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## **ANALYSIS OF AGRICULTURAL SECTOR LINKAGES TO THE ECONOMY OF WEST KALIMANTAN PROVINCE: INPUT-OUTPUT ANALYSIS**

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### **ABSTRACT**

West Kalimantan Province is famous for its large plantation area with a gross domestic product growth rate of 4.11 - 7.51 during 2021. This data shows the instability of the rate of agricultural growth. This study aims to analyze the structure of demand and supply, the linkages between the agricultural sector and other sectors and key sectors in the economy of West Kalimantan Province. The data used comes from the input-output table published by the Central Statistics Agency for West Kalimantan in 2016 for producer prices (million rupiah) with a classification of 52 sectors and aggregated into 27 sectors. Parameters analyzed consist of backward linkage, forward linkage and multiplier effect. The research results show that the total output (supply) of West Kalimantan's agricultural sector is produced to meet intermediate demand and final demand of 43.366 million rupiah. The highest value of backward linkage is the annual and annual plantation sector. This means that the sector requires a lot of raw materials from other sectors to grow. The highest value of forward linkages is the agricultural and hunting services sector; this sector acts as a provider of raw materials for the growth of other sectors. The key agricultural sector in this region is annual and annual plantations. However, the multiplier effect on output, income, and the multiplier number of workers from the agricultural sector is still lower than other sectors. The agricultural sector is interrelated with other sectors to grow.

### **KEY WORDS**

Agricultural sector linkages, GRDP, input-output analysis, West Kalimantan.

Agriculture is a very dominant sector in the income of the Indonesian people because the majority of Indonesia's population works as farmers, but agricultural productivity is still not as expected from the 2019-2021 report by the Indonesian Central Bureau of Statistics, Indonesia's agricultural productivity in 2019 was recorded at 51.14% in in 2020 it was recorded at 51.28% and in 2021 it was recorded at 52.26%. One of the factors causing the lack of agricultural productivity is human resources that are still low and the use of agricultural technology that has not been maximized in cultivating agricultural land to the processing of agricultural products. Agricultural production that is unable to meet domestic needs will disrupt the trade balance (Lero et al., 2020; Pudjiastuti, 2014; Pudjiastuti et al., 2013, 2021; Pudjiastuti & Kembauw, 2018; Widowati et al., 2018). The majority of farmers in Indonesia still use a manual system in processing agricultural land (Sukanto & Atmanti, 2011). If this system is not changed, it will be difficult to achieve economic resilience, because economic resilience is one of the pillars for national independence. Therefore, economic development is very important (Siregar, 2011).

Economic development is one of the efforts that can be made by the government and society to manage the various resources they have. Local governments and their communities must jointly take initiatives for regional economic development (Heryadi, et.al, 2021). Economic development is supported by cooperation between economic sectors in each region or area. Economic development itself is basically a change in the structure of production and allocation of resources. The development process will be carried out in each region and will have different constraints. Kalimantan Island is one of the islands that has many natural resources both from land and water. Kalimantan Island has five provinces, one



of which is West Kalimantan Province. West Kalimantan Province is an area or area that is famous for its extensive land and plantations with various types of plants that can be used as regional income, but over time various problems have arisen, one of which is the Covid-19 outbreak. The Covid-19 outbreak has greatly affected the economic growth of the community due to the implementation of restrictions on community activities (PPKM). It can be seen from the 2021 BPS report that the growth rate of West Kalimantan's PDRB was recorded at 4.11 in the first quarter, 7.51 in the second quarter, 6.87 in the third quarter and 4.14 in the fourth quarter. The data shows the instability of the rate of agricultural growth in the regional GDP of West Kalimantan. In addition, the development of economic growth is inseparable from the national development strategy which is the guideline for the direction of regional development. Regional development policies are directed at developing regions by optimizing the empowerment of regional potentials, adjusting the growth rate between regions, also refers to equitable development to improve people's welfare. This is done to increase food security. Food security has recently given more attention to households and individuals than to its availability at the international, national, regional and state levels (Abu & Soom, 2016).

