors of plant material and technical culture action factor (Risza, 2009). These three factors are interrelated and mutually influence each other. (Risza, 2009) adding that the age of the plant, a population of plants per hectare, land preservation system, pollination system, the coordinate system of harvest-haul though, security systems of production and harvest a premium system also affects the productivity of oil palm. Premium system can provide motivation for workers to increase manpower resources to achieve the expected premium target.

Therefore, by increasing the premiums granted an impact production increased due to the addition of labor. From the description that the factors that affect the productivity of oil palm are (1) land (topography), (2) the use of fertilizers (3) labor (4) The age of the plant

(5) the number of plant population per hectare (6) types of seed (7) the cropping pattern.

Fertilizer is an addition and complement to the availability of nutrients in the soil. Fertilization actions are affecting levels of productivity. Fertilization should pay attention to more important things, such as soil type, the age of the plant itself and weather factors that fertilization delivers maximum results. Fertilization which includes fertilizers, fertilizers, manner, time and frequency of fertilization. The key to successful fertilization refers to a 5 right that is timely, appropriate dose, the right type of fertilizer, the right way and the right application where the application.

The age composition of productive plants (10-15 years) compared to non-productive will lead to the fall of the productivity of oil palm. According to Risza (2009) oil palm crop productivity also depends on the age composition of the plant. The wider the age composition of juvenile plants and older plants, the lower the productivity per hectare. The age composition of this plant changes every year and therefore contributes to the achievement of productivity per hectare per year (Risza, 2009).

3. Research methods

This research was conducted in Indragiri Hilir Riau province because it has tipology types of land, peat tides, coastal peat and coastal lands. Research using multistage sampling methods Sampling area concerning the Spatial maps of the districts used to elect a representative (independent smallholders) in Indragiri Hilir can be seen in Table 1 below:

Samples taken are Subdistrict of Kemuning, Keritang, Kempas, Gaung and Tempuling represent sub-district high category. District of Reteh, Batang Tuaka and Gaung Anak Serka representing the sub-district and District Enok medium category. Kateman, Pulau Burung, and Concong represent districts with oil palm acreage lower category. according to the typology of the village and field observations set 20 sample villages in 11 districts with a total area of a sample of 92 respondents.

3.1 Data analysis

To analyze the production of palm oil according to the typology of land use descriptive statistics analysis. Furthermore, to analyze the dominant factors affecting the production of oil palm in Indragiri Hilir based typology of land use models dummy regression variable multiple Ordinary Least Square method (OLS). Mathematical function regression model is as follows:

Y = b0 + b1 X1 + b2 X2 + b3 X3 + b4 X4 + b5 X5 + b6 D1 + b7 D2+ b8 D3 + b9 D4 + u

Where:

Y = Production of Palm Oil (Kg/year)
X1= Number rod (rod / ha)
X2= Total fertilize (kg/ha)
X3= Labor (HOK/ha/year)
X4= Age Plants (Year)
X5= herbicide (Ltr/ha)
D1= Land type D1=0 Coastal Land
D1=1 In addition to Land Peisir
D2= Land type D2=0 Tidal Peatland
D2=1 Peat lands addition Tidal
D3= Land type D3=0 Mainland
D3=1 In addition to the Mainland
D4= Seed type D4=0 Superior
D4=1 Winning is not
b0= Intersep
b1...b7= regression coefficient
u= Error Term

Before the estimation of multiple regression model, the data used should be ensured free of irregularities classical assumptions for Multicollinearity, Heteroskedasticity, and autocorrelation (Gujarati, 2008; Intriligator, 1978; Pindyck and Rubinfeld, 2014; Thomas, 1997; Verbeek, 2017a, 2000). The classic test can be regarded as an econometric criterion to see if the results meet the basic classical linear estimation or not. With the fulfillment of these classical assumptions then the estimator Ordinary Least Squares (OLS) regression coefficient of linear bias is not the best estimator BLUE (Best Linear Unbiased Estimator) (Gujarati, 2011, 2008, 2003; Pindyck and Rubinfeld, 1998; Thomas, 1977; Verbeek, 2000), that phase estimate obtained correctly and effectively. One of the assumptions that must be met to satisfy BLUE properties are homoskedasticity when assumptions are not met, then the opposite is true, which means that heteroskedasticity error variance is not constant. Variance this constant error that does not lead to the conclusion reached is invalid or bias.

