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THE LINKAGES AND IMPACT OF PLANTATION-BASED SECTORS ON ECONOMY AND POVERTY IN JAMBI PROVINCE, INDONESIA: MIYAZAWA'S INPUT-OUTPUT MODEL

Purpose. *This study aims to analyze the linkages and impacts of the plantation-based sector on the economy and poverty.*

Methodology / approach. *The method used in this study is the Miyazawa Input Output (I-O) analysis. Foster-Greer-Thorbecke Poverty Index Analysis is used to view poverty as the impact of changes in output in the economic sector and comparative analysis using the Wilcoxon test.*

Results. *The leading sectors in the plantation-based sectors of Jambi Province are the food and beverage industry sector (CPO processing industry) and the rubber industry sector, materials from rubber. The percentage of poverty (P0) in the plantation sub-sector is lower than the other agricultural sub-sectors, but the poverty depth index (P1) and poverty severity index (P2) in the plantation sub-sector are greater than the other agricultural sub-sectors. Another result is the addition of final requests, impact on output, value added, labor and income in the plantation-based sectors and other economic sectors and income of poor households. The downstream policy of the rubber industry, oil palm replanting and down streaming of the oil palm industry can be done because it has a similar impact on output and additional income for poor households is higher than replanting rubber*

Originality / scientific novelty. *Research using the I-O Miyazawa for Jambi province updated 2015 with the 2010 base year and the System of National Account (SNA 2008). This study recommends an improvement or suggestion in making policy priorities that must be done in the plantation-based sectors, especially in alleviating poverty or increasing community welfare and increasing better quality economic growth.*

Practical value / implications. *The policy implication that can be done based on the priority scale that has the greatest impact on the output of all economic sectors is by making a policy of down streaming the rubber industry. Likewise with the policy implications that have the greatest impact on the economic impact of all economic sectors and income of poor households is the down streaming of the rubber industry.*

Key words: *Economics, Plantation, Miyazawa's Input-Output Model, Poverty.*

Introduction and review of literature. Various issues in agricultural development are related to a decrease in the quality of life, limited availability of facilities and infrastructure, the inability of financial institutions to provide business opportunities, limited employment, and inadequate income. These issues have a relative and absolute impact on poverty. In fact, it is often found linkages of various issues that add to the complexity of the problems faced.

The linkage between agriculture and those aspects is basically inseparable from the multifunctionality of the agricultural sector (in a broad sense). The

multifunctionality of the agricultural sector has been recognized and adopted in developed countries, especially the European Union, the United States, and Japan. Multifunctionality of agriculture has been used in these countries as the basis/argument for public policy (large-scale agricultural subsidies) and international trade policy (strict protection). The logic behind the agricultural policies of developed countries, which protect and provide massive subsidies, is the positive externality/public goods produced by the agricultural sector [1–7].

Referring to the multifunctionality of the agricultural sector, studies on agricultural development that are related to various aspects, particularly the economy and poverty, are still important studies to develop models to boost economic growth and alleviate poverty. Anriquez and Stamoulis [8] examined the relationship between agriculture, rural development and poverty. The results of their study found that agriculture is the starting point for rural development, particularly in areas with low levels of development. Yudhoyono [9] in his study discovered that a policy mix between government spending on agricultural development and wage policies is required to decrease poverty, particularly in rural areas. Based on the results of several studies that have been carried out [10–12], it shows the need to develop agricultural sectors to reduce high poverty rates. The development of the agricultural sector can be done in particular through the development of agricultural technology, the supply of materials and means of production, and the provision of markets for agricultural products. Furthermore, it is expected that the agricultural sector will become a more productive sector and be able to improve the welfare of farmers.

In Indonesia, agricultural development has contributed greatly in encouraging both short and long-term economic growth. There are various sub-sectors in the agricultural sector, and one of them is the plantation subsector. The plantation subsector is a mainstay in Indonesia's foreign trade balance due to its contribution to the formation of foreign exchange. Some plantation commodities can only grow in the tropics so that market demand can only be met by several countries. Some of Indonesia's plantation commodities that have comparative advantages like this are coffee, cocoa, rubber and oil palm. With comparative advantage, several plantation commodities have a large potential to contribute to foreign exchange and should be developed [13].

