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OUTPUT OF INDONESIAN CRUDE PALM OIL (CPO) INDUSTRY: A REVIEW - RUNNING HEAD : OUTPUT OF CPO IN INDONESIA

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ABSTRACT

Background: the crude palm oil industry in Indonesia is one of the largest palm oil producers in the world over the past decade, so some efforts are needed to increase output through increasing the effectiveness of determinants.

Purpose: to observe and analyze the determinants of the crude palm oil industry output and calculate the crude palm oil industry Total Factor Productivity (TFP).

Method: the method used was the dynamic panel regression / Generalized Moment Method (GMM) and Total Factor Productivity (TFP). Micro data wass used based on the ISIC 5 (five) digit code with the 2009-2013 time series. Secondary data was obtained from the annual Indonesian Central Bureau of Statistics report. A total of 373 companies were observed in a row for 5 (five) years, resulting in a total of 1,119 observations.

Result: the output of production fluctuated from year to year, in line with the development of raw materials and labor. While industrial capital had increased. F-statistic (Capital, Labor and Material) probability values in the GMM two step systems estimation model obtained significant results at α = 1% (p = 0,000). The three variables simultaneously caused an increase in the company's output. The value of the Total Factor Productivity (TFP) of more than 0 indicates that CPO output growth is more than the sum of input growth.

Conclusion: capital, raw materials, and total labor affect the output of the crude palm oil industry. Output had increased along with the use of production factors intensively and efficiently therefore capital, raw materials and labor need to be considered in policy formulation.

Key words: industrial output, crude palm oil, industry

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1. INTRODUCTION

As of 2020, about 70% of global rough diamond production is controlled by three Indonesia is one of the largest palm oil producers in the world and the crude palm oil industry is the highest agricultural export sector in the past decade. In addition to meeting domestic needs, crude palm oil production has continued to increase in recent years due to demand from developed countries (Ministry of Agriculture, 2012). Vegetable oil derived from oil palm fruit is used both for food and non-food consumption and crude palm oil industry (World Bank, 2016). The crude palm oil industry is a renewable source of energy and contributes to regional development due to the production of crude palm oil (Widodo, 2010). Industrial sectors such as the crude palm oil industry have high terms of trade compared to other sectors for several reasons, namely accelerating economic progress, more precise, more elastic production controls, able to absorb more labor and capitalization of capital and the ability to create added value from each input or basic ingredients processed (Sodik, 2005) (Malik, 2013). (Pasaribu, 2012).

The acceleration of productivity in the crude palm oil sector is the main focus of the vegetable oil industry. Indonesia continues to encourage the development of oil palm plantation areas. Various regions throughout Indonesia began to be formed as centers for producing crude palm oil. During the 2010-2013 period, the growth of Crude Palm Oil (CPO) production fluctuated due to the movement of palm oil prices both in the domestic market and in the world market and the growth of plantation area and trade barriers. Certain constraints such as land, environmental constraints, the use of critical land, poor agricultural practices and inadequate conservation also cause disruption in industrial processes (Ministry of Agriculture, 2016). In addition, the uneven distribution of human resources causes fewer potential to generate additional employment and revenue growth (World Bank, 2016).

The rapidly growing industry must be supplied with determinant factors. This condition needs intervention from government to maintain the growth of Crude Palm Oil (CPO) production remains high and sustainable. The implementation of the policy of increasing Crude Palm Oil (CPO) production can be achieved through programs: oil palm rejuvenation, development of technology and market-based seed industries, increased supervision and testing of seed quality, protection of oil palm germplasm, development and stabilization of farmer institutions (Ministry of Agriculture Indonesia, 2016). This policy shows that multi-aspects affect the productivity of the industry.

Many factors influence the CPO industry so that it is related to the growth of inputs that used to produce the output. This is assessed through the Total Factor Productivity (TFP). It is possible that the rapid growth of the Crude Palm Oil industry depends on the rapid growth of inputs, namely capital, labor and raw materials. When the extraordinary output growth of the Crude Palm Oil industry is driven by increased productivity, this implies that the Crude Palm Oil industry has more efficient production techniques and then output growth will be sustainable. Based on the theory of production, output is influenced by capital and labor (Mankiw, 2008). Factor level of capital and labor can encourage an increase in output so that economic activities can develop (Momongan, 2013). In addition, the smooth production process with adequate raw material inventories will produce output in accordance with the production plan (Haseeb et al., 2020; Maryaningsih, 2014).

Many factors that influence the productivity of the crude palm oil industry that need to be analyzed, so the policies that carried out is accordance with input and output factors. This study aims to analyze the determinants of crude palm oil industry output and calculate the Total Palm Factor Productivity (TFP) of the crude palm oil industry.