In order to provide valid results in econometric necessary to test some of the assumptions of normality econometrics covering detection, multicollinearity, heteroscedasticity and autocorrelation of the equation in the regression model (Gujarati, 2011, 2008, 2003; Pindyck and Rubinfeld, 1998; Thomas, 1977; Verbeek, 2000).

Detection of normality was conducted to determine whether the variable or normal distribution using the Shapiro-Wilk by the following formula (Intriligator, 1978; Pindyck and Rubinfeld, 1998; Thomas, 1977; Verbeek, 2017b, 2000):

$$W = \frac{\left[\sum_i^h a_n\left(\tilde{e}_{(V-1+1)} - \tilde{e}_{(i)}\right)\right]^2}{\sum_{i=1}^h (\tilde{e}_i - \tilde{e})^2}$$

$$V = T - k\,nj$$

H = n/2 for even numbers or the (n-1) for an odd number, where: v = degrees of freedom; T = number of observations; K = number of variables; a,i...n = parameters of the Shapiro-Wilk statistical.

Multicollinearity test is used to determine whether there is a correlation between the independent variables in the regression model. To detect mul multicollinearity tikolinieritas in a model made by looking at Variance Inflation Factor (VIF) to the equation, as follows (Gujarati, 2008, 2003; Thomas, 1977):

Variance Inflation Factor = 1/ tolerance

Multicollinearity problems become very serious if the variance inflation factor of greater than 10 while the multicollinearity problem is not considered serious if the value is smaller variance inflation factor equal to 10.

Heteroskedasticity detection is used to determine whether a variant of the confounding variable is not constant for all observations. Heteroscedasticity problem detection using the Breusch-Pagan test (Pindyck and Rubinfeld, 1998; Thomas, 1977; Verbeek, 2017b) with the following formula:

$$\sigma_i^2 = \sigma^2 h\left(z_i^1 \alpha\right)$$

Where:

h = Unknown elements, which is a function derived continuously (does not depend on i) that h (.)> 0 and h (0) = 1.

s = variance z = variables that affect terms disturbance variance. Value Statistics Bruesch-Pagan insignificant showed no problems Heteroskedasticity.

Autocorrelation used to determine whether a linear regression model there is a correlation between the member observation one other observation moved at different times. To test for autocorrelation using Durbin Watson, with the following formula (Pindyck and Rubinfeld, 1998; Thomas, 1977; Verbeek, 2017b):

$$d = \frac{\left[\sum_{t=1}^{t=n}(\hat{e}_t - \hat{e}_{t-1})\right]}{\sum_{t=1}^{t=n} \hat{e}_t^2}$$

where d = coefficient of Durbin-Watson; t = t; n = sample; e = residual.

The d value obtained from comparation of du and dl value, if 0 <d <dL or 4 - dL <d <4 means there is autocorrelation, when the value of d lies between dL <d <du or 4 - du <d <d <dL means cannot be ensured autocorrelation, when du <d <4 - du means no autocorrelation positive / negative.

4. Results and Discussions

4.1. Palm oil production and farming peoples based typology of Land

Production of palm oil is the result obtained by the farmers of the results of the processing of palm oil or farm management. The production is a determining factor for the amount of revenue that the farmers in addition to the price. The higher production of palm oil the higher revenue that the farmer, if the fixed price. therefore oil palm growers seek to obtain maximum production

Production of oil palm (non pattern) generated by each typology of different land in Indragiri Hilir. To determine the production of oil palm land typology can be seen in Fig. 1. The table shows that the average production of palm oil self-generated patterns highest to lowest in a row on a land area of 11351.7 kg / ha / year next on peat tidal amounted 9.703,2kg / ha / year, production on peatlands discuss coast of 9344.9 kg / ha / year and the typology of coastal land for coastal 7250.5 kg / ha / year.

Comparison of production can be seen in Fig. 1. Referring to Fig. 1 shows that the high production on TBS on mainland soil typology is influenced by the type of land, seed varieties, fertilizer applications, maintenance by spraying herbicides and by way of slashing.