The large potential of natural resources owned by West Kalimantan Province should be an opportunity to develop the agricultural sector, so that it can support people's lives. However, the agricultural sector in West Kalimantan is still not optimal, as can be seen from the productivity of the agricultural sector which is still not as expected as seen in the publication report of the West Kalimantan Central Bureau of Statistics in 2019-2021, in 2019 it was recorded at 29.23%, in 2020 it was recorded at 30.33% and in 2021 it was recorded at 31.90%. The data has increased but is still not optimal when compared to the amount of natural resources owned. This value is still far from expectations for the economic growth of people in West Kalimantan. This condition is caused by several factors, including the lack of market information, mastery of agricultural science and technology and the low added value of agricultural products owned by the agricultural sector so that they have not contributed optimally to economic growth.

The agricultural sector can contribute to the regional economy, such as in East Nusa Tenggara (Redu et al., 2020). In addition, the plantation crop agricultural sector is also feasible to be developed (Kusmaryatun et al., 2020) (Hidayat & Pudjiastuti, 2022), and also marketing (Kusmawan et al., 2022), so that a plan and policy are needed with the selection on the basis of priorities and targets of the agricultural development program. Agricultural development policies are directed at developing human and natural resources, science and technology, funds, information, and institutions. So that the agricultural sector is not only seen as a reservoir of uneducated labor or a provider of cheap food. The agricultural sector is expected to be a supporting actor on par with other industrial sectors. Therefore the agricultural sector must be more advanced with the use of the latest technology that is environmentally friendly, efficient and competitive. Based on the explanation above, it can be seen that the agricultural sector has not been fully utilized. Therefore, it is relevant to examine the linkages of the agricultural sector to the economy of West Kalimantan Province. This research is very important to do because it is necessary to change the agricultural system related to West Kalimantan's economic growth so that the agricultural sector can be utilized optimally and can encourage economic growth to be even better.

## METHODS OF RESEARCH

This research was conducted on August to October 2022. This study uses secondary data. The data used comes from the input-output table published by the Central Statistics Agency for West Kalimantan in 2016 for producer prices (million rupiah) with a classification of 52 sectors and aggregated into 27 sectors. Data analysis uses input-output analysis, to see the value of the structure of demand and supply, forward linkages, backward linkages, and multiplier numbers.

a) Back Linkage. It is used to see the ability of a sector to increase the growth of its upstream industry (Malba, 2016):



$$KLTB_j = \frac{n \sum_{i=1}^n a_{ij}}{\sum_{i=1}^n \sum_{i=j}^n a_{ij}}$$

Where:  $KLTB_j$  is the direct backward linkage index for sector  $j$ ,  $a_{ij}$  is the input coefficient between sector  $j$  originating from sector  $i$ .

b) Future Linkages. Shows the linkage of a sector with the downstream sector which is the user of the sector's output to meet inputs for other sectors:

$$KLTD_i = \frac{n \sum_{i=1}^n a_{ij}}{\sum_{i=1}^n \sum_{i=j}^n a_{ij}}$$

c) Deployment Power Analysis. Is the impact of changes in final demand in a sector on output in aggregate:

$$IDP = \frac{\sum_{i=1}^n a_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{i=1}^n a_{ij}}$$

Where:  $IDP$  is the spreading power index,  $n$  is the number of sectors,  $a_{ij}$  is the inverse coefficient of Leontief (IA) -1.

d) Sensitivity Index Analysis. Is the impact that occurs on the output of a sector as a result of changes in final demand in each economic sector with the formula:

$$IDK = \frac{FLI = \sum_{i=1}^n a_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{i=1}^n a_{ij}}$$

Where:  $IDK$  is the degree of sensitivity index,  $n$  is the number of sectors,  $b_{ij}$  is the leontief (IA) -1 inverse matrix.

e) Multiplier Matrix:

*Input coefficient matrix:*

$$a_{ij} = \frac{x_{ij}}{x_j}$$

Where:  $i$  is 1,2,3  $a_{ij}$  is the technology coefficient of sector  $i$  originating from sector  $j$ ,  $X_j$  is the total input of sector  $j$  with  $X_j > 0$ ,  $X_{ij}$  is the amount of output of sector  $i$  which is used as input by sector  $j$ .