As one of the provinces in Indonesia, the agricultural sector also plays a significant part in the economy of Jambi Province, particularly the plantation subsector. Besides contributing 17.02 percent of the Gross Regional Domestic Product (GRDP), the plantation sector and the plantation processing industry also contributed around 24 percent to the exports of Jambi Province, mainly from the palm oil and rubber processing industries. Labor absorption in the plantation sector in Jambi Province is also quite large, around 42 percent of the total workforce, when compared to other business fields [14].

The contribution of plantations in the Jambi economy has fluctuated in line with the movement of plantation commodity prices on the international market. This is because market demand for plantation-based industries is still limited to upstream

industries, such as Crude Palm Oil (CPO) and bokar (people's rubber processed materials), which have low added value. As a result, productivity remains very low and vulnerable to world or international price fluctuations, as well as hampering the level of welfare of plantation farmers. This is illustrated by the Jambi Province Subsector Farmers' Exchange Rate which is still relatively low, below 100. BPS – Statistics of Jambi Province [15] states that Farmer Exchange Rates (FER) are obtained from a comparison of the price index received by farmers against the price index paid by farmers (in percentage), is one indicator to see the development of the ability/purchasing power of farmers in rural areas. The FER number also shows the term of trade of agricultural products with goods and services consumed and for production costs. The higher the FER, the stronger the ability / purchasing power of farmers and the lower the value of FER, the lower the ability / purchasing power of farmers.

Low income of plantation farmers will reduce the level of welfare, exacerbate the level of poverty and deepen the gap of inequality that can ultimately cause social conflict that is very detrimental to regional development. According to the BPS-Statistics of Jambi Province, in March 2015, the number of poor people in Jambi Province was 300.71 thousand people or around 8.86 percent. Rural areas have the highest number of poor people, which amounts to 181.17 thousand people, while urban areas have only 119.54 thousand poor people.

Based on the facts that the role of plantation sector is important in the economy in Jambi Province and there is still low productivity of plantations which has an impact on low income and high levels of rural poverty (especially farming communities), studies on the linkages and impacts of plantation-based sectors on economy and poverty in Jambi Province are necessary.

The purpose of the article. The main purpose of this article is to analyze the impact of the plantation-based sectors on the economy and poverty in Jambi Province. Analysis of the impact of the plantation-based sectors on the economy such as output, value added, labor, income and the linkages between the plantation-based sectors and other economic sectors. The plantation-based sectors studied in this article only cover rubber, oil palm, annual plantation crops, annual plantation crops, food and drink industries (CPO processing), and the rubber industry.

Data collection in this study uses available data or non-survey data such as Jambi Province Output Output Tables and Indonesian Input Output Tables by BPS and also uses 2015 GRDP data. Non-survey methods in data preparation or processing are by updating Input Output table with RAS and iteration methods. The economist who first introduced how to create an Output Input Table using the RAS method was Richard Stone of Cambridge University in 1961 [16].

The Miyazawa I-O model was first introduced by Kenichi Miyazawa in 1968 and rewritten in 1976. This model generalizes the Keynesian income multipliers into the form of an inter-relational income multipliers matrix. Miyazawa's I-O model is a further development of the Leontief I-O model. The advantages of Miyazawa's I-O model compared to other I-O models, this model has included household income

groups in the model. According to West [17], the transactions used in the preparation of Input Output tables are based on the assumptions of homogeneity, proportionality, additivity.

Analysis of the Foster Greer Thorbecke Poverty Index (FGT) is an analysis used in looking at poverty as the impact of changes in economic sector output. The poverty indicators used in this study are:

$$P_{\alpha}(y; z) = \frac{1}{n} \sum_{i=1}^q \left(\frac{z - y_i}{z} \right)^{\alpha}, (\alpha \geq 0)$$

where, y_i = the average value of the i-per capita individual expenditure in the household;

n = the total population;

q = the number of poor population;

z = the poverty line.

Value $\alpha = 0$, states the headcount index (P_0) which is the percentage of the poor population to the total population. Value $\alpha = 1$, states the poverty gap index (P_1), which is the size of the expenditure gap of each poor population against the poverty line. Value $\alpha = 2$, namely poverty severity index (P_2) [18].

National socioeconomic survey data in Jambi province is used to analyze poverty using the FGT method.