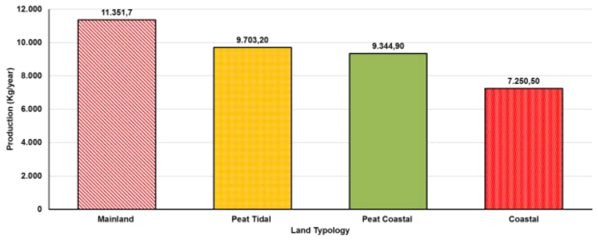

Fig. 1. Average production TBS based typology of Land

Farmers on the land typology entirely land use types of seeds kind of Topaz, Marihat, and Lonsum. While on the other land typology there that use this type of seed is not clear. On the land typology majority of farmers, land applies cropping pattern equilateral triangle, while the majority of farmers other land typologies apply to crop patterns and irregular quadrangle.

At the time of planting oil palm farmers on land typology land use fertilizer as much as 52.94%, while the peat tidal typology as much as 43.75%, coastal peat as much as 29.41% and 33.33% as much coastal land.In TM-time farmers fertilizing the soil typology of land as much as 88.24%, on peatlands tidal typology as much as 18.75%, on the typology of the coastal peatlands as much as 76.47% and the typology of coastal land wholly or 100% use of fertilizers.

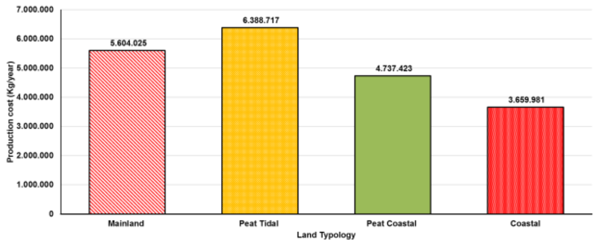

Fig. 2. Palm Oil Production Costs based typology Farming Land

Fig. 2 shows the cost of production of oil palm on peat highest tides, the next is the cost of production on the land mainland and coastal lands. The lowest production costs, namely farming coastal land peat. The high cost of farm production of palm oil on peatland tidal due to farmers on this land typology other than extraction costs also incurred costs for maintenance on the plants produce ranging from slashing weeds manually and by spraying herbicides, fertilizers, disposal and cleaning disc midrib while farmers in the typology of coastal land clearing are not spending it manually and only clear land by spraying herbicides. The high cost of labor in peatlands and coastal tidal because the distance from the house to the garden and orchard conditions, where the farther the distance from the house to the garden, the cost will increase and the higher grass or weeds growing wages.

Net income based typology Oil Palm Farming Land can be seen in Fig 3.

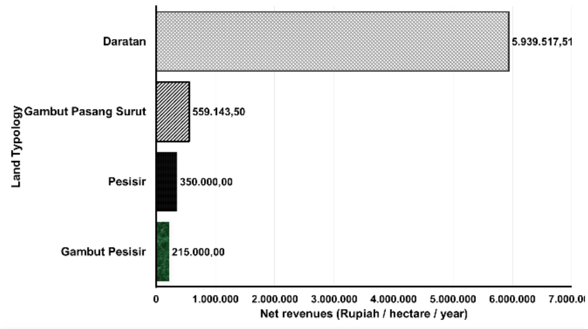

Fig. 3. Net income based typology Oil Palm Farming Land

Oil palm farmers' incomes are highest on mainland soil typology Rp. 5,939,517.51, - followed the next while on peat tidal Rp. 559,143.50, - coastal land Rp. 350.000, - and coastal peat Rp. 215000. The low income of oil palm farmers self-supporting patterns caused due to the high prices of inputs and outputs as well as the length of the inexpensive price of TBS journey from the ground to the shelter (MCC) over 12 hours which resulted in the release TBS experiencing the fruit from the stalk or quote affect the selling price and additional costs to be borne by farmers.

Oil palm growers in the typology of the coastal peatlands did not feel the losses; this was due to revenues from the sale of TBS real wages of the work performed and the cost of depreciation of plants considered as revenue instead of an expense. Net income of non-oil palm farmers in the land pattern mainland high compared to net income of oil palm on peat land tides, coastal peatlands and coastal lands. Net income of farmers on the mainland average of 10.6 times higher than net income in peatland tidal and net income in land application mainland average of 116.3 times higher than the net income of farmers in coastal land.