2. LITERATURE REVIEW

Research on manufacturing productivity and crude palm oil has been carried out by several researchers. Research results vary so that they can contribute to the academic literature. Previous research estimated the manufacturing production function in Mexican countries for 14 sub-sectors, and analyzed the factors that influence manufacturing productivity growth using GMM analysis. Production factors such as labor, capital, energy, and technology have a significant effect on manufacturing production in Mexican countries for 14 sub-sectors (Banda, 2011). Factors affecting palm oil production in the Nigerian country during 1997-2010 were reviewed by ECM analysis. Exchange rate and structural adjustment program (SAP) have a significant effect on palm oil production in the Nigerian country during 1997-2010 (Olufemi, 2015). Factors that affect palm oil's Total Factor Productivity in Indonesia during 2009-2012. Land, pesticides, fertilizers and labor have a significant contribution to total palm oil production (Umrani et al., 2019; Nuryartono, 2016). Determinants of oil palm productivity such as plant age, harvest labor, rainfall, and rainy days are analyzed by Ordinary Least Square. Plant age, harvest labor, rainfall, and rainy days significantly influence oil palm productivity (Yohansyah, Willy Monika, and Lubis, 2014: Machado et al, 2019).

2.1. Hypothesis Development

It is assumed that the variables of labor, capital, and raw materials have a significant effect on the sector output of Crude Palm Oil (CPO). This study uses the Generalized Moment Method. The framework of the Dynamic Panel Regression Analysis Model is as follows:

$$LnY_{it} = \beta_1 LnY_{t-1} + \beta_2 LnX1_{it} + \beta_3 LnX2_{it} + \beta_4 LnX3_{it} + \varepsilon_{it}$$

Description: Y as sector output of Crude Palm Oil (CPO), X1 as labor, X2 as capital, X3 as raw material, t is unit of time 2009-2013, i is ISIC 5 digit crude palm oil company and Ln is natural logarithm.

Productivity can be determined by estimating Total Factor Productivity (TFP) from Cobb Douglass's production function. The magnitude of TFP growth is assessed using equations :

$$\frac{\Delta TFP}{TFP} = \frac{\Delta Y}{Y} - \beta_2 \frac{\Delta X1}{X1} - \beta_3 \frac{\Delta X2}{X2} - \beta_4 \frac{\Delta X3}{X3}$$

Description: Y as sector output of Crude Palm Oil (CPO), X1 as labor, X2 as capital and X3 as raw material, TFP as Total Productivity Factor.

3. METHOD

This study used a dynamic panel regression approach through micro data. Dynamic panels were divided into two, namely dynamic panel data fixed effects and dynamic panel data random effects. The type of data used was secondary data from the results of the annual survey report of the Indonesian Statistics Center (Badan Pusat Statistik/ BPS). The data was selected to obtain industrial Crude Palm Oil in Indonesia based on the ISIC 5 (five) digit code. Time series consists of 5 (five) years, from 2009 to 2013, while the cross section consists of 373 companies which are observed consecutively for 5 (five) years, to produce a total of 1,119 observations.

This study examined labor, capital, and raw materials towards the output of the CPO industrial sector. The prospect of crude palm oil industry is described as a production value

produced by a company in the Crude Palm Oil industry in Indonesia. Capital is the total capital consisting of land and buildings, other machinery and vehicles used by companies to carry out industrial production of Crude Palm Oil in Indonesia. Raw materials or materials are the value of raw materials used during the industrial production process of Crude Palm Oil. Raw materials consist of two types, namely domestic raw materials and imported raw materials. Variable output of CPO, capital and raw materials based on constant prices in rupiah units. In addition, labor (L) is described as the number of Crude Palm Oil industrial workers in Indonesia from 2009 to 2013 in person. Variable of labors is transformed into natural logarithms.

The data processing stage in this study was inputting industrial data from Crude Palm Oil in Indonesia based on ISIC 5 (five) digits code obtained from the Central Statistics Agency to Microsoft Excel then processed with STATA 13 software for dynamic panel regression methods and calculating TFP. The next step interprets and analyzes the results processed dynamic and TFP regression from STATA 13. Industrial variable output / prospects Crude Palm Oil, labor, raw materials, and capital are transformed into natural logarithms.

This study used the Generalized Moment Method (GMM). There are two estimation procedures used in GMM, namely first-difference GMM and GMM system. The validity of the additional instruments can be known by using the Citargan / Hansen test for over-identifying restrictions and the Arellano-Bond test for autocorrelation. Probability test with chi-square. The following test was the t test which is examined through t count or p-value. The level of significance is 1%, 5% or 10%. A total of 3 different approaches were carried out for TFP analysis to estimate output growth, namely the indexing approach or Growth Accounting Approach (GAA), the estimation of production functions with the econometric approach, and the efficiency measurement approach. TFP is known from the Cobb Douglass production function.

