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Role of Agriculture Sector on the Economy of East Java Province, Indonesia (Input-Output Analysis)

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Abstract

The purpose of this research is to analyze backward linkage, forward linkage, and analyze the economic impact that agriculture sector has caused based on the multiplier effect on the output, income, and absorption of labor in the Province of East Java. Data used is sourced from Table Input-Output domestic transactions based on price classification of 110 sectors East Java Province year 2015 which is aggregated into a classification of 14 sectors. Results of the analysis showed index of degrees of sensitivity (backward linkage) of agricultural sector has a value of 0.795, below average degree of sensitivity of entire economic sector. Agricultural spread power index (forward linkage) had a value of 0.803 lower than average of spread power index of the entire sector. Output multipliers, income multipliers, and labor multipliers of agricultural sector respectively, i.e. 1.259, 1.203, and 1.094 lower than other sectors in the economics of East Java Province. This indicated that agricultural sector serves as a supporting sector instead of leading in the economy of East Java Province.

***Keywords**: Agriculture, Backward linkage, Forward linkage, Multiplier effect*

***JEL Classification**: Q10, R15*

Tarım Sektörünün Doğu Java İl Ekonomisindeki Yeri, Endonezya (Girdi-Çıktı Analizi)

Özet

Bu araştırmanın amacı, Doğu Java Eyaletindeki emeğin çıktısı, geliri ve emilimi üzerindeki çarpan etkisine dayanarak, geriye doğru bağlantıyı, ileri bağlantıyı ve tarım sektörünün yol açtığı ekonomik etkiyi analiz etmektir. Kullanılan veriler, Doğu Java Eyaleti 2015 yılı 110 sektör fiyat sınıflandırmasına dayanan 14 girdi sınıfında toplanan Tablo Girdi-Çıktı yurtiçi işlemlerinden elde edilmiştir. Analiz sonuçları, tarım sektörünün hassasiyet derecelerinin (geriye doğru bağlantı) endeksinin, tüm ekonomik sektörün ortalama hassasiyet derecesinin altında 0.795 değerinde olduğunu göstermiştir. Tarımsal yayılma güç endeksi (ileri bağlantı) tüm sektördeki yayılma güç endeksinin ortalamasından 0.803 daha düşük bir değere sahiptir. Tarım sektörünün üretim çarpanları, gelir çarpanları ve emek çarpanları, yani Doğu Java Eyaleti ekonomisindeki diğer sektörlerden sırasıyla 1.259, 1.203 ve 1.094 daha düşük. Bu, tarım sektörünün Doğu Java Eyaleti ekonomisinde lider olmak yerine destekleyici bir sektör olarak hizmet ettiğini göstermektedir.

***Anahtar Kelimeler**: Tarım, Geriye doğru bağlantı, İleri bağlantı, Çarpan etkisi*

***JEL Sınıflandırması**: Q10, R15*

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1. Introduction

Economic development aims to improve the community's living standards, increase revenues, and ensure the availability of jobs and drivers of change and renewal of other life areas. Success of the economic development of a region is seen from its economic growth. Economic growth indicator is seen from Gross Domestic Product (GDP). GDP is gross value added arising from all sectors of the economy in a given period. Value-added is difference between production value (output) and intermediate cost. Gross added value includes of income factor (wage and salary, interest, lease, and profit), net depreciation and indirect taxes (Ratag et al., 2016). Contribution of sectors to GDP shows that there is a gap in economic sectors. Intended gap is income gap and labor gap (Suryani, 2013). Therefore, role of sectors is expected to contribute revenue for economic development. Also, it is important to approach non-superior sector, so it becomes a subsystem in developing superior sector (Firman, 2008; Prawoto, 2010).

Agricultural sectors contribute to GDP, creation of employment opportunities, increasing public income, and acquisition of foreign exchange (Widyawati, 2017). It was reviewed from agricultural sector's contribution to GDP, not as a primary sector. Growth of agricultural sector in 2014 by 3.29, less than national growth (5.06) and other sectors. Industrialization process has resulted in a change in the role of agricultural sectors in Indonesian economy shown by a decrease in proportion of agricultural output. Comprehensively, agriculture sector is a development driver (engine of grow) which serves as a food security and raw material provider, saving foreign exchange derived from substitution product import, potential market by products' industry, transfer surplus labor to industry, capital provider for other sector development, and environmental service provider. Agricultural sector is still a main sector of job creation than other sectors. It is seen from percentage of labor absorption of 33.20% in Indonesia (Kembauw et al., 2015; Widyawati, 2017).