The high net income of farmers on the mainland than in other lands because (1) production of FFB in mainland land is higher than production in peatlands tidal peat production in coastal areas and coastal land; (2) the selling price of land TBS in the mainland is also higher than the selling price of FFB in peatland tides, production in the coastal peatlands and coastal lands. The high oil palm farmers' net income in the coastal area than the income of farmers in the coastal peatlands plug because the cost of production in the coastal area is relatively lower than the cost of production on peatlands coastal.

4.2. Dominant Factors Affecting Production of Palm Oil

The results of the model estimation palm oil production factor in this study is very good as where the look of the coefficient of determination (R^2) is 0.6809. This shows that 68.09 percent of the variable amount of production can be explained by the variable of the principal amount, the amount of fertilizer, labor, plant age, herbicides, coastal land Dummy, dummy peatland tidal land dummy land and seed type. While 31.01 percent is influenced by other variables that are not included in the model. This variation is significant at the 1 percent significance level visits of F count equal to 19.2 and probability <0.0001.

Results of statistical test for normality using the Shapiro-Wilk statistical calculations show that the results of the Shapiro-Wilk for palm oil production of 0.05. The value is significant at the 10 percent significance level. Multicollinearity test VIF value for all independent variables (number of plants, the amount of fertilizer, labor, age plants, herbicides, coastal land Dummy, dummy peatland tidal land dummy land and dummy type of seed) has a value less than 10. Test results heteroskedasticity show Breusch-pagan statistics at 30.95 zero value on the real level of 10 percent. Value Durbin-Watson (DW) on models built in the amount of 1.808 at n = 92 and k = 8 from Table distribution DW with the real level of 1 percent was obtained dL value by 1.336 and du amounted to 1,714. his indicates that the normally distributed data, multicollinearity does not occur, not happening and not happening heterokedasity autocorrelation.

Regression coefficients in the model production functions are each variable independently (number of plants, the amount of fertilizer, the amount of labor, plant age, herbicides, dummy coastal land, dummy peatland coast, dummy land mainland, and dummy types of seeds) as presented in table 1. Based on the table can be created multiple linear regression equation as follow:

Y = -3.695,122 + 31,34824 X1 + 5,9176 X2 + 28,35857 X3 + 800,2312 X4 + 138,0101 X5 -1.931,714 D1 - 572,7889D2 + 2.033,881 D3 -1.554,361D4.

Faktor dominan yang mempengaruhi produksi kelapa sawit rakyat di Kabupaten Indragiri Hilir dapat dilihat dari hasil pendugaan model faktor dominan yang mempegaruhi produksi usahatani kelapa sawitt dapat dilihat pada Tabel 2.

The dominant factor affecting oil palm production in Indragiri Hilir can be seen from the results of the estimation model of the dominant factors affect oil palm coconut farm production can be seen in Table 2.

<table>
<tr><th>Variable</th><th>Parameter Estimate</th><th>Standard Error</th><th>t Value</th><th>Pr > |t|</th><th>Variance Inflation</th></tr>
<tr><td>Intercept</td><td>-3.695,12</td><td>4.369,68</td><td>-0,85</td><td>0,4003</td><td>0</td></tr>
<tr><td>Number rod (rod / ha)</td><td>31,34824</td><td>32,61984</td><td>0,96</td><td>0,3394</td><td>1,12891</td></tr>
<tr><td>Total fertilize (kg/ha)</td><td>5,9176</td><td>2,6101</td><td>2,27</td><td>0,026*</td><td>1,15698</td></tr>
<tr><td>Labor (HOK/ha/Year)</td><td>28,35857</td><td>7,35175</td><td>3,86</td><td>0,0002*</td><td>1,16492</td></tr>
<tr><td>Age Plants (Year)</td><td>800,2312</td><td>138,6076</td><td>5,77</td><td><.0001*</td><td>2,08768</td></tr>
<tr><td>herbicide (Ltr/ha)</td><td>138,0101</td><td>82,9744</td><td>1,66</td><td>0,1001*</td><td>1,05036</td></tr>
<tr><td>Coastal Land</td><td>-1.931,71</td><td>1.326,81</td><td>-1,46</td><td>0,1493</td><td>1,17724</td></tr>
<tr><td>Tidal Peatland</td><td>-572,789</td><td>889,2131</td><td>-0,64</td><td>0,5213</td><td>1,33265</td></tr>
<tr><td>Mainland</td><td>2.033,88</td><td>1.060,90</td><td>1,92</td><td>0,0587*</td><td>1,952</td></tr>
<tr><td>Seed type</td><td>-1.554,36</td><td>1.159,24</td><td>-1,34</td><td>0,1837</td><td>1,15437</td></tr>
<tr><td colspan="6">R2 =0.6809, Fhitung =19.2, Pr > F <0.0001, DW = 1.808</td></tr>
</table>