4. RESULT

Products of Crude Palm Oil (CPO) are the main ingredient of the alternative energies used as substitute for petroleum, namely biodiesel energy. The development of Indonesia's total output of CPO during 2009-2013 was fluctuated. The total CPO output in 2009 was 2018.7 million rupiah and contracted in 2010 to 1853.6 million rupiah. In 2011 the total CPO output expanded by 3008.0 million rupiahs, but in 2012 the total CPO output decreased by 2917.6 million rupiahs, and again increased by 3068.5 million rupiah. The graph of the development of the total output of Crude Palm Oil (CPO) is presented in Figure 1.

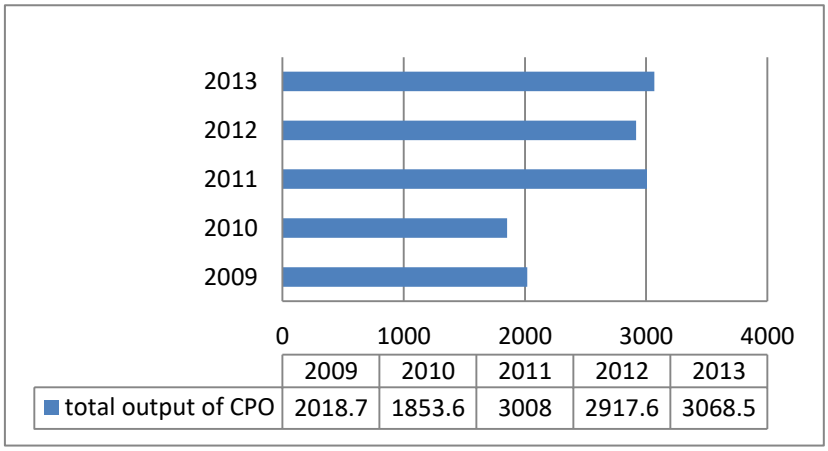
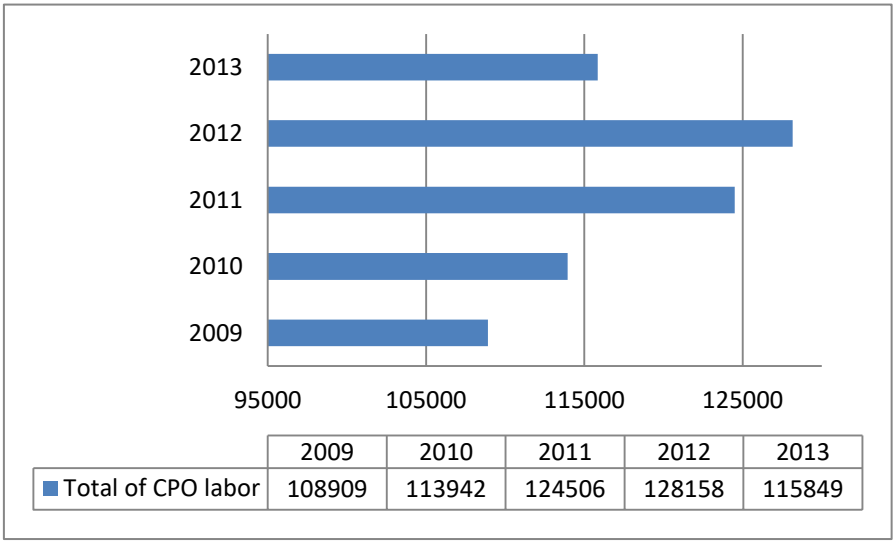


Figure 1 Total Output of Crude Palm Oil (CPO) Indonesia Based on ISIC 5 Digit Code for 2009-2013 (in million rupiah)

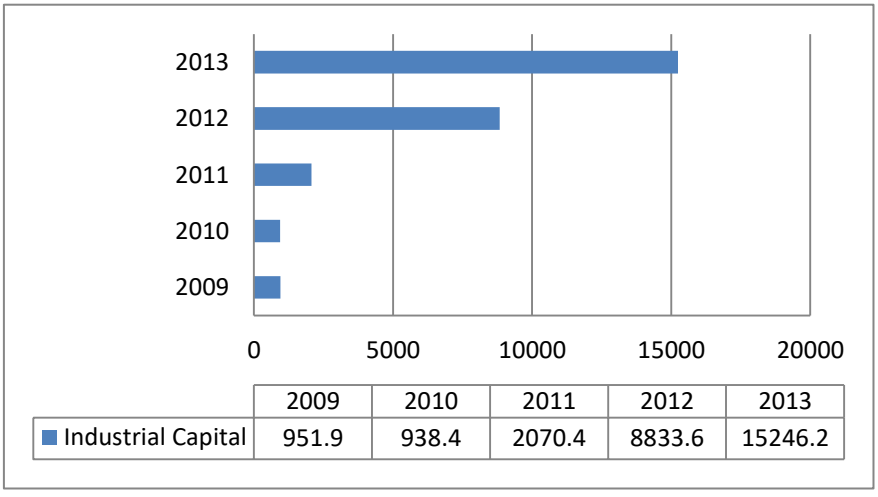
The development of the number of workers in the CPO sector during 2009-2013 had fluctuated. The highest number of workers in the CPO industry to carry out the production process was in the period of 2012, which is 128,158 people. This condition shows that in 2012 the Indonesian CPO industry needed a lot of labor. The absorption of the CPO industrial labor had increased from 2009-2012. Indonesia's CPO output demand had increased. The increase in CPO industrial labor absorption did not last long, because in 2013 the number of employment in CPO industries decreased. The graph of changes in the number of workers is presented in Figure 2.