Contribution of agriculture sector is placed in the 3F framework of food, feed, and fuel. Food is a basic human need that is very essential because it contains of nutrients (carbohydrates, fat, proteins, vitamins, minerals, and water) that human needed to sustain the life. Given importance of food meaning, food is an important of human rights that must be fulfilled (Rosmawati, 2009; Lantarsih et al., 2011).

Efforts to increase farm productivity and fisheries to support food security then feed quality, quantity, continuity should be assured. Availability sustainable feed can drive growth of farms and fisheries. Waste and byproducts of agro industries that can be used for livestock include straw (rice and corn), tip of sugarcane, grains (peanuts and cowpea), tubers (cassava and sweet potato), oilseed meal (oil palm, cotton, and copra), mixture rice and bran (Pratiwi et al., 2015).

Energy needs continue to increase but more limited reserves of fossil energy and concern for environmental sustainability, because attention to renewable energy is increasing especially to renewable energy sources of agricultural. Almost all

commodities in agricultural can produce biomass, as a source of materials that can be transformed into renewable energy. Biomass is all organic ingredients that are relatively young and come from plants/animals; products and waste of cultivation industry (agriculture, plantation, forestry, animal husbandry, fisheries), which can be processed into bio-energy (Prastowo, 2007).

Based on the role of agriculture, Strategic plan of Agriculture Research and Development Agency (2010) contains that the Ministry of Agriculture has established a sustainable industrial-agricultural system of on-going local resources to improve food independence, value-added, export, and welfare of farmers. Vision of the Master strategy for agricultural development in 2013-2045 also emphasized the realization of a sustainable bio-industrial farming system that produces a variety of healthy food and high value-added products from agricultural and tropical marine biological resources. This shows that agriculture sector can reduce poverty while creating economic and employment growth (Pratiwi et al., 2015).

Agricultural sector is distinguished into five subsectors: food crops, plantation, fisheries, forestry, and livestock. The sector is not only food but includes commodities produced from five subsectors. Agricultural subsector according to Dumairy (1996):

1) Food crops subsectors are also often called people's agricultural subsectors because they are usually cultivated by people, not companies or governments. These subsectors include commodity commodities such as rice, soy, corn, cassava, cassava, peanut, mung beans and vegetables, and fruits.

2) Plantation subsectors are distinguished from people and large plantations. People's plantations are cultivated by people or society, usually on a small scale and with simple technology. Plantation crops consist of rubber, copra, tea, coffee, tobacco, clove, cardamom, cotton, chocolate, and various spices. Large plantations are all plantation activities run by legal plantation companies. Large plantation plants are mostly same as people's plantations covering rubber, palm oil, tea, coffee, tobacco, chocolate, sugarcane and many more.

3) Forestry subsector consists of three activities such as logging, harvesting of other forests and hunting. Logging activities resulted in logs, firewood, charcoal, and bamboo. Other forest products include resin, rattan, wood sap, bark, as well as various kinds of roots and wood bulbs.

4) Livestock subsector includes farm's activities and its results. These subsectors include production of large and small livestock, eggs, fresh milk, wool, and animal slaughtering.

5) Fishery subsector includes of marine fisheries, general waters, ponds, ponds, paddy fields, keramba, as well as simple processing of fishery products (salting and drying). Based on its technical terms of effort, this subsector

differentiated over three sectors: sea fisheries, land, and rake. This subsector not only includes fish commodities but also shrimp, crabs, jellyfish and such.

East Java is the largest industrial area in Indonesia. East Java Province was the second largest contributor to GDP (15.25%) after DKI Jakarta. Gross Regional Domestic Product (GRDP) East Java Province in 2018 reached IDR 1,563.76 trillion. Economic structure of East Java according to business field in 2018 is dominated by three: processing industry 29.73 percent; large and retail trade, car and motorcycle repairs 18.19 percent; agriculture, forestry, and fisheries 11.90 percent (BPS, 2019).

Contribution of agriculture in East Java Province is output 11.23%, gross value-added 15.88%, and income 17.24%. Agricultural sectors are also instrumental in the absorption of manpower. Most of East Java population depend on agriculture, but the labor absorption of this sector is decreasing. Agricultural sector's labor absorption in 2008 reached 43%, decreased to 42% in 2009 and 2010, and 39% in 2011 and 2012, and 25.96% in 2016 (BPS, 2014; Oktavia et al., 2016).