* Significant at the 10 percent significance level

Based on the model estimation results in Table 2 that there are five variables that significantly affect people's production palm oil, the amount of fertilizer, labor, plant age, herbicides and land dummy land. Whereas the principal amount of plants, peat tidal dummy, dummy coastal land and seed type did not affect the production of oil palm in Indragiri Hilir.

Next Table 2 above shows that the variables, while the number of plants, peat tidal dummy, dummy coastal land and seed type is not significant or not significant to the variable of palm oil production. The not influential factor of the number of plants for oil palm farmers self-pattern (people) in Indragiri Hilir applies cropping pattern and the number of plants that vary between 70-300 stems / ha, whereas the ideal number of plants between 128-143 stems/ha. This means that the addition of the principal amount of palm oil plants will not significantly affect production.

Coastal land also did not significantly affect production compared with another land, this is due to that the coastal land characteristics not significantly different from other land (peat tidal and inland). Next peatland tidal no real effect on production compared with another land (coastal and inland), this is due to that as previously described that have almost the same characteristics the land is located between the coastal and inland area. It is also due to the manufacture of dikes, canals, sluice and the production are largely not well established, subsequent transport oil palm production in the district is largely the Indragiri downstream through water transport.

While these types of seedlings did not affect the production of palm oil in Indragiri Hilir caused difficult to distinguish between quality seeds and not superior. Of seeds by farmers do not have a legal, because farmers buy seed is not a direct superior of breeding seeds but from retailers in the form of sprouts and seedlings so. Viewed from the aspect of the prevailing price is still far below the price of seeds are certified. While the factors of production that have a real effect on the production are the use of fertilizers, labor, the age of the plant, pesticide and land dummy land. These five factors are outlined as follows:

a. Total fertilize

The estimation results in the can show that data on the use of fertilizers has a positive influence on the amount of palm oil production and significantly different from zero at the 10 percent significance level so H0 is rejected and Ha accepted hypothesis. This means that if the amount of one kilogram of fertilizer plus it will increase the production 5.9176 kilograms. Fertilizer production facilities that have an important role in the growth of palm oil; the study was in line with (Heriyanto et al., 2018; Mustofa et al., 2010). Growth in oil wellhead will provide palm oil production. Additionally, fertilizer is a nutrient for plants that do not all provided by nature or provided by nature is not sufficient for the plant to be absorbed for the growth and the production of palm oil. Given that oil palm farm in Indragiri Hilir majority is on marginal land.

b. Labor

The estimation results in the data may indicate that the number of workers has a positive influence on the amount of palm oil production in Indragiri Hilir and significantly different from zero at the real level of 1 percent, so H0 is rejected and Ha accepted hypothesis. This means that if the number of labor increases by one HOK then production will also increase 28.35857 kilograms.

c. Mainland

Results obtained estimates that mainland land positive effect on the production of oil palm in Indragiri Hilir and significantly different from zero at the 1 percent significance level so that H0 hypothesis is rejected and Ha accepted. This means that if farmers are farming oil palm on the land area of production is higher compared to another land (peatland tidal and coastal land) amounted to 2033.881 kg. This is due to that land area is the most suitable land for oil palm because it can affect the production of 14:56% (Dja'far and Purba, 2001).

d. Age Plants

The estimation results in the data may indicate that the age of the plant positive effect on the amount of palm oil production and significantly different from zero at the 10 percent significance level so H0 is accepted and hypothesis Ha rejected. This means that if the age of the plant increases, the amount of production will increase. Coefficient age of the plant has a positive sign that is equal to 800.2312 which means that every increase of 1 year age of the plant will increase production amounted to 800.2312 kg/ha. It can be concluded that in the case of oil palm age in Indragiri Hilir are largely still in their productive age.