	2009	2010	2011	2012	2013
Total of CPO labor	108909	113942	124506	128158	115849

Figure 2 Total Indonesian Crude Palm Oil (CPO) Labor Based on 2009-2013 ISIC 5 Digit Code (in soul)

Capital is one of the very important factors of production for every industry. The capital development of the CPO industry in Indonesia is measured based on the costs incurred to finance processing parts such as the cost of purchasing boiler chemicals, spare parts and other materials, fuel and lubricant costs, employee processing fees, employee food and beverage costs and costs. other costs. In 2009-2013 the capital of the CPO industry continued to increase. In 2009 it was 951.9 million rupiahs to 15,246, 2 million rupiahs in 2013. Development of industrial capital are presented in figure 3.



	2009	2010	2011	2012	2013
Industrial Capital	951.9	938.4	2070.4	8833.6	15246.2

Figure 3 Indonesian Crude Palm Oil (CPO) Industrial Capital Based on ISIC 5Digit Code 2009-2013 (in million rupiah)

Raw material is the basis used for the beginning of the production process. The production process is inseparable from the availability of raw materials. The development of CPO industry raw materials has fluctuated. The amount of raw materials in 2009 amounted to 1346.1 million rupiahs, but decreased in 2010, which amounted to 1119.9 million rupiah. In 2011 the number of raw materials increased by 1985.4 million rupiah and became the highest number of raw materials during 2009-2013. In 2012 the number of raw materials declined to 1871.3, while in 2013 the number of raw materials again increased to 1961.3 million rupiah. The graph of the development of raw materials is presented in Figure 4.

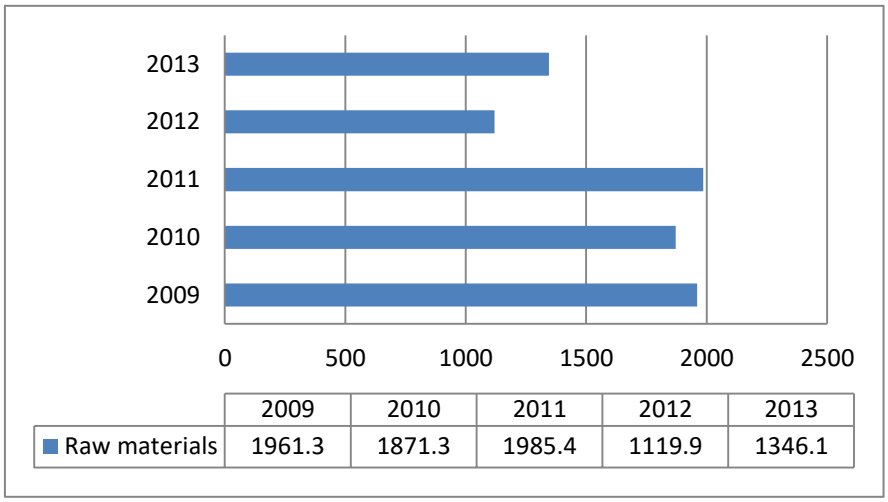


Figure 4 Indonesian Crude Palm Oil (CPO) Industrial Raw Materials Based on ISIC 5 Digit Code for 2009-2013 (in million rupiah)

Based on the results of panel data processing using the GMM system that the AR test (1) has a p-value of 0,000 and is significant at level 1%. Then in AR (1) it is received and shows that there is autocorrelation in the first order. The AR test (2) shows a p-value of 0.232 which is not significant at level 1%, 5%, and 10%. Then in AR (2) there is no second-order autocorrelation. In the model using sys-GMM this shows the p-value of the Sargan and Hansen test test0.265 and 0.512. This shows that in the Sargan and hansen tests the model is considered exogenous and the model is considered valid. From the results of tests that have been carried out using sys-GMM is more recommended than diff-GMM. Sys-GMM provides better test results because it produces more valid instruments on L. ln_Y, AR (1), AR (2), and Sargan and Hansen test. Thus the test used in this study is sys-GMM.