Input-Output Analysis has been carried out by several researchers at home and abroad. Analyze economy structure and determine key sectors to be developed in the Polish State. Based on Input-Output Tables for 1990, 1995 and 2000, there are five sectors included in superior category (high backward and forward linkages). Five sectors are: (1) textile; (2) ready-made clothing; (3) food, production and service sector construction; (4) agriculture, forestry, and fisheries, and (5) transparency (Gurgul and Majdosz, 2015). Kula (2008) analyzed economy structure and determination of Turkey's leading sector using 2002 Input-Output table (classifying 59 sectors). Analysis shows that there were 11 sectors that are recommended as leading sectors in Turkey: (1) agriculture, hunting and related services; (2) food and beverage products; (3) textiles, chemicals and chemical products; (4) other non-metallic mineral products; (5) base metals; (6) electricity, gas and hot steam energy; (7) wholesale and retail trade; (8) land transportation; (9) supporting and additional transportation services; (10) travel agent services; and (11) real estate. Botric (2013) identifies leading sector in Croatia. Based on the I-O table for 2004 (classification of 57 sectors), sectors with high backward linkages are: (1) electricity and (2) construction. Sectors had high forward linkages are: (1) processed foods, (2) processed tobacco, and (3) services.

Bekhet and Azlina (2010) analyzed relationship of energy sector to other sectors, especially agricultural sector in Malaysia. Based on I-O table in 1991 and 2000 (sectors are aggregated into 15 sectors), shows that energy sector had a strong relationship with agricultural sector. Agricultural has a very strong relationship with coal refined oil sector.

Astrini (2013) examined revitalization of agricultural sector in the economic development in East Java by input-output approach. As a result, sectors that have forward and backward linkage, as well as being a leading sectors in East Java

Province, were electricity, gas and water supply sector; financial sector, leasing, and company services.

Oktavia et al. (2016), indicating that agricultural sector contributed to output structure of 11.23%, gross value-added structure of 15.88%, revenue structure of 17.24%, and labor structure of 25.96%. The largest interconnectedness is other livestock of 1.46, while the most linkage of rice is 1.48. Agricultural sector's superior commodity: marine fish and other fishery products, land fish and other fishery products, rice, corn, vegetable, fruit, soybean, eggs, beef, chicken, fresh milk, other livestock, sheep and goat, sugarcane, tobacco.

Widyawati (2017) shows that processing industry and electricity, gas, and clean water sectors have a forward related to agricultural sector. Furthermore, electrical, gas, clean water; and building sector has a backward linkage to agricultural sector. Agricultural sector has a lower output multiplier impact than other sectors, while household income multipliers and employment opportunities have a greater multiplier impact than other sectors.

The contribution of this research is to assist the government in determining the right policies in the development of the agricultural sector. Policy making is carried out based on the results of backward linkage analysis, forward linkage, and analyze the economic impact that agriculture sector has caused based on the multiplier effect on the output, income, and absorption of labor in the Province of East Java, Indonesia.

2. Materials and Methods

Input-Output (I-O) analysis is a method that systematically measures relationship between several sectors in an economic system (BPS, 2015). Model I-O serves as superior sector for a region economic development. Superior sector is a sector that has high coverage and sensitivity capability (Haris et al., 2017). Analysis with model I-O based on a matrix-shaped table that presents information about transactions of goods and services (in monetary unit size, e.g. IDR) as well as interconnectedness between an economic activity in a region a certain period. Along I-O table, rows indicate an allocation of output generated by a sector to meet industry and final demand. Besides, value-added line shows a composition of sectoral added value creation, while along column indicates input structure used by each sector in production, both in input between and primary inputs (Firmansyah, 2006). Impact analysis is closely related to multiplier. Multiplier is a measurement of a response or impact of economic stimulus. Economic stimulus is generally assumed to be an increase in sales of one currency unit to final demand of a sector. Economic stimulus can be output, income or employment (Firman, 2008).

Data has been used I-O table of East Java Province year 2015 based on domestic transaction at producer price and has classification of 110 sectors (secondary data). Then, it has been aggregated into 14 sectors. Analysis consists of multipliers effects

and linkage. Matrix multiplier is inverse matrix that is used to connect final demand with output production. Steps to find inverse matrix element Leontief.