4.3. Policy Implications

To achieve agricultural development policy in the plantation sector subset out in the Strategic Plan of the Directorate General of Plantation Year 2015-2019, drafted a policy which consists of a common policy and technology policy. General policy aims to synergize all the resources of the estate in order to increase the competitiveness of the plantation business, value added, productivity and quality of farm products through the active participation of the community estate, and the application of modern organization which is based on science and technology and is supported by governance good. Technical Policy estate development aimed at improving production, the productivity of oil palm plantations.

To increase the production and productivity of oil palm plantations in the governmental pattern Indragiri Hilir can be done in the following way: First: The expansion of the plant is done by planting oil palm on vacant land or new land by applying the latest technological innovations and adapted to the soil conditions. The development of oil palm plantations in Indragiri Hilir done on the typology of tidal peat, peat coast and in the coastal area. Both the use of quality seeds to increase production of palm oil and palm oil productivity of the people by the pattern of non-recommended or recommended are the type Marihat, Topaz, Socfin and Lonsum.

Increased production and productivity of oil palm patterns on non-productive plants in Indragiri Hilir be done by improving the maintenance of plants ranging from planting to produce crops to devote more manpower for maintenance by way of slashing or spraying with herbicides. Furthermore, the provision of fertilizer from the time of planting to produce crops by the recommendation or suggestion that serve as additional nutrients not provided by nature and to neutralize the soil. As well as the construction of the water system as a trio of water circulation and keep the water level and avoid the intrusion of sea water. The infrastructure development of oil palm plantations can support the cultivation, post-harvest and marketing.

4.4. Fertilize

The estimation results in the can show that the herbicide positive effect on the amount of palm oil production and significantly different from zero at the 10 percent significance level that the hypothesis H0 is accepted and Ha rejected. This means that if the herbicide increased one liter / ha, the number of production will increase. Herbicides coefficient has a positive sign that is equal to 138.0101 which means that every increase of 1 liter / ha of herbicide will increase palm oil production amounted to 138.0101 kg / ha. It can be concluded that largely oil palm in Indragiri Hilir district, there are still palm pest weeds that have an impact on the production of palm oil.

5. Conclusion

Based on the analysis and discussion of the conclusions of this study as follows:

1. Production and productivity of land, farming land of palm oil on the mainland highest compared with peat typology tidal, coastal peat and coastal lands. Oil palm farming income on a non-pattern land typology best compared with another land (peat tides, coastal peatlands and coastal area)
2. The dominant factor affecting the production of palm oil in Indragiri Hilir is the amount of fertilizer, labor, plant age, herbicides and soil typology dummy land.
3. Policy Implications development of oil palm plantation in Indragiri Hilir in order to increase production, productivity and farm income oil palm can be through the construction of roads production, provision of means of production and palm oil processing industry to shorten the distance and shorten the time of transport that TBS of oil palm plantations to the factory. Furthermore, the use of fertilizers, labor and land typology is very responsive to TBS production. Therefore, in the farming of oil palm cultivation should follow the recommended technical.

Acknowledgment

The Biggest thanks to all colleagues during the data collection and the parties involved in this research and the Universitas Islam Riau who permitted field observation, and hopefully this journal can be useful as it should.

References

Ahmadi, 2001. Ilmu Usahatani. Penebar Swadaya, Jakarta.

Alfayanti, Efendi, Z., 2013. Analisis Faktor-Faktor Yang Produksi Kelapa Sawit Rakyat di Kabupaten Mukomuko. Agrisep 13, 1–10. https://doi.org/10.4049/jimmunol.1302244.Differential

Ananto, E.E., 2017. Pengolahan Lahan Gambut di Provinsi Sumatera Selatan. Badan Penelit. dan Pengemb. Pertan. 194–2011.

Ananto, E.E., Pasandaran, E., 2007. Pengelolaan Lahan Gambut di Provinsi Sumatera Selatan, in: Membalik Kecenderungan Degradasi Sumber Daya Lahan Dan Air. pp. 194–211.

Ardi, D., Teddy, M., 1992. Jenis-jenis lahan berpotensi untuk pengembangan pertanian di lahan rawa.

Arsyad, I., Maryam, S., 2017. analisis faktor – faktor yang mempengaruhi produksi kelapa sawit pada kelompok tani sawit Mandiri. J. Ekon. Pertan. dan Pembang. 14, 75–85.