Results and discussion. The discussion in this section includes an analysis of the linkages of the plantation-based sectors, poverty in the plantation sector, the impact of the plantation-based sectors on the economy, and the impact of the plantation-based sectors on poverty.

Plantation-based sectors Linkages. Sjafrizal [19] explained that an interesting analysis in the input output technique is that it can show direct and indirect economic linkages between sectors in terms of inputs which are commonly called backward linkages and in terms of output which is commonly called forward linkages.

The strategic role of a sector is not only seen from the contribution to output growth, the growth of gross added value, an increase in community income and employment, but what is equally important is whether the sector has strong support or linkages to the upstream sector downstream sector (forward linkage).

The backward linkage and forward linkage index is a measure used to view leading sectors based on the I-O model. The leading sector is determined by the higher values of the index of power of dispersion and sensitivity degree index above 1.

By looking at index of power of dispersion and sensitivity degree index which have more than 1 (one) value (Table 1), there are 2 superior commodity/commodity groups in the plantation-based sectors in Jambi Province. The two plantation-based commodity/commodity groups are food and beverage industry, and rubber industry, rubber and plastic materials. By encouraging an increase in the two leading sectors, this can spur economic growth in the plantation-based sectors and the economy in Jambi Province.

Table 1

The spread of index power and an index degrees sensibility according to sector plantation based in Jambi province

No	Sectors	Dispersion Power	Dispersion Power Index	Degree of sensitivity	Index of degree of Sensitivity
1	Perennial Plantations	1.163	0.751	1.093	0.706
2	Rubber	1.216	0.785	1.433	0.926
3	Palm oil	1.354	0.875	1.313	0.848
4	Other Annual Plantation Plants	1.232	0.796	1.263	0.816
5	Food and Beverage Industry	1.997	1.290	2.744	1.772
6	Rubber Industry, Rubber and Plastic Materials	1.922	1.241	1.599	1.033

Source: calculated by authors.

Of all plantation-based sectors, the food and beverage industry sector has the highest both indexes compared to other plantation-based sectors. The index of power of dispersion of the food and beverage industry is 1.290, meaning the food and beverage industry sector has a strong association with the upstream sector. The growth of the food and beverage industry, which is dominated by CPO, will absorb the yield of oil palm commodities and others which are the raw materials for CPO production. The next CPO process will encourage the growth of other sectors in the economy of Jambi Province. The index of degree of sensitivity in the food and beverage industry is 1.772. The sector has production output that is widely used by other economic sectors. In other words, the sector has a future relationship with the long downstream industry.

The other leading sectors are the rubber industry, rubber and plastic materials with a value of index of power of dispersion and index of degree of sensitivity higher than 1 (one) which is equal to 1.241. The sector will absorb the ingredients of people's rubber (bokar) and other materials and encourage the growth of other sectors as well. Index of degree of sensitivity of the rubber industry, rubber and plastic materials is 1.033. Similar to the food and beverage industry sector, the rubber industry, rubber and plastic materials also have production output that is widely used by other economic sectors. In other words, the sector has a future relationship with the long downstream industry.

Poverty in the Plantation Sector. The percentage of poor population to total population (P0) in Jambi Province was recorded in September 2011 at 7.90 percent, then the percentage of poverty increased to 8.42 percent in March 2012, then fell to 8.07 percent in March 2013 and dropped again to 7.92 percent in March 2014.

The poverty depth index (Table 2) of the agricultural sector as a whole is greater than the other sectors, so it can be said that the average poor population in the agricultural sector is deeper / far from the poverty line. In 2011 the depth index of poverty in the agricultural sector was 0.790 and in other sectors was 0.502. During 2012 and 2013 the depth index of poverty fluctuated up and down both the

agricultural sector and other sectors. The poverty depth index in 2014 amounted to 0.553 in the agricultural sector and amounted to 0.494 in other sectors.