In the sys-GMM test it can be seen that first, the lag of the endogenous variable, namely L. ln_Y is significant at the 5% level with p-value0,001. These results indicate that the year t analysis is still influenced by year t-1 so that this model has a dynamic relationship. Both Capital based on the above results have a p-value of 0.025 which is significant at the level of 1% with a coefficient of 0.11. These results indicate that there is a significant effect on L. ln_Y industries. The positive value of the capital coefficient indicates that an increase in capital of 1 unit will affect L. Ln_Y by 0.11. The three labor based on the above results have a p-value of 0,000 which is significant at level 1% with a coefficient of 0.98. These results indicate that there is a significant effect on L. ln_Y industry (Ma & Ma, 2020). The positive value of the labor coefficient indicates that an increase in Labor of 1 unit will affect L. ln_Y of 0.98. The four materials based on the results above have a p-value of 0,000 which is significant at level 1% with the value of efficiency 0.73. These results indicate that the industry has a significant effect on L. Ln_Y. The positive value of the material coefficient indicates that an increase in material of 1 unit will affect L. ln_Y of 0.73.

The results of the F test indicate that the F-statistic probability value in the GMM two step system estimation is 0,000. This number indicates that the value of probability F is less than the significance level α = 1%, so H0 is rejected. This means that all independent variables (Capital, Labor and Material) simultaneously significantly influence the CPO industrial output.

The results of hypothesis testing in this study consist of 3 hypotheses. The first hypothesis is with an increase in the amount of capital in production factor will increase the output of the company. The addition of the amount of capital will affect the increase in company output, this hypothesis is proven by positive and significant coefficients of capital variables.

The second hypothesis is the use of intermediate inputs in the process of production factors to produce output maximally and achieve the maximum scale of production. This hypothesis is proven by the positive and significant coefficients of the variable raw material. With the addition of the number of raw materials, it will affect the increasing output of the company.

The third hypothesis is with increasing labor in production factors will increase the output of the company. The addition of labor force has an effect on increasing the company's output, this hypothesis is proven by the positive and significant coefficients of the labor variable.

In addition, to analyze the factors that influence CPO output, Total Factor Productivity is used to determine technological change that occurs. Productivity measurement (TFP) using the growth accounting method approach, makes it possible to decompose the source of output growth. The formula formula for estimating Total Factor Productivity (TFP) is used:

$$\frac{\Delta TFP}{TFP} = \frac{\Delta Y}{Y} - \beta_2 \frac{\Delta X1}{X1} - \beta_3 \frac{\Delta X2}{X2} - \beta_4 \frac{\Delta X3}{X3}$$

The formula described includes Y as output sector Crude Palm Oil (CPO), X1 as labor, X2 as capital, X3 as raw material and TFP as Total Productivity Factor. The results of the regression models at the beginning have been obtained, namely:

lnY = -2,299627 + 0,5731353lnX1 + 0,0252109lnX2 + 0,7997396lnX3

Then the equation can be written as follows:

$$\frac{\Delta TFP}{TFP} = \frac{\Delta Y}{y} - 0{,}5731353 \frac{\Delta X1}{X1} - 0{,}0252109 \frac{\Delta X2}{X2} - 0{,}7997396 \frac{\Delta X3}{X3}$$

The initial data from each independent variables was substituted into the equation, so the calculation results can be seen in Table 1. In 2010-2013, the TFP value is more than 0 so it can be stated that CPO output growth is more than the weighted sum of input growth. Based on the results of the TFP calculation that the period which has the highest productivity level in 2013 was 0.027163, while the results of the productivity level in the lowest period in 2012 were 0.000547. In 2010-2011 the productivity level was 0.023125 and 0.015234.

Table 1 TFP CPO Industry According to ISIC 5 Digits for 2010-2013

Period	$\Delta Y/Y$	$\beta 2 * \Delta L/L$	$\beta 3 * \Delta K/K$	$\beta 4 * \Delta M/M$	TFP
2010	-0.089065	0.0588448	-0.000364937	-0.17067006	0.023125
2011	0.383764	0.0060952	0.013784454	0.348650324	0.015234
2012	-0.030984	-0.002029	0.019302149	-0.04880415	0.000547
2013	0.049164	-0.025325	0.010603694	0.036723136	0.027163

5. DISCUSSION

Indonesia's CPO output has fluctuated due to palm oil price movements both in the domestic market and in the world market and the growth of plantation area and trade barriers (BI, 2012). One aspect that affects CPO output is labor. The labor coefficient (L) is 0.98. It means the increase in labor is 1 percent, then the CPO output will increase by 0.98 percent. The results of this study were in accordance with the production function theory. Labor refers to the human abilities that can be donated to enable the production of goods and services. Labor plays an important role in each of the activities of the Indonesian CPO industry even though the role and function of the workforce has been largely replaced by industrial machinery. Production function theory shows that labor and output variable have a positive correlation (Sulistiana, 2010)

Industry that is labor intensive, the use of labor that is suitable for quality through formal and non-formal education and that amount can increase production (Yohansyah, Willy Monika, and Lubis, 2014). Focusing on increase the human resources's quality, namely the spread of literacy and education, makes a simple contribution but sustainable to the growth of labor productivity (Fuglie, 2010). Labor is a vital part of the global palm oil supply chain. About 3 million small oil palm workers around the world produce around 4 million tons of palm oil, around 9% of total global production. In Indonesia and Malaysia, countries that produce about 85% of the world's oil palm, the number of laborers is recorded at up to 40% of the area planted. However, various factors, such as limited awareness of new technologies and best practices and a lack of financial resources, place considerable losses compared to other large-scale producers (Nagiah and Azmi, 2012).