Badan Pusat Statistik, 2017. Statistik Indonesia. Badan Pusat Statistik Indonesia, Jakarta.

Badan Pusat Statistik, 2016a. Statistik Indonesia. Badan Pusat Statistik Indonesia, Jakarta.

Badan Pusat Statistik, 2016b. Riau Dalam Angka 2015. Badan Pusat Statistik Provinsi Riau, Pekanbaru.

Brinkman, R., Anthony, J.S., 1973. Land evaluation for rural purposes: summary of an expert consultation.

Champ, B.R., Charles Edward Dyte, 1976. Report of the FAO global survey of pesticide susceptibility of stored grain pests. FAO.

Daryono, H., 2009. Potensi, permasalahan dan kebijakan yang diperlukan dalam pengelolaan hutan dan lahan rawa gambut secara lestari. Anal. Kebijak. Kehutan. 6, 71–101.

Dja'far, A.S., Purba, P., 2001. Pengaruh Topografi Lahan Terhadap Produksi dan Kapasitas Tenaga Panen Kelapa Sawit. War. Pus. Penelit. Kelapa Sawit 9.

Firmansyah, M.A., 2017. Karakterisasi, Kesesuaian Lahan dan Teknologi Kelapa Sawit Rakyat di Rawa Pasang Surut Kalimantan Tengah. J. Penelit. Pertan. Terap. 14, 97–105.

Gatto, M., Wollni, M., Asnawi, R., Qaim, M., 2017. Oil Palm Boom, Contract Farming, and Rural Economic Development: Village-Level Evidence from Indonesia. World Dev. 95, 127–140. https://doi.org/10.1016/j.worlddev.2017.02.013

Gujarati, D., 2011. Econometric By Example. McGraw-Hill/Irwin, a Business Unit of The McGraw-Hill Companies.Avenue of the Americas, New York.

Gujarati, D., 2008. Basic Econometrics. McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York.

Gujarati, D., 2003. Basic Econometrics, Fourth Edition. McGraw-Hill Companies, New York.

Harahap, F., Silveira, S., Khatiwada, D., 2017. Land allocation to meet sectoral goals in Indonesia An analysis of policy coherence. Land use policy 61, 451–465. https://doi.org/10.1016/j.landusepol.2016.11.033

Heriyanto, H., 2017. Efficiency Of Rubber People Production In Kampar Regency Of Riau Province, in: Proceeding International Conference on Science Engineering and Technology (ICoSET) and International Conference on Social Economic Education and Humaniora (ICoSEEH). Universitas Islam Riau, Pekanbaru, pp. 28–35.

Heriyanto, H., Asrol, A., Karya, D., Yarda, V., 2018. Analisis Faktor Produksi Kelapa Sawit Rakyat Menurut Tipologi Lahan di Kabupaten Indragiri Hilir Provinsi Riau. J. Lahan Suboptimal 7, 9–20.

Heriyanto, H., Darus, D., 2017. Analisis Efisiensi Faktor Produksi Karet di Kabupaten Kampar Provinsi Riau. J. Din. Pertan. XXXIII, 1–10. https://doi.org/http://doi.org/10.5281/zenodo.1220898

Intriligator, M.D., 1978. Econometric Models, Techniques, & Applications. Prentice Hall, Englewod Cliffs, New Jersey.