2.1. Create a Transaction Matrix

Input-Output Table of classification 110 sectors has been aggregated into 14 sectors.

2.2. Calculating Input Coefficient

$$a_{ij} = \frac{x_{ij}}{x_j} \quad (1)$$

Description:

i = 1, 2, 3

a_{ij} = i sectors technology derived from j sector

X_j = Total sector input j with $X_j > 0$ (IDR)

X_{ij} = Quantity of sector output i used as input by j sector (IDR)

The matrix is compiled as follows:

$$a_{11}x_{12} + a_{12}x_{12} + a_{13}x_{13} + F_1 = X_1$$

$$a_{21}x_{21} + a_{22}x_{22} + a_{23}x_{23} + F_2 = X_2$$

$$a_{31}x_{31} + a_{32}x_{32} + a_{33}x_{33} + F_3 = X_3$$

$$a_{n1}x_1 + a_{n2}x_2 + a_{n3}x_3 + F_n = X_n \quad (2)$$

If there is a change in final demand, there will be a change in national income. The equation is written as follows:

$$AX + F = X \text{ or } (I - A)X = F \text{ or } X = (I - A)^{-1}F \quad (3)$$

Description:

I = nxn identity matrix

F = Final demand

X = Output

(I-A) = Leontief matrix

$(I-A)^{-1}$ = Inverse Leontief matrix

2.3. Backward Linkage

Backward linkage is analyzed based on a sensitivity degree index. Backward linkage can be formulated by:

$$IDK = \frac{\sum i\, b_{ij}}{(\frac{1}{n}) \sum i \sum j\, b_{ij}} \quad (4)$$

Description:

IDK = Degree of sensitivity index

$\Sigma i\ b_{ij}$ = Number of input coefficients between/Leontief, which i = row sector

$\Sigma i\ \Sigma j\ b_{ij}$ = Number of input coefficients between/Leontief, which j = column sector

n = Number of sectors

Conclusion criteria:

IDK = 1: j sector backward linkage equals average linkage to all economic.

IDK > 1: j sector backward linkage is greater than average linkage behind entire economic.

IDK < 1: j sector backward linkage is smaller than average linkage behind entire economic.

Sectors are said to have a high degree of sensitivity when IDK > 1 or greater than average degree of entire economic. Sectors are said to have low sensitivity degrees when IDK is < 1.

2.4. Forward Linkage

Forward linkage analyzed by power index deployment that can be formulated mathematically:

$$IDP = \frac{\sum j\ b_{ij}}{(\frac{1}{n}) \sum i \sum j\ b_{ij}} \quad (5)$$

Description:

IDP = Deployment Power Index

$\Sigma j\ b_{ij}$ = Number of input coefficients between/Leontief, which j = column sector

$\Sigma i\ \Sigma j\ b_{ij}$ = Number of input coefficients between/Leontief, which i = row sector and j = column sector

n = Number of sectors

Conclusion criteria:

IDP = 1: i sector forward linkage equals average linkage all of sectors.

IDP > 1: i sector forward linkage is greater than average linkage all of sectors.

IDP < 1, i sector forward linkage is smaller than average linkage all of sectors.

Sectors are said to have high deployment power when IDP > 1 or greater than average deployment power all of sectors. Sectors are said to have low deployment power when the IDP is < 1. If IDK > 1 and IDP > 1, the sector is a key sector or can

be said as leading sectors, because it has a level of forward and high relation to the backward.

2.5. Output Multiplier

Output multiplier is total value of output generated by the economy to meet (or result) the change in a single unit of final demand. Magnitude of output multiplier for n^{th} sector is calculated from n^{th} column of Leontief inverse matrix for relevant economy, formulated by:

$$O_{ij} = \sum_{i}^{n} a_{ij} \quad (6)$$

Description:

O_{ij} = j sector output multiplier

a_{ij} = Element in Leontief inverse matrix

i = Row 1, 2, 3... n

2.6. Income Multiplier

Income multiplier occurs when there is a change (increase) in final demand of a sector that will also increase total revenue. Magnitude of this increased multiplication can be seen from income multiplier. Household income of a sector indicates the total amount of household income created due to add one unit of final demand money in the sector. Household income multiplier is translated as an increase in final demand in a household. If the multiplier is quoted with I_j then it can be written:

$$I_j = \sum_{i=1}^{n} a_{n+1,i} a_{ij} \quad (7)$$

Description:

I_j = Income multiplier sector j

$a_{n+1,i}$ = Value added section of wages/salary per total output

α_{ij} = Inverse matrix of Leontief

2.7. Labor Multipliers

Labor multipliers occur when there is a change in labor opportunity as a result of increased production. Magnitude of the effect can be taken into account from labor multiplier. The multipliers are the total effect of labor change in the economy due to a single unit of the final demand change in a sector. To be able to capture a change of final demand in a production sector against labor changes across the economy, the initial labor or workforce amount in each production sector is required has been used to perform production processes during this time. Data is used to calculate contribution of each worker, on average, in producing its respective sector outputs. If the average output value of each worker in sector j is quoted with wj, it is obtained:

$$W_j = \frac{l_j}{x_j}, \text{then } L_j = \Sigma W_j \, (I - A)^{-1} \quad (8)$$

Description:

W_j = Labor coefficient of a sector j

L_j = Labor multiplier figures

l_j = Total labor in sector j

x_j = Number of outputs in sector j

$(I\text{-}A)^{-1}$ = Inverse matrix of Leontief

3. Results and Discussion

The role of agricultural sector in East Java Province is seen from its attractiveness to the upstream sector (backward linkage), its driving force to the downstream sector (forward linkage), and its impact on final demand, and other sectors (multiplier effects) described the following.

3.1. Backward Linkage Agricultural Sector in East Java Province

Relations between economic sectors in the form of interconnectedness are relationship with raw material (Haris et al., 2017). This analysis shows ability of agricultural sectors that include subsectors of food crops, horticultural crops, plantation, forestry, and fisheries to attract growth economy of East Java. Backward linkage shows the effect of one unit money of final demand in agricultural sectors will increase input demand from all sectors. High-relation sectors mean the potential to increase production, which ultimately results in high output, reflected in the degree of sensitivity.

Degree of sensitivity is indicated by index. Sensitivity index demonstrates a degree of sensitivity of a sector to final demands of other sectors. This index is used to identify key sectors that can be developed (Hartono et al., 2015). A sector is said to have a high degree of sensitivity when IDK > 1 or greater than average degree of sensitivity of entire economic sector, vice versa (Malba and Taher, 2016). IDK and IDP per sector can be seen in Table 1.

According to Table 1, it is known that IDK agriculture sector of 0.795. Degree of sensitivity is below average of entire sector. It means that agriculture sector is not able to withdraw sectors so that the influence on the economic growth of East Java Province is also small. Agricultural sector has a high dependence on other sectors. According to (Pudjiastuti et al., 2013); (Pudjiastuti, 2014) and (Pudjiastuti and Kembauw, 2018), if this is left, there will be imports of high agricultural commodities and will disrupt the trade balance.

Table 1. Coefficient of Sensitivity Degree Index (IDK), and Distribution Power Index (IDP) of East Java Province, 2015

No.	Sector	IDK	IDP
1	Agriculture	0.795	0.803
2	Mining and excavation	1.102	0.850
3	Agricultural-based processing industry	**1.058**	**1.130**
4	Other processing industries	1.024	**1.139**
5	Procurement of electricity and gas	**1.236**	**1.150**
6	Water procurement, waste processing, and recycling	0.655	0.897
7	Construction	0.753	**1.096**
8	Large and retail trade, car and motorbike repair	**2.006**	0.811
9	Transportation and warehousing	0.926	**1.205**
10	Provision of accommodation and eating drinks	1.021	0.970
11	Information and communication	**1.925**	0.906
12	Financial services and insurance	0.943	0.919
13	Real estate	**1.294**	0.834
14	Other services	0.736	**1.082**
Total		**15.472**	**13.790**
Average		**1.105**	**0.985**

Source: East Java Province Input-Output Table 2015, processed

Therefore, to increase agricultural output, the key sectors developed for economic growth are major trading and retail sectors, car and motorcycle repair, information and communication, real estate, electricity procurement and gas, and agricultural-based processing industries. The results of this study are in line with several research results which show that the agricultural sector is not a leading sector based on backward linkages. Botric (2013) research in Croatia has found that the sectors with high backward linkages are electricity and construction. Astrini (2013) examined revitalization of agricultural sector in the economic development in East Java by input-output approach. As a result, sectors that have forward and backward linkage, as well as being a leading sectors in East Java Province, were electricity, gas and water supply sector; financial sector, leasing, and company services. Different from Kula's research (2008) which shows that agricultural sector is a leading sector in Turkey. It proves that agricultural sector is not a leading sector in East Java.