*Output Multiplier:*

$$O_{ij} = \sum_i^n a_{ij}$$

Where:  $O_{ij}$  is the output multiplier of sector  $j$ ,  $A_{ij}$  is the element of the leontief inverse matrix,  $I$  is the 1st, 2nd, 3rd, ...  $n$  row.

*Revenue Multiplier:*

$$I_j = \sum_{i=1}^n a_{n+1,i} a_{ij}$$

Where:  $I_j$  is the multiplier of sector  $j$  income,  $a_{n+1,i}$  is the value added share of the wage/salary share per total output,  $a_{ij}$  is Leontief's inverse matrix.

*Labor Multiplier:*

$$w_j = l_j / x_j, \text{ then } L_j = \sum w_j (IA)^{-1}$$

Where:  $L_j$  is the labor multiplier,  $w_j$  is the labor coefficient of a sector  $j$ ,  $l_j$  is the number of workers in sector  $j$ ,  $x_j$  is the total output in sector  $j$ ,  $(IA)^{-1}$  is Leontief's inverse matrix



## RESULTS AND DISCUSSION

The structure of demand and supply in West Kalimantan, the total output (supply) of the agricultural sector produced to meet intermediate demand and final demand is equal to 43,366 million rupiah, which is used to meet the needs of the demand between 20.728 million rupiah, household consumption of 5.951 million rupiah, gross fixed capital formation of 11.813 million rupiah, inventory change of 122 million rupiah, complied foreign exports amounted to 386 million rupiah, export between provinces 4.365 million rupiah. These results indicate that West Kalimantan's agricultural sector exports abroad are much smaller than exports between provinces, this is because the quality of agricultural commodities owned by West Kalimantan is still unable to meet export demand. Therefore it is necessary to apply technology for export products because there are several export destination countries such as the United States and several other countries that receive agricultural products without residue or hazardous chemicals due to the use of insecticides, pesticides and the like. There is the application of environmentally friendly, sustainable and integrated technology from upstream to downstream so that agricultural products are produced both for consumption and for export so as to increase added value (Ramadhan, at.al, 2010).

The backward linkage is the linkage of the downstream production sector to the upstream production, while the forward linkage will show the effect of the large increase in the output of a particular sector on sectors that use a portion of that output per unit increase in total demand, which can drive the growth of all upstream and downstream sectors. in the economy (Salsabila, at.al., 2022). The research results are presented in Table 1, based on Table 1 the highest value of backward linkage in West Kalimantan Province in the classification of 27 sectors, namely the food and beverage industry is 3.297, meaning that if there is an increase in sector demand the food and beverage industry for 1 unit of production unit will require additional input from this sector and other sectors for 3.297 units of production units. The highest linkage to the agricultural sector is the agricultural sector annual and annual plantations of 2.419. These all state that every change increases the final demand for the sector annual and annual plantations of 1 unit of production unit, then the additional input factor of production required is 2.419 production units for the annual and annual plantation sector and other sectors which will increase output are allocated directly to the sector itself and other sectors. The annual and annual plantation sector has a high value of backward linkage indicating that this sector requires a lot of raw materials from other sectors to grow and has a high linkage to its upstream production.

Based on Table 1, the highest value of forward linkages in West Kalimantan Province is in the classification of 27 sectors, namely the agricultural and hunting service sectors 2.708, this value indicates that any change in the increase in final demand for the agricultural and hunting services sector by 1 unit of production unit, then the output in that sector which is allocated directly to the sector itself and other sectors will increase by 2.708 units of production unit. In the future, the highest linkage for the agricultural sector in West Kalimantan Province, namely the agricultural and hunting service sector, is 2.708, shows that every change in the increase in final demand for the agricultural and hunting services sector by 1 unit of production unit, then the output in that sector which is allocated directly to the sector itself and other sectors will increase by 2.708 units of production unit. Based on this value, it can be concluded that the agricultural and hunting services sector is quite high in providing the output produced to be used as input by other sectors in the production process or used to meet final demand, but it still needs to be developed so that the agricultural sector can support economic growth and meet demand, both agricultural commodities and raw materials for agricultural-based processing industries, so that in the end there will be a balance between supply and demand (Fagi, 2013).