Table 2

**Poverty Percentage, Poverty Depth Index and Poverty Severity Index
in Jambi Province by Sectors**

No	Description of Sector	09/2011	03/2012	09/2012	03/2013	09/2013	03/2014
1	Poverty percentage (P0)						
	a. Agriculture	8.71	9.41	9.38	8.87	9.15	7.90
	- Plantation	8.62	9.07	8.16	7.55	8.77	7.37
	- The Other agriculture	9.09	11.23	14.94	13.90	10.69	10.46
	b. The Other Sectors	7.06	7.38	7.00	7.25	7.68	7.94
	Total	7.90	8.42	8.28	8.07	8.41	7.92
2	Poverty Depth Index (P1)						
	a. Agriculture	0.790	0.758	0.842	0.463	0.641	0.553
	- Plantation	0.595	0.615	0.535	0.320	0.416	0.438
	- The Other agriculture	0.194	0.143	0.307	0.143	0.226	0.115
	b. The Other Sectors	0.502	0.459	0.529	0.527	0.477	0.494
	Total	1.292	1.217	1.371	0.990	1.118	1.047
3	Poverty Severty Index (P1)						
	a. Agriculture	0.219	0.185	0.233	0.078	0.155	0.128
	- Plantation	0.158	0.154	0.136	0.057	0.081	0.106
	- The Other agriculture	0.061	0.031	0.097	0.020	0.074	0.022
	b. The Other Sectors	0.129	0.105	0.203	0.117	0.105	0.106
	Total	0.348	0.290	0.436	0.195	0.260	0.234

Source: calculated by authors.

If the agricultural sector is broken down according to the plantation sub-sector and other agricultural sub-sectors, then the poverty depth index for the plantation sub-sector has a P1 value higher than the other poverty sub-indices in the agricultural sector. The poverty depth index in the plantation sub-sector was recorded around 0.4 to 0.6 during the period of 2011 to 2014. The depth index of poverty in 2011 on plantations was recorded at 0.595 and in other agriculture at 0.194. Finally, in 2014, the poverty depth index in the plantation sub-sector amounted to 0.438, while the other agricultural sub-sectors amounted to 0.111.

The plantation sub-sector has a higher poverty severity index than the other agricultural sub-sectors. The poverty severity index of the plantation sub-sector in 2011 was 0.158 and other agricultural sub-sectors amounted to 0.061. Furthermore, the poverty severity index in the plantation sub-sector amounted to 0.154 in March 2012, then fell to 0.057 in March 2013. Finally, in 2014, the poverty severity index in the plantation sub-sector was 0.106, while the other agricultural sub-sectors were 0.22.

It can be concluded that in proportion or number, the poor population in the plantation sub-sector is more than the other sub-sectors. When viewed from the percentage of poverty (P0) it turns out that in the plantation sub-sector is lower than the other agricultural sub-sectors, but the poor population in the plantation sub-sector

both the poverty depth index (P1) and the poverty severity index (P2) are greater than compared with other agricultural sub-sectors. In other words, the poor in the plantation sub-sector are deeper and worse in poverty compared to other agricultural sub-sectors.

Poor people in the plantation sector are worse and deeper in poverty compared to other agricultural sectors; one of the indicators that can be seen is by looking at the income gap in the plantation sector. This can be seen from the index value of the Gini ratio (Table 3).

From the results of data processing, it can be seen that the index value of the Gini ratio in Jambi Province as a whole is in the moderate category, which is around 0.327 to 0.359. When viewed by sector, it turns out that the level of inequality in other sectors is greater than the agricultural sector as a whole. Circumstances in 2014, with the Gini index ratio of 0.329 as a whole, where other sectors have a Gini index ratio of 0.325 and the agricultural sector has a smaller index value of Gini ratio which is equal to 0.310.

Table 3

Gini Ratio Index according to the main sector of employment of head of households in Jambi Province in 2011–2014

No	Sectors	09/2011	03/2012	09/2012	03/2013	09/2013	03/2014
1	Agriculture	0.330	0.289	0.309	0.280	0.253	0.310
	- Plantation	0.334	0.294	0.309	0.277	0.258	0.315
	- The Other Agriculture	0.285	0.242	0.279	0.277	0.232	0.272
2	The Other Sectors	0.351	0.364	0.391	0.378	0.351	0.325
	Total	0.348	0.345	0.359	0.348	0.327	0.329

Source: calculated by authors.