Sectors that have a high degree of sensitivity (IDK > 1) in East Java Province are:

1) Wholesale and retail trade, car and motorcycle repair (2.006)

2) Real estate (1.294)

3) Electricity and gas (1.236)

4) Agriculture-based manufacturing industry (1.058)

It means that the sectors can attract other sectors including agriculture sector to increase their output. Therefore, development driving by the sectors will have an impact on the development of agriculture sector in East Java Province. These results are in line with (Widyawati, 2017) that sectors that had a backward linkage to agricultural sector were electricity and gas, clean water and real estate.

Identification of a sensitivity index of more than 1 (> 1) or high, means that these sectors were able to attract other sectors including the agricultural sector to increase output. Therefore, developing in these sectors will have an impact on the development of agricultural sector. These results are in line with (Gurgul and Majdosz, 2005; Botric, 2013); and Widyawati, 2017) that the sectors that have a backward linkage to the agricultural sector are electricity and gas, water and real estate, textile, apparel, as well as production and services of construction sector.

3.2. Forward Linkage Agricultural Sector in East Java Province

Relations between sectors in the form of forward linkage that is relationship with sale of goods and services (Haris et al., 2017). Forward linkage analysis demonstrated ability of agricultural sectors to promote growth of all upstream and downstream sectors in East Java Province. The future interconnectedness shows the effect of the rising in one unit final demand in agricultural sector unit that can increase the total output of all sectors. Sectors that have a high forward linkage indicate that they can produce high outputs that ultimately increase the growth of other sectors in East Java Province.

Degree of forward linkage is indicated by Deployment Power Index. The index shows deployment of sector power to final demand in other sectors. It is used for determining key sectors that can be developed (Hartono et al., 2015). A sector is said to have a high power of deployment when IDP > 1 or greater than average sensitivity index of entire sector, vice versa (Malba and Taher, 2016).

Based on Table 1, it is known that the IDP agriculture sector has a value of less than 1 (< 1) and less than the average spread of entire sector power index 0.803. It means that agricultural sector has not been able to fulfill the demand for use as inputs by other sectors. Agricultural output is used as inputs for other sectors. Agriculture sector has not been able to promote growth of downstream sectors in East Java Province.

Sectors that have a high deployment power (IDP > 1) in the province are:

1) Transportation and warehousing (1.205)

2) Procurement of electricity and gas (1.150)

3) Other processing industries (1.139)

4) Industrial agricultural-based processing (1.130)

5) Construction (1.096)

6) Other services (1.082)

Deployment Power Index more than 1 or high means that agricultural sector (in production output distribution), mostly used as inputs by other sectors. Therefore, development in transportation and warehousing, procurement of electricity and gas, other processing industries, agricultural-based processing industries, construction, and other services will have an impact on agricultural sector development.

Overall, agricultural sector has a total degree of sensitivity index (IDK) 15.472 greater than distribution power index (IDP) 13.790. The results are inversely proportional to (Diyana et al., 2008) and (Ropingi and Alusi, 2006) which concluded that food sector has a forward linkage greater than backward linkage. This proves that there has been a transformation in the role of agricultural sector. The transformation is food crop agriculture sector initially played a role as a driving sector turning into a pulling sector. It is occur because use of inputs continues to increase but output not. Increased in production requires high seed input and high fertilizer. High input requirements cause the industry sector to provide superior seeds and fertilizers continues to grow. That is, the food crop agriculture sector attracts industry sectors that provide superior seeds and fertilizers.

The dependence of food crop on fertilizer is higher because land fertility is decreasing. Organic matter levels in intensively managed agricultural centers contain <2% organic material (Suriadikarta and Simanungkalit, 2006). In addition, agricultural land near the mining industry center has been polluted by industrial waste, especially heavy metals (lead, mercury, copper, cadmium, arsenic, nickel and chromium). Land contaminated with heavy metals is difficult to restore. It requires a large cost and a long time to recover (Handayanto et al., 2017).

Intensification must be accompanied by extensification so that food crop productivity increases. However, extensification is a difficult problem because of agricultural land conversion (especially food crops). Narrowing of agricultural space has implications for the decline in food production and in the long run will affect food security. Transfer of agricultural land functions is a threat to development of food commodities (Wijaya, 2017).