Laelani, A., 2011. Analisis Usaha Tani Kelapa Sawit Di Desa Hampalit Kecamatan Katingan Hilir Kabupaten Katingan. Ziraa'ah 32, 225–230.
Mosher, A.T., 2002. Menggerakkan dan membangun pertanian. Yasaguna, Jakarta.
Mulyani, A., Sarwani, M., 2013. Karakteristik dan Potensi Lahan Suboptimal untuk Pengembangan Pertanian di Indonesia. J. Sumberd. Lahan 7, 47–55. https://doi.org/http://dx.doi.org/10.2018/jsdl.v7i1.6429.g5724
Mustofa, R., Dewi, N., Yusri, T., 2010. Analisis Komparasi Usahatani Kelapa Sawit Swadaya Menurut Tipologi Lahan di Kabupaten Indragiri Hilir. Indones. J. Agric. Econ. 1, 169–183.
Noor, M., 2010. Peningkatan produktivitas lahan gambut dan perluasan lapangan kerja. pp: III-1–III.20, in: Prosiding Semiloka Nasional Pemanfaatan Lahan Gambut Berkelanjutan Untuk Pengurangan Kemiskinan Dan Percepatan Pembangunan Daerah. PSP3-Dept.ITSL, IPB, Bogor.
Noor, M., 2004. Lahan Rawa, Sifat dan Pengelolaan Tanah Bermasalah Sulfat Masam. Raja Grafindo Persada, Jakarta.
Ordway, E.M., Naylor, R.L., Nkongho, R.N., Lambin, E.F., 2017. Oil palm expansion in Cameroon: Insights into sustainability opportunities and challenges in Africa. Glob. Environ. Chang. 47, 190–200. https://doi.org/10.1016/j.gloenvcha.2017.10.009
Pindyck, R.S., Rubinfeld, D.L., 2014. Microeconomics Eighth Edition. Pearson Education Limited, London New York.
Pindyck, R.S., Rubinfeld, D.L., 1998. Econometric Model and Econometric Forecasts, Fourth Edi. ed. McGraw-Hill International Editions, New York.
Pusat Penelitian Kelapa Sawit, 2006. Budidaya Kelapa Sawit. PPKS, Medan.
Regency, M., 2013. The Analysis For Comparing of The Income of Oil Palm Farm Ofiga And Plasma Groups in Gunungsari Village of Pasang Kayu District in North 1, 153–158.
Risza, S., 2009. Kelapa Sawit Upaya Peningkatan Produktivitas. Kanisius, Yogyakarta.
Safriyani, E., Holidi, Bakat, 2016. Pertumbuhan Tanaman Sawit Pada Berbagai Tipologi Lahan, in: Prosiding Seminar Nasional Lahan Suboptimal 2016. pp. 261–266.
Sodik, M., Imanudin, Bakri, 2016. Model Drainase Lahan Gambut Untuk Budidaya Kelapa. Semin. dan Lokakarya Kelapa Sawit Terpadu dan Berkelanjutan 1–19.
Soekartawi, 2005. Teori Ekonomi Produksi Dengan Pokok Bahasan Analisis Fungsi Cobb-Douglas. Raja Grafindo Persada, Jakarta.
Sulaeman, Y., Abdurachman, A., 2002. Pendekatan Pewilayahan Komoditas Pertanian Menurut Pedo-Agroklimat di Kawasan Timur Indonesia. J. Litbang Pertan. 21, 1–10. https://doi.org/10.1002/cncr.24181
Suratiyah, K., 2008. Ilmu Usahatani. Penebar Swadaya, Jakarta.
Suriadikarta, D. a, 2012. Teknologi pengelolaan lahan gambut berkelanjutan. J. Sumberd. Lahan Pertan. 6, 197–212.
Suriadikarta, D. a, 1969. Teknologi pengelolaan lahan gambut berkelanjutan. Tanah Gambut 197–212.
Suriadikarta, D.A., 2009. Pembelajaran dari kegagalan penanganan Kawasan PLG Sejuta Hektar Menuju Pengelolaan Lahan Gambut Berkelanjutan. Pengemb. Inov. Pertan. 2, 229–242.
Thomas, R.., 1997. Modern Econometrics an Introduction. Harlow, Addison Wesley.
Thomas, R.., 1977. Modern Econometrics an Introduction. Addison Wesley Longman, Harlow.
Verbeek, M., 2017a. A guide to modern econometrics, Fifth Edit. ed. John Wiley & Sons Ltd.
Verbeek, M., 2017b. A guide to modern econometrics, Fifth Edit. ed. John Wiley & Sons Ltd, Rotterdam.
Verbeek, M., 2000. A Guide to Modern Ecomometrics. John Wiley & Sons Ltd, Chichester.
Yuliani, N., Selatan, K., 2014. Teknologi Pemanfaatan Lahan Gambut Untuk Pertanian., in: Prosiding Seminar Nasional Inovasi Teknologi Pertanian Spesifik Lokasi. pp. 361–373.
Zuriah, Y., Purba, W., 2014. Analisis Konstribusi Pendapatan Usahatani Kelapa Dalam pada Perkebunan Rakyat di Tipologi Lahan Pasang Surut Provinsi Sumatera Selatan 3, 12–23.