Gaps in the agricultural sector actually occur in the plantation sector when compared to other agricultural sectors. During the period of 2011 to 2014 the index value of the Gini ratio in plantations was always greater than that of other agricultural sectors. The Gini index value for the 2011 ratio for plantations of 0.334 is greater in other farms which is 0.285. The same thing happened in 2014, where the Gini index ratio on plantations (0.315) was greater than the other agricultural sectors (0.272).

Thus, it can be said that the population working in the plantation sector has a greater gap compared to other agricultural sectors. In other words, although the percentage of poverty in the plantation sector is relatively small, the poverty depth index (P1) and poverty severity index (P2) are greater when compared to other agriculture sectors.

Impact of plantation-based sectors on the economy. In order to spur economic growth, efforts are needed to encourage sectors that can have a major impact on rising output, added value, labor and income. With the addition of a final request of one million rupiah to output and added value, the biggest impact (the biggest multiplier) is the food and beverage industry sector with a multiplier value of 1.9969 to output and 3.1251 to added value and then the industry of rubber, rubber and

plastic goods with multiplier values of 1.9217 against output and 3.0042 for added value (Table 4). While the value of output multipliers and added value for other plantation-based sectors is still below the two sectors.

The plantation-based sectors which have the greatest impact on labor if there is an additional final demand of one million rupiah are the rubber industry, rubber and plastic goods by 19 people, then the food and beverage industry by 8 people, while the other plantation-based sectors are still below 2 persons.

With the addition of the final demand for income, the plantation-based sector that has the greatest multiplier value is in the rubber industry sector of 3.249 and the food and beverage industry sector of 2.9610. The value of multiplying other plantation-based sectors is still below 1.3.

Table 4

Value of Type I Multipliers of Plantation-based sectors by Output, Value Added, Labor and Opinion

No	Sectors	Output	Value Added	Labor	Income
1	Industry of rubber, rubber and plastic goods	1.9217	3.0042	18.9133	3.0249
2	Industry of Food and beverage	1.9969	3.1251	8.2608	2.9610
3	Oil Palm	1.3545	1.2687	1.6996	1.2434
4	Seasonal Plantation Plants	1.1630	1.1033	1.9013	1.2007
5	Other annual plantation crops	1.2320	1.1567	1.4002	1.1813
6	Rubber	1.2156	1.1449	1.1284	1.1240

Source: calculated by authors.

Impact of plantation-based sectors on poverty. We will discuss a number of policy simulations that can be done to see how much influence the policy has on the formation of output and income of poor households. Some of the simulations carried out include replanting rubber, down streaming the rubber industry, replacing oil palm, and down streaming oil palm.

Rubber Replanting simulation. The first simulation will look at the impact of rubber replanting of 1 billion rupiah against output and income of poor households by sector. The addition of rubber replanting amounting to 1 billion rupiah will have an impact on the formation of a total output of 1.276 billion rupiah.

In the total economy, the simulations conducted on the increase in rubber replacements will have an impact on increasing income by 60.51 million rupiah spread across various economic sectors. The interesting thing that is of concern is, from this value of 60.51 million rupiah, there are 22.33 million rupiahs enjoyed by poor households. The basis of this assumption is that increased consumption can occur only because of an increase in income as a result of an increase in output. This increase in income in poor households is far above the general income increase in other sectors. When compared with the increase in income that occurred in the entire economy, the share of the increase in poor household income reached 36.91 percent (Table 5). Although not as high as income increases in poor households, there are some sectors whose homes are experiencing high income growth.

Table 5

Impact of Rubber Replanting on Formation of Outputs and Additional Income of Poor Households by Plantation-based sectors and Economic Sector which have a large impact (Million Rupiahs)

No	Sectors	Impact of Closed Output	Impact of Consumption Benefit	Contribution Impact of Consumption Benefit (%)
1	Seasonal Plantation Plants	0.051	-0.01	-0.01
2	Rubber	1029.828	0.35	0.57
3	Oil Palm	1.381	0.46	0.76
4	Other annual plantation crops	1.022	0.66	1.09
5	Agricultural and Hunting Services	17.787	0.27	0.44
6	Results from Oil & Gas Refineries	11.757	1.73	2.86
7	Industry of Food and Beverages	10.947	7.16	11.83
8	Chemical, Pharmaceutical and Traditional Medicine industries	24.784	-0.69	-1.13
9	Industry of Rubber, Rubber and Plastic Goods	4.041	0.53	0.88
10	Industry of Metal, Computer, Electronic, Optical and Electrical Equipment	5.957	-0.37	-0.61
11	Construction	25.927	0.74	1.22
12	Retail and Trade	25.879	12.70	20.99
13	Information and Communication Services	5.451	1.42	2.34
14	Banking financial services	20.259	0.69	1.14
15	Other financial services	4.421	0.18	0.29
16	Company Services	7.155	0.36	0.59
17	Poor household income	22.333	22.33	36.91
	Total	1.276	60.51	100.00

Source: calculated by authors.