On the other hand, agriculture-based processing industry continues to grow. Increasing demand for agricultural commodities causes an imbalance between supply and demand, so that dependence on imported food will be even greater (Fagi, 2013). It shows that a role of food crop as an input provider cannot be replaced, but has not been able to be a driver for the growth of other sectors in East Java Province.

3.3. Role Agricultural Sector based on Output Multiplier

Output multiplier indicates that every final demand change is one unit of money, it will increase output of entire sector (Wijaya et al., 2014). Based on analysis of output multiplier (Table 2), agricultural sectors in East Java Province seen that agricultural sector is low (rank of 14). The value of 1.259 means that any change in

final demand of one IDR in agricultural sectors will increase output of all sectors (including agricultural sectors) of 1,259 IDR. Agricultural sector can stimulate or encourage additional low output in East Java Province. This results following (Widyawati, 2017) which concluded that ability of agriculture sector encourages additional output in Indonesian is very low.

Table 2. Output Multiplier, Income Multiplier, and Labor Multiplier of East Java Province, 2015.

Numb	**Sector**	**Output Multiplier**		**Income Multiplier**		**Labor Multiplier**	
		Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**
1	Agriculture	1.259	14	1.203	12	1.094	14
2	Mining and excavation	1.326	11	1.374	9	6.536	2
3	Agricultural-based processing industry	1.764	3	3.093	2	4.846	3
4	Other processing industries	1.763	4	2.792	3	2.812	4
5	Procurement of electricity and gas	1.794	2	13.749	1	13.472	1
6	Water procurement, waste processing, and recycling	1.400	10	1.191	13	1.255	12
7	Construction	1.711	5	1.549	6	1.647	6
8	Large and retail trade, car and motorbike repair	1.265	13	1.117	14	1.142	13
9	Transportation and warehousing	1.880	1	1.684	5	2.739	5
10	Provision of accommodation and eating drinks	1.513	7	1.343	10	1.627	7
11	Information and communication	1.413	9	1.342	11	1.441	10
12	Financial services and insurance	1.434	8	1.411	8	1.534	9
13	Real estate	1.301	12	1.968	4	1.316	11
14	Other services	1.689	6	1.468	7	1.581	8

Source: East Java Province Input-Output Table 2015, processed

Lack of agricultural sector contribution to additional output is caused by limitations of facilities and infrastructure. Equipment used by farmers in production activities is still simple or traditional so that output produced is low. The low capital of farmers in accessing production facilities (fertilizer, seeds/seeds superior, pay lease land) to produce both base and non-base commodities (Widyawati, 2017).

Main problem faced in agricultural development is the function of productive agricultural land to non-agriculture (Tuminem et al., 2019). Comprehensive regulatory devices relating to land protection and efforts to grant incentives to farmers have been made but land conversion remains high. Land control based on BPS data of East Java Province in the span of 4 years since 2012-2014, there is 4400 ha of agricultural land that switch function into an industrial sector. It leads to a narrowing of agricultural space that implicates production of agricultural commodities decreases, even in the long term it affects food security. Conversion of farm land to non-farm is a threat to development of excellent food commodities (Wijaya, 2017). According to (Fagi, 2013) over productive land, function causes an imbalance between supply and demand, and depend on imported food will be greater.

Sectors that have high output multipliers based on Table 2, sorted from the rank of 1-5:

1. Transportation and warehousing sector (1.880)

2. Procurement of electricity and gas (1.794)

3. Agricultural-based processing industries (1.764)

4. Other processing industries (1.763),

5. Construction (1.711).

This means that any change in the final request of 1 unit of money in the relevant sectors (transportation and warehousing, procurement of electricity and gas, agricultural-based processing industries, other processing industries, construction) will be increase the output of the entire economic sector amounting to 1.880 units of rupiah transportation and warehousing, 1.794 units of rupiah of electricity and gas, 1.764 units of the industrial-based processing of agriculture, 1.763 units of other industrial processing rupiah, and 1.711 rupiah unit of construction. This sector can stimulate or encourage the addition of high output in the economy of East Java Province. This results following (Widyawati, 2017), that the ability of the procurement sector of electricity and gas, construction, and transportation and warehousing encourages additional output in the Indonesian economy is very high.