The Indonesian government must pay attention to the aspects of protection and improvement of the welfare of workers / workers in the palm oil processing industry throughout Indonesia (Yohansyah, Willy Monika, and Lubis, 2014). The main problem in the plantation sector is the undocumented work relationship, and there is no mechanism for wage increases, and many workers are known not to be registered as health insurance participants (Central Statistics Agency, 2008).

In addition to labor, capital contributes to the output of the crude palm oil (CPO) industry. Capital increase is 1 percent, then Y (output) increases by 0.11 percent according to the assumption of ceteris paribus. This is because capital includes money that available in the company to buy machinery and other production factors. Capital as a set of facilities used by workers (Mankiw, 2008). A capital can be said as productive capital, if capital has the ability as a supporting factor in producing production goods, and capital is able to produce a price value (price) that is greater than the value of capital itself (Bowerk, 2002). The availability of sufficient capital greatly determines the success of the business and is one of the conditions for daily CPO industry activities to be carried out (Nuryartono, 2016).

Problems in capital factors of the crude palm oil sector include land issues, infrastructure for plantation production, both physical and functional, scientific and social networks. The expansion of the palm oil sector is stimulated by world market dynamics. Finally, the mobilization of state capital and capacity regulations acts as a lever to break the traditional dependency pathway so as to increase the export of state commodities. The CPO industry comes from investment. Investors who are not much interested in investing in the CPO industry because of problems in the electricity and road infrastructure sectors that affect business activities. Electricity supply for low business and poor road conditions results in high operational costs and lower capital returns, so investors who are capital donors do not want to invest in the CPO industry sector (Sulistiana, 2010).

Raw materials are materials that form a whole section (Mulyadi S, 2003). In this study, the increase in raw materials is 1 percent, then Y (output) increases by 0.73 percent according to the assumption of ceteris paribus. The company's policy on raw material inventory is very important to support the production process in a company, especially in manufacturing companies, where errors in determining the amount of inventory can hamper the production process, this of course also results in lowering the company's profits (Nuryartono, 2016).

The production function theory shows that raw materials and output have a positive correlation (Sulistiana, 2010). Good professionalism and management in organizing existing raw materials is a must to achieve this (Maryaningsih, 2014). Raw materials are estimated by estimates of the fluctuations in the prices of raw materials, government regulations regarding the availability of materials, and the rate of speed of the material being damaged or declining. The raw material for fresh fruit bunches is one of the important factors in the activities of the palm oil industry. Palm oil processing plants often experience shortages of raw materials in meeting production capacity to maximize company profits so that activities to optimize the procurement of fresh fruit bunches are needed to achieve optimal profits (Banda, 2011).

In addition, Total Factor Productivity (TFP) is important in the management of the crude palm oil industry. If the TFP value is positive, it means that the increase in input causes an increase in output, according to the results of this study. So, it means that the contribution of technology is detected, the production process also takes place efficiently. Total productivity factors are considered as a very comprehensive measure of productivity and efficiency (Lakitan, 2009). The development of TFP in the CPO industry in Indonesia decreased during 2010-2011. Indonesian economy. Different conditions in 2012-2013. The TFP of the CPO industry is increasing. This condition shows that the company increases its productivity through the efficiency of the production process.

There is a positive relationship between total productivity factors and human capital stock. It means the higher human capital stock in a company will encourage the process of increasing productivity growth (Banda, 2011). One of the other components that can increase the total productivity factor of technological mastery, in a production process even though it is not always absolutely necessary but cannot be denied, can help increase productivity (Lipsey, 2004). Rapid oil expansion currently oil palm plantations in Indonesia are largely driven by rising demand oil for food and industrial processes in Asia and for lower demand levels and speculation for biofuels. This trend could enable companies to increase production and profitability without the need for additional land, but might also provide incentives to build new plantations and open forests (Gaskell and Sunderland-groves, 2009).

Despite increased productivity, the assessment of the sustainability of palm oil-based bioenergy has become a critical problem because its positive nature has an impact on saving foreign exchange in Indonesia. The results of the sustainability assessment indicate that Indonesia's sustainability status from palm oil-based bioenergy is still low (less sustainable). The level of sustainability of each aspect, namely the index score of the economic aspects is not sustainable, the social aspects are not sustainable and the environmental aspects are moderate. This index is expected to be useful as a basis for determining the best strategy for Indonesia in the future of bioenergy development (Restuati et al., 2020; Papilo, Hambali and Sitanggang, 2018).