These sectors include trade sector of 12.7 million rupiah and food and beverage industry sector of 7.16 million rupiah. Other sectors, besides the trade sector and the food and beverage industry sector, experienced an increase in income under 2 million rupiah.

Simulation of Down Streaming Rubber Industry. The simulation of the downstream rubber industry, such as finished rubber goods, shows that with open I-O it can be seen that the effect of increasing final demand on the output of each sector and also the total output of the economy. It can be seen that the downstream of rubber of 1 billion rupiah will create a total sectoral output formation of 1.925 billion rupiah, higher than the rubber replanting which is only 1.276 billion rupiah. Overall, economic impact or an aggregate increase by 3.76 million rupiah (Table 6).

Poor household income showed a positive result of 9.87 million rupiah, with a share reaching 262.4 percent. Other sector contributions that were positively and significantly affected were the wholesale and retail trade sector of 96.9 percent with an increase of 3.65 million rupiah, the food and beverage industry sector at 67.7 percent with an increase of 2.55 million rupiah, and other sector contribution sectors are still below the sectors mentioned above.

Table 6

Impact of Downstreaming of Rubber on Formation of Outputs and Additional Income of Poor Households by Economic Sector (Million Rupiahs)

No	Sector	Impact of Closed Output	Impact of Consumption Benefit	Contribution Impact of Consumption Benefit (%)
1	Seasonal Plantation Plants	0.155	-0.02	-0.57
2	Rubber	274.516	0.11	2.79
3	Oil Palm	4.063	-0.60	-15.88
4	Other annual plantation crops	1.603	0.03	0.80
5	Crude oil and condensate	27.998	-1.91	-50.68
6	Natural gas	17.068	-1.79	-47.61
7	Mining and Other Excavation	11.601	-1.19	-31.56
8	Results from Oil and Gas Refineries	18.693	-0.16	-4.14
9	Industry of Food and Beverage	8.514	2.55	67.73
10	Chemical, Pharmaceutical and Traditional Medicine industries	169.607	-4.44	-118.10
11	Rubber Industry, Rubber and Plastic Goods	1128.362	0.04	0.93
12	Electricity	16.568	-0.93	-24.84
13	Construction	11.444	-0.05	-1.23
14	Retail and Trade	63.142	3.65	96.92
15	Other Land Transport Services	13.637	-0.22	-5.90
16	Information and Communication Services	18.120	-0.39	-10.31
17	Banking financial services	20.827	-0.22	-5.73
18	Company Services	10.678	-0.27	-7.20
19	Poor household income	9.870	9.87	262.40
	Total	1.925	3.76	100.00

Source: calculated by authors.

Oil Palm Replanting Simulation. Treatment of oil palm plants and their derivatives has a higher yield than the treatment of rubber plants and their derivatives. The oil palm replanting simulation of 1 billion rupiahs will have an impact on increasing output to 1.41 billion rupiah. The impact on the largest output is of course oil palm itself, amounting to 1.02 billion rupiah (Table 7).

Sectors that have increased output greater than the open IO model, are the construction sector output increased to 66.52 million rupiah, agricultural services increased output by 60.29 million rupiah, banking financial services sector amounted to 34.26 million rupiah, sector large and retail trade of 28.22 million rupiah, the yield sector from oil and gas refineries amounted to 12.54 million rupiah, the trade sector of cars, motorbikes and repairs was 11.05 million rupiah, and the general government sector also experienced an increase in output by 10.33 million rupiah. The increase in output in household income is around 20.64 million rupiah. The sector that experienced a slight decrease in output was the chemical, pharmaceutical and traditional medicine sectors amounting to 19.11 million rupiah. While other sectors outside of the sectors mentioned above, there are those that have experienced an increase or decrease in output, although not too large.