Economic sector if it has a spreading power index value and a large degree of sensitivity of 1 ( $> 1$ ) means that the sector has the ability to boost the production growth of other sectors that use output from this sector (downstream industry), and if the value is less than 1 ( $< 1$ ) indicates that the ability of the sector to increase the growth of its upstream industry is still small (Salsabila, at.al. 2022).



Table 1 – Figures of Backward and Forward Linkages of the Agricultural Sector (2016)

No	Sector	Backward Linkage	Forward Linkage
1	Food Crop Agriculture	1.257	1.875
2	Annual Horticultural Plant Farming, Annual Horticulture, and Others	1.094	1.191
3	Annual and Annual Plantations	2.419	1.711
4	Farm	1.201	1.333
5	Agricultural and Hunting Services	1.012	2.708
6	Forestry and Logging	1.036	2.391
7	Fishery	1.067	1.266
8	Mining and excavation	1.254	1.891
9	Food and Beverage Industry	3.297	1.078
10	Tobacco Processing Industry	1.016	1
11	Textile and Apparel Industry	1.139	1.18
12	Leather Industry, Leather Goods and Footwear	1.598	1.009
13	Wood Industry, Products from Wood and Cork and Woven Products from Bamboo, Rattan and the Like	1.784	1.44
14	Paper and Paper Products Industry, Printing and Reproduction of Recorded Media	1.022	1.004
15	Chemical, Pharmaceutical and Traditional Medicine Industries	1.057	1.237
16	Rubber Industry, Rubber and Plastic Products	1.219	1.065
17	Other Processing Industry, Machinery and Equipment Repair and Installation Services	1.735	1.525
18	Procurement of Electricity and Gas	1.112	2.145
19	Water Procurement, Waste Management, Waste and Recycling	1.07	1.018
20	Construction	1.825	1.311
21	Wholesale and Retail Trade; Car and Motorcycle Repair	1.057	1.304
22	Transportation and Warehousing	1.999	1.417
23	Provision of Accommodation and Food and Drink	1.413	1.216
24	Information and Communication	1.45	1.634
25	Financial Services and Insurance	1.201	1.701
26	Real Estate	1.165	1.462
27	Government Administration and Other Services	3.144	1.533
	Amount	39.645	39.645
	Average	1.46	1.47

Source: West Kalimantan Input-Output Table 2016, Processed.

Table 2 – Index of Spreading Power and Degree of Sensitivity of the Agricultural Sector to the Economy (2016)

No	Sector	Deployment Index	Sensitivity Degree Index
1	Food Crop Agriculture	0.856	1,277
2	Annual Horticultural Plant Farming, Annual Horticulture, and Others	0.745	0811
3	Annual and Annual Plantations	1,648	1.166
4	Farm	0.818	0.908
5	Agricultural and Hunting Services	0.689	1,844
6	Forestry and Logging	0.706	1628
7	Fishery	0.727	0.862
8	Mining and excavation	0.854	1,288
9	Food and Beverage Industry	2,246	0.734
10	Tobacco Processing Industry	0.692	0.681
11	Textile and Apparel Industry	0.776	0.804
12	Leather Industry, Leather Goods and Footwear	1,088	0.687
13	Wood Industry, Products from Wood and Cork and Woven Products from Bamboo, Rattan and the Like	1.215	0.980
14	Paper and Paper Products Industry, Printing and Reproduction of Recorded Media	0.696	0.684
15	Chemical, Pharmaceutical and Traditional Medicine Industries	0.720	0.842
16	Rubber Industry, Rubber and Plastic Products	0.830	0.725
17	Other Processing Industry, Machinery and Equipment Repair and Installation Services	1,181	1,039
18	Procurement of Electricity and Gas	0.757	1,461
19	Water Procurement, Waste Management, Waste and Recycling	0.729	0.694
20	Construction	1,243	0893
21	Wholesale and Retail Trade; Car and Motorcycle Repair	0.720	0.888
22	Transportation and Warehousing	1,362	0.965
23	Provision of Accommodation and Food and Drink	0962	0.828
24	Information and Communication	0.988	1.113
25	Financial Services and Insurance	0.818	1.158
26	Real Estate	0.794	0.996
27	Government Administration and Other Services	2,141	1,044
	Amount	27,000	27,000

Source: West Kalimantan Input-Output Table 2016, Processed.