Plantation productivity is highly dependent on the supply of resources (eg, water, fertilizer and sunlight) and on the right plantation management system. Various practical plantation management with different resource supply constraints are considered. Expanding the use of optimal practices in plantations can help meet increasing global demand without the need to convert native ecosystems to new plantations (Foong et al., 2019). Palm oil is the most widely traded vegetable oil globally, with demand projected to increase substantially in the future.

Government and voluntary market interventions can help encourage the expansion of oil palm plantations in ways that protect ecosystems that are rich in biodiversity.

Efforts to continue agricultural development and economic growth are needed to improve the quality of life and basic needs of a growing population while at the same time protecting the environment by reducing pressure on carrying capacity (Syuaib, 2016). Concerns about deforestation and forest fires that caused haze caused by industrial expansion, oil palm oil sector continues to be an important source of income, foreign exchange and rural jobs for Indonesia, and Indonesia is pursuing a broad biofuel policy to further trigger expansion of the sector (Varkkey, 2012). In addition there are threats that encourage massive destruction of peatlands and rainforests and increase greenhouse gas emissions (Ma & Ma, 2020; Noor et al., 2017).

The government is expected to carry out routine supervision of the government against working practices on oil palm plantations, make special regulations related to the labor regulation system, increase the intellectual capital aspect and programs on the raw materials used. The implementation of policies to increase Crude Palm Oil (CPO) raw materials can be pursued through programs: oil palm rejuvenation, development of technology and market-based seed industries, increased supervision and testing of seed quality, protection of oil palm germplasm, development and stabilization of farmer institutions (Banda, 2011). In addition, control of environmental conditions also needs to be considered for possible future simulation projections (Otieno et al., 2016).

6. CONCLUSION

Output has increased along with the use of production factors intensively and efficiently. Capital, raw materials, and total labor affect the output of the crude palm oil industry. Policies related to capital, raw materials and labor will provide an encouragement to increase crude palm oil industry output.

7. IMPLICATION

The government routinely supervises the work practices on oil palm plantations, makes regulations specifically concerning the wage system, working hours and overtime, work systems, equipment and work protection, periodic work status and wages and freedom of association, and the existence of social security for all laborer. The Indonesian government should be able to direct companies to increase the intellectual capital aspect because this aspect affects the profitability of companies, and companies must begin to measure the efficiency of the use of intellectual capital. This allows companies to realize how they have managed and used intellectual capital because basically good management will contribute to the profitability of the company. The application of the program is needed for oil palm rejuvenation, development of technology and market-based seed industries, increased supervision and testing of seed quality, protection of oil palm germplasm, development and strengthening of farmer institutions.

REFERENCES

[1] Badan Pusat Statistik. (2008) Berita Resmi Statistik 2008. jakarta.

[2] Banda, H. S. (2011) ‘Multifactor Productivity And Its Determinants: An Empirical Analysis For Mexican Manufacturing’, Journal of Productivity, 2(36), pp. 293–308.

[3] Bowerk, A. (2002) ‘Dynamics in the Determinants of Capital Structure in the UK’, University of Glasgow. Working paper, p. pp: 1-10.

[4] Foong, S. Z. Y. et al. (2019) 'Input – output optimisation model for sustainable oil palm plantation development', Sustainable Production and Consumption. Elsevier B.V., 17, pp. 31–46. doi: 10.1016/j.spc.2018.08.010.

[5] Fuglie, K. O. (2010) 'Sources of growth in Indonesian agriculture', (September 2009), pp. 225–240. doi: 10.1007/s11123-009-0150-x.

[6] Gaskell, J. and Sunderland-groves, J. (2009) The impacts and opportunities of oil palm in Southeast Asia What do we know and what do we need to know ?

[7] Kementerian Pertanian Indonesia (2016) Statistik Perkebunan Kelapa Sawit 2016. Jakarta, Indonesia.

[8] Kementerian Pertanian Indonesia. (2012) Statistik Perkebunan Kelapa Sawit 2012. Jakarta, Indonesia.

[9] Lakitan, B. (2009) 'Kontribusi Teknologi dalam Pencapaian Ketahanan Pangan', Jurnal Agro Ekonomi, 22(1), pp. 38–48.

[10] Lipsey, L. and C. (2004) 'Productivity, Technology and Economic Growth: What is the Relationship', Journal of Economic Surveys, 17(3), pp. 146–167.

[11] Malik, Z. (2013) Ekonomika Industri Indonesia Menuju Negara Industri Baru 2030. Edited by P. Andi. Yogyakarta.

[12] Mankiw, N. G. (2008) Makroekonomi. 6th edn. Edited by I. Liza, Fitria Nurmawan. Jakarta, Indonesia: Erlangga.

[13] Maryaningsih, N. (2014) 'Pengaruh Infrastruktur terhadap Pertumbuhan Ekonomi', Buletin Ekonomi Moneter dan Perbankan., 17(1), pp. 1–97.