Table 7

Impact of Replanting of Oil Palm on the Formation of Outputs and Additional Income of Poor Households by Economic Sector (Million Rupiah)

No	Sectors	Impact of Closed Output	Impact of Consumption Benefit	Contribution Impact of Consumption Benefit (%)
1	Seasonal Plantation Plants	0.086	-0.01	-0.01
2	Rubber	1.080	0.10	0.19
3	Oil Palm	1023.503	0.59	1.08
4	Other annual plantation crops	0.961	0.61	1.12
5	Agricultural and Hunting Services	60.291	0.52	0.96
6	Results from Oil & Gas Refineries	12.541	1.51	2.77
7	Industry of Food and Beverages	10.875	6.62	12.11
8	Chemical, Pharmaceutical and Traditional Medicine industries	19.106	-0.75	-1.36
9	Rubber Industry, Rubber and Plastic Goods	4.335	0.45	0.82
10	Manufacture of Metal, Computer, Electronic, Optical and Electrical Equipment	10.088	-0.78	-1.43
11	Construction	66.523	0.91	1.66
12	Trade in cars, motorbikes and repairs	11.050	0.52	0.95
13	Retail and Trade	28.220	11.56	21.15
14	Banking Financial Services	34.257	0.69	1.27
15	Public Administration	10.334	0.16	0.30
16	Poor household income	20.642	20.64	37.78
	Total	1.409	54.64	100.00

Source: calculated by authors.

The impact of total consumption of consumption increased by 54.64 million rupiah, contributed by poor household income of 20.64 million or the largest contribution of 37.78 percent. Then it is followed by the impact of household consumption for the wholesale and retail trade sector at 21.15 percent, and for the food and beverage industry sector at 12.11 percent. The benefits of household consumption for other sectors are not very large compared to the sectors discussed.

Simulation of Downstream Oil Palm Industry. The next simulation for oil palm is a simulation of the downstream oil palm industry of 1 billion rupiah. The downstream oil palm industry had a significant impact on increasing output to 2.02 billion rupiah compared to the simulation of oil palm replanting which was only 1.41 billion rupiah. Of the total, the food and beverage industry sector in which the palm oil industry receives the largest increase in output, which amounted to 1.22 billion rupiah (Table 8).

Sectors that get a larger increase in output in the closed IO model are the food and beverage industry sector at 1.22 billion rupiah, the rice sector at 205.56 million rupiah, the large and retail trade sector at 109.45 million rupiah, the coconut sector palm oil at 99.44 million rupiah, other annual plantation crops at 53.21 million rupiah, livestock sector at 42.02 million rupiah, fisheries sector at 40.1 million rupiah,

corn sector at 26.84 million rupiah, chemical industry sector, pharmaceuticals and traditional medicines amounting to 15.64 billion rupiahs, the construction sector amounted to 15.64 million rupiahs, the information and communication services sector amounted to 15.79, and the banking financial services sector amounted to 13.94 million rupiahs. The sector that experienced a slight decrease in output was the chemical, pharmaceutical and traditional medicine sectors amounting to 19.02 million rupiah. While other sectors outside of the sectors mentioned above, there are those that have experienced an increase or decrease in output, although not too large.

Consumption benefits in the down streaming simulation of the food and beverage industry amounted to 24.89 million rupiahs and it can be said that the consumption impact in the down streaming of the food and beverage industry is smaller compared to the simulation of oil palm replanting. The same thing also happened in the income of poor households. Although the contribution of consumption was dominated by income of poor households (42.19 percent), it was only 10.5 million rupiah, followed by the impact of consumption in the trade sector and the food and beverage industry sector respectively at 22.76 percent and 12.95 percent.