Based on Table 2 it is known that the domestic-based economic sector of West Kalimantan Province from the input side the value of the spreadability index of the small agricultural sector is 1 or (<1) except for seasonal and annual plantations. The agricultural sector it self is sorted based on the highest value, namely annual and annual



plantations 1.648, food crop agriculture 0.856, animal husbandry 0.818, annual horticultural crops, annual horticulture and others 0.745, fishery 0.727, forestry and logging 0.706 and agricultural and hunting services 0.689. A dispersive power index value that is less than 1 ( $< 1$ ) or low indicates that the agricultural sector in the rate of distribution of output produced is not used as input by other sectors in the economy of West Kalimantan Province. Several agricultural sectors have not been able to drive the growth of their downstream sectors but not for the annual and annual plantation sector, this sector has been able to encourage its downstream sector.

As for the index of the highest degree of sensitivity of the agricultural sector, namely the agricultural services sector and hunting with a value of 1.844, forestry and logging 1.628 and seasonal and annual plantation sector of 1.166. This shows that these three sectors have been able to encourage production growth in other sectors that use output from downstream sectors which are used as input by other sectors in the economy of West Kalimantan Province. The agricultural sector has a high dependence on other sectors except for livestock, fisheries and seasonal horticultural crops, annual horticulture, and others. The results of this study are in accordance with the results of research by Utomo, et.al. (2015), that the index of the degree of sensitivity of the agricultural sector is able to meet the final demand above the average so that it is relatively able to encourage economic growth. If the agricultural sector is used as a leading sector or a key sector, then the index value for dispersion and degree of sensitivity must be above 1.

The Multiplier Effect is used to calculate the total production value of all economic sectors to meet the final demand as seen from the value of output, income and employment in a sector. The output multiplier value changes if there is a 1% change in final demand, then the output of all economic sectors will increase by the output multiplier number produced by a sector (Wijaya, et.al, 2014). The results of the analysis show that the agricultural sector in West Kalimantan Province has a low output value, a low output value indicates that the agricultural sector is still unable to meet all final demands and this sector still requires output from other sectors. As for the highest value for the output of the agricultural sector, namely seasonal horticultural crop farming, exists a change in final demand of 1% in the agricultural sector of annual horticultural crops, annual horticulture, and others will increase the output of the agricultural sector of annual horticultural crops, annual horticulture, and others by 0.84%. The low contribution of the agricultural sector to additional output is due to the lack of agricultural infrastructure in production and information activities, as well as the low skills possessed due to the absence of special training and guidance so that the resulting output is low. Therefore, the government's role is very much needed in increasing the growth of the agricultural sector so that it can encourage increased output in the economy of West Kalimantan. The highest value of the output multiplier of West Kalimantan Province for the classification of 27 economic sectors namely rubber industry, rubber and plastic goods by 12.508 shows that every 1% change in final demand will increase sector output rubber industry, goods from rubber and plastics by 12.50%. This shows that the industrial sector of rubber, rubber and plastic goods has the largest output impact on economic growth and can meet final demand. These results are consistent with the results of Mohan's research, et.al, (2021) which states that the industrial sector has the highest output value.