[14] Momongan, J. E. (2013) 'Investasi PMA Dan PMDN Pengaruhnya Terhadap Perkembangan PDRB Dan Penyerapan Tenaga Kerja Serta Penaggulangan Kemiskinan Di Sulawesi Utara.', Jurnal EMBA, 1(3), pp. 530–539.

[15] Mulyadi S (2003) 'Analisis Sumber Daya Manusia dalam Perspektif Pembangunan', Jurnal Ekonomi Pembangunan Indonesia, 3(4), pp. 66–75.

[16] Nagiah, C. and Azmi, R. (2012) 'Journal of Oil Palm & The Environment An official publication of the Malaysian Palm Oil Council (MPOC) A Review of Smallholder Oil Palm Production : Challenges and Opportunities for Enhancing Sustainability - A Malaysian Claudine Nagiah and Reza Azmi', (September), pp. 114–120. doi: 10.5366/jope.2012.12.

[17] Restuati, M., Pulungan, A. S. S., Pratiwi, N., & Sirait, T. P. (2020). Evaluation of the Effect of Premna Pubescence Extract against DMBA-Induced Breast Cancer in Female. Systematic Reviews in Pharmacy, 11(3), 399-404.

[18] Noor, F. M. M. et al. (2017) 'Beyond sustainability criteria and principles in palm oil production', 22(2).

[19] Nuryartono, N. (2016) 'Total Factor Productivity Analysis of Oil Palm Production in Indonesia.', International Journal of Economics and Financial., 6(4), p. 1570–1577.

[20] Olufemi, A. (2015) 'Analyses of the Determinants of Palm Oil Production in Nigeria', Greener Journal of Agricultural Sciences, 5(4), pp. 110–117.

[21] Otieno, N. E. et al. (2016) 'Palm Oil Production in Malaysia : An Analytical Systems Model for Balancing Economic Prosperity, Forest Conservation and Social Welfare', (February), pp. 55–69.

[22] Papilo, P., Hambali, E. and Sitanggang, I. S. (2018) 'Sustainability index assessment of palm oil-based bioenergy in Indonesia', Journal of Cleaner Production. Elsevier Ltd, 196, pp. 808–820. doi: 10.1016/j.jclepro.2018.06.072.

[23] Ma, D., & Ma, Y. (2020). Correlation between Psychological Empowerment and Acceptance Behaviour of Audience in Legal Education. Revista Argentina de Clínica Psicológica, 29(2), 166-172.

[24] Pasaribu, R. (2012) 'Industri Dan Industrialisasi Indonesia.', Jurnal Ekonomi Pembangunan Indonesia, 2(3), pp. 307–325.

[25] Umrani, W. A., Afsar, B., Khan, M., & Ahmed, U. (2019). Addressing the issue of job performance among hospital physicians in Pakistan: The role of job security, organizational support, and job satisfaction. Journal of Applied Biobehavioral Research, 24(3), e12169.

[26] Sodik, H. (2005) 'Lokasi Industri dan Fenomena Aglomerasi di Indonesia: Perspektif Ekonomi Regional.', Working Paper LPEB Faculty of Economics, Mulawarman University.

[27] Sulistiana, R. (2010) 'Analisis Produksi Minyak Kelapa Sawit Indonesia', Buletin Ilmiah Litbang Perdagangan., 7(2), p. 129–149.

[28] Syuaib, M. F. (2016) 'Sustainable agriculture in Indonesia : Facts and challenges to keep growing in harmony with environment', 18(2), pp. 170–184.

[29] Varkkey, H. (2012) 'The Growth and Prospects for the Oil Palm Plantation Industry in Indonesia', pp. 1–13.

[30] Haseeb, M., Haouas, I., Nasih, M., Mihardjo, L. W., & Jermsittiparsert, K. (2020). Asymmetric impact of textile and clothing manufacturing on carbon-dioxide emissions: Evidence from top Asian economies. Energy, 196, 117094.

[31] Widodo, K. (2010) 'Sistem Supply Chain Crude-Palm-Oil Indonesia dengan Mempertimbangkan Aspek Economical Revenue, Social Welfare dan Environment', Jurnal Teknik Industri., 12(1), pp. 47–54.

[32] World Bank (2016) 'World Development Indicator and Global Development Finance'. Available at: (www.worldbank.org diakses tanggal 13 Januari 2017).

[33] Yohansyah, Willy Monika, danLubis, I. (2014) 'Analisis Produktivitas Kelapa Sawit di PT. Perdana Inti Sawit Perkasa I, Riau., Jurnal Pertanian., 16(1), pp. 53–60.

[34] Machado, A. D. B., Souza, M. J., & Catapan, A. H. (2019). Systematic Review: Intersection between Communication and Knowledge. *Journal of Information Systems Engineering & Management*, *4*(1).