3.4. Role of Agriculture based on Income Multiplier

Income multiplier is an increase in revenue due to changes in output. In I-O table, incomes are wages or salaries received by households. The multiplier indicates that every final demand change of one unit of money in a sector will increase income of entire sector (Anas, 2015).

Based on the analysis (Table 2), income multiplier of agriculture sector in East Java was 1.203. It means that any change in final demand was one IDR on agricultural sector will increased income of all sectors (including agricultural sector) of 1.203 IDR. Agricultural sector can stimulate or encourage additional low income than other sectors in East Java Province.

The low agricultural sector contribution to additional income was caused by the function of agricultural land which implicates on employment in agriculture sector. Limitations of employment in agricultural resulted in farmers move to other sectors or becoming unemployed. The main problem in agricultural development is the transformation land of productive agricultural to non-agricultural. This causes a narrowing of agricultural space which results in low productivity of agricultural commodity production and decreases in farmers' income (Tuminem et al., 2019).

Sectors that had high income multiplier in East Java Province are:

1) Electricity and gas (13.749),

2) Agricultural-based processing industries (3.093),

3) Other processing industries (2.792),

4) Real estate (1.968),

5) Transportation and warehousing (1.684).

It means that any change in final demands of one IDR in the sectors will be increased income by 13.749 IDR in electricity and gas, 3.093 IDR in agricultural-based processing industry, 2.792 IDR in other industrial processing, 1.968 IDR in real estate, and 1.684 IDR in transport and warehousing. These sectors can stimulate or encourage additional high revenues in East Java Province. This results following (Widyawati, 2017) that ability of electricity and gas contributes greatly to increase revenues in Indonesian economy.

3.5. Role of Agriculture based on Labor multiplier

A production activity is not separated from labor factor because it can affect to output and final demand. Final demand demonstrates impact of labor needs. Labor multiplier is a change in labor that caused initial change from output side. Impact of final demand on labor is done by measuring workforce coefficient. The multiplier indicates that every final demand change of one unit of money in a sector will increase the employment of entire sector by the number of labor multipliers generated by a sector. The result of analysis of labor multiplier can be utilized for the labor absorption in each sector. The higher labor multipliers in a sector shows the higher power absorption in sector concerned because more labor required to produce one IDR output (Suryani, 2013; Haris et al., 2017).

Based on the results, the agricultural sector's labor multiplier by 1,094 is ranked 14th in East Java Province. It shows that to produce one IDR output required 1,094 labor in agricultural sectors. This sector's ability to absorb labor is very low compared to other sectors. The results of this research correspond to (Haris et al., 2017) and (Astrini, 2013) which concluded that agricultural sector is not a leading sector in the structure of output and the linkage between the upstream and downstream sectors. Low labor absorption is caused by land function change (Tuminem et al., 2019). Land conversion resulted in the threat of food resistance, loss of farmer livelihood and then unemployment (Director General of Agriculture and agricultural facilities, 2020). In the long term, it will be affect food security.

Sectors that can induce high labor in East Java Province are:

1) Electricity and gas (13.472)

2) Mining and excavation (6.536)

3) Agricultural-based processing industries (4.846)

4) Other processing industries (2.812)

5) Transportation and warehousing (2.739).

It means that any change in final demand of one IDR will increase workforce demand of all sectors as much as 13.472 labor; 6.536 labor; 4.846 labor; 2.812 labor; and 2.739 labor. These sectors can absorb high manpower in the economy of East Java Province.

4. Conclusion

Role of agricultural sector in East Java has changed based on backward linkage, forward linkage and multiplier effect. Degree of sensitivity index (backward linkage) of the sector is 0.795, below average index of entire sector. Agricultural spread power index (forward linkage) is 0.803, lower than average of index all sectors. It means that agricultural sector has not been able to attract upstream sectors and drive downstream sectors in the economic growth of East Java Province.

Output multiplier, income multiplier, and labor multiplier in agricultural sector is lower than other sectors. These multipliers of agricultural sector respectively, i.e. 1.259, 1.203, and 1.094. It indicates that agricultural sector serves as a supporting sector instead of leading in East Java Province.

Policy recommendations that can be suggested to the government that are the government continues to complement the infrastructure of facilities and infrastructure and provide subsidies so as to increase output in the agricultural sector. Protection of perennial agricultural land comprehensively by improving the welfare of farmers so that land conversion does not occur

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