The income multiplier value indicates that every time there is a change in the final demand of 1 unit of money in a sector, the income of all economic sectors will increase by the income multiplier number generated by a sector (Anas, 2015). The results of the analysis show that the value the highest income multiplier figure from the classification of 27 economic sectors of West Kalimantan, namely sector water supply, waste management, waste and recycling of 5.189, indicating that every change in final demand of 1 unit of money in that sector will increase the income of all economic sectors by 5,189 units of rupiah sector water supply, waste management, waste and recycling. The value of the income multiplier figure for the agricultural sector in West Kalimantan Province is not ranked 3rd which has a large income impact. West Kalimantan's agricultural sector is ranked based on the highest value, namely agricultural services and hunting, with 1.355 ranks (5), forestry and logging of 1.179 ranks (6), food crop agriculture of 1.084 ranks (7), seasonal and annual plantations of 0.859



ranks (9), live stock with 0.471 ranks (16), fisheries with 0.379 ranks (18) and seasonal horticultural crops, annual horticulture, and others with 0.212 ranks (23). This value indicates that the agricultural sector in West Kalimantan Province has the ability to stimulate or encourage additional income which is still low. The low contribution of the agricultural sector to additional income is due to a lack of skills and agricultural labor because the average workforce in West Kalimantan Province prefers non-agricultural work. This problem is a concern for West Kalimantan Province to be able to develop the agricultural sector so as to provide a greater income multiplier impact and can increase employment in agriculture.

The value of the labor multiplier changes if there is a change in the final demand of 1 unit of money in a sector, thus increasing employment for all economic sectors by the multiplier number of labor produced by a sector. The results of the analysis of the employment multiplier in the agricultural sector for West Kalimantan Province based on the highest scores, namely seasonal horticultural crops, annual horticulture, and others with 0.572 ranks (10), fisheries with 0.525 ranks (11), animal husbandry with 0.482 ranks (14), plantation seasonal and annual 0.306 ranks (19), forestry and logging 0.273 ranks (22), food crop agriculture 0.187 ranks (23) and agricultural and hunting services 0.001 ranks (26). This shows that to produce 1 unit of output rupiah, it takes 0.572 workers in the agricultural sector for seasonal horticulture crops, annual horticulture and others, 0.525 workers in the fisheries sector, 0.482 workers in the livestock sector, 0.306 workers in the annual and annual plantation sector, 0.273 workers in the forestry and logging sectors, 0.187 workers in the food crop agriculture sector and 0.001 workers in the agricultural services sector and hunting for the Province of West Kalimantan. Based on this value, it can be concluded that the agricultural sector's labor multiplier is still low, this means that the agricultural sector is still not able to create jobs so that the workforce in this sector and the resulting output do not increase.

The sector that absorbs the highest workforce in the classification of 27 economic sectors in West Kalimantan Province, namely the rubber industry, rubber goods and plastics by 8.519, this value indicates that every change in the final demand of 1 unit of money in that sector will increase employment in West Kalimantan Province by 8.519 rubber industry, goods from rubber and plastics. The rubber, rubber and plastic industry sector has the ability to create jobs in this sector so that the contribution of its workforce increases and can increase output and increase income for farmers.

## **CONCLUSION**

The total output (supply) of West Kalimantan's agricultural sector produced to meet intermediate demand and final demand is 43.366 million rupiah. The highest value of backward linkage is the seasonal and annual plantation sector with a value of 2.419, meaning that the sector requires a lot of raw materials from other sectors to grow. West Kalimantan has the highest value of forward linkages, namely the agricultural and hunting service sectors with a value of 2.708, the sector acts as a provider of raw materials for the growth of other sectors. The agricultural sector that can be used as a key sector is the annual and annual plantation sector which has a spreading power index value of 1.648 and a sensitivity index of 1.166. This shows that the seasonal and annual plantation agricultural sector has the ability to encourage high upstream and downstream industries compared to several sectors. other agriculture. However, the multiplier effect of the agricultural sector on the output multiplier, income multiplier, and labor multiplier is still lower compared to other sectors, so that the agricultural sector is interrelated with other sectors to grow.

## **SUGGESTIONS**

Agricultural development policies must emphasize increasing the fulfillment of the needs for agricultural facilities and infrastructure and increasing the use of technology in the upstream and downstream production processes so that inputs are more efficient so as to



increase additional agricultural output to increase the added value of agricultural products for both consumption and export purposes.

There is conservation of germplasm for agriculture, especially for plantation agriculture because almost all plantations in West Kalimantan Province are owned by foreign companies so that indigenous people only become laborers.

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