Table 8

Impact of Palm Oil Downstreaming on Formation of Outputs and Additional Income of Poor Households by Plantation-based sectors and Other Economic Sectors (Million Rupiah)

No	Sectors	Impact of Closed Output	Impact of Consumption Benefit	Contribution Impact of Consumption Benefit (%)
1	Paddy	205.562	0.43	1.73
2	Corn	26.837	0.06	0.24
3	Seasonal Plantation Plants	6.713	-0.02	-0.08
4	Rubber	0.897	0.04	0.17
5	Oil Palm	99.438	0.16	0.66
6	Other annual plantation crops	53.208	0.29	1.16
7	Livestock	42.016	0.41	1.65
8	Agricultural and Hunting Services	12.299	0.09	0.37
9	Fishing	40.098	0.67	2.70
10	Results from Oil & Gas Refineries	14.612	0.66	2.64
11	Industry of Food and Beverages	1221.841	3.22	12.95
12	Chemical, Pharmaceutical and Traditional Medicine industries	15.015	-0.62	-2.50
13	Rubber Industry, Rubber and Plastic Goods	3.596	0.20	0.79
14	Construction	15.635	0.24	0.98
15	Retail and Trade	115.117	5.67	22.76
16	Information and Communication Services	15.789	0.58	2.32
17	Banking Financial Services	13.938	0.23	0.92
18	Poor household income	10.499	10.50	42.19
	Total	2.022	24.89	100.00

Source: calculated by authors.

Policy Implications. In taking the right policy for the plantation-based sectors in Jambi Province, statistic testing is necessary using the Wilcoxon statistical test. Wilcoxon tests are carried out on the output value and share of consumption induced or income increases for each economic sector.

The results of the Wilcoxon test on four simulations, obtained the sequence that has the greatest impact on increasing output in all sectors in sequence are as follows; downstreaming of the rubber industry, replanting oil palm, downstreaming the oil palm industry, then replanting rubber (Table 9, 10).

Table 9

Wilcoxon Test Results from Output Impacts based on the Program Simulation carried out

No	Program Simulation	Value P-Value of Test Result	Result of Test Criteria
1	Downstreaming Rubber Industry – Replanting Rubber	0.000	Significant
2	Replanting Palm Oil – Replanting Rubber	0.000	Significant
3	Downstreaming of the Palm Oil Industry – Replanting Rubber	0.001	Significant
4	Oil palm replanting – Downstreaming of the Rubber Industry	0.006	Significant
5	Downstreaming of the Palm Oil Industry – Downstreaming the Rubber Industry	0.182	Not Significant
6	Downstream Oil Palm Industry – Oil Palm Replanting	0.405	Not Significant

Source: calculated by authors.

The results of the Wilcoxon test on four simulations obtained sequences that had the greatest impact on consumption consumption in all sectors and especially the income of poor households sequentially as follows; downstreaming of the rubber industry, rubber replanting, oil palm replanting and downstream oil palm industry.

Table 10

Wilcoxon Test Results from Consumption Impacts based on the Program Simulation carried out

No	Program Simulation	Value P-Value of Test Result	Result of Test Criteria
1	Downstreaming Rubber Industry – Replanting Rubber	0.092	Not Significant
2	Replanting Palm Oil – Replanting Rubber	0.756	Not Significant
3	Downstreaming of the Palm Oil Industry – Replanting Rubber	0.019	Significant
4	Oil palm replanting – Downstreaming of the Rubber Industry	0.092	Not Significant
5	Downstreaming of the Palm Oil Industry – Downstreaming the Rubber Industry	0.105	Not Significant
6	Downstream Oil Palm Industry – Oil Palm Replanting	0.013	Significant

Source: calculated by authors.

Conclusions. The linkage of the plantation-based sectors is seen from the distribution power index (DPI) and sensitivity degree index (SDI), both of which are valued above 1, namely the food and beverage industry sector and the rubber

industry, rubber and plastic materials which are the leading sectors in the plantation-based sectors Jambi Province. If there is a policy stimulus for the two sectors, it will have a positive impact in spurring economic growth.

The poverty percentage (P0) of Jambi Province in the plantation sub-sector is in the low category, but the poverty depth index (P1) and poverty severity index (P2) in plantations are greater than the other agricultural sub-sectors or in other words the poverty in plantations is deeper and more severe poverty compared to other farms. For this reason, in alleviating poverty in Jambi Province, one program cannot be solved, but various poverty alleviation programs are needed.

The policy simulation that has the highest impact on the output of other economic sectors is the downstream policy of the rubber industry when compared to other simulations. Likewise, the policy simulation that has the greatest impact on the share of consumption of other economic sectors and the income of poor households is the down streaming of the rubber industry.

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