Agriculture Sector Analysis in Central Java
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Abstract. The purpose of this research attempt to analyze the linkages of the agriculture sector with others and to analyze the ability of the agriculture sector as a driver of growth, driving income and creating employment in Central Java using the input-output analysis and the multiplier analysis. Research data use Input-Output Table from Central Java 2008 and 2013. The findings of this research are (1) the agriculture sector has a linkage with other and the highest linkage with the agriculture sector, (2) the agriculture sector can not drive an output growth but the agriculture sector can drive income and encourage employment in Central Java.

1. Introduction

There is two assumptions about the agriculture sector. First, the agriculture sector has a unique characteristic emerged in its contribution as economic activity, the producer of food and as a livelihood for most people. Second, the other side, the agriculture sector considered a traditional way to boost economic performance [11]. Both of these assumptions are not entirely wrong. As we know, the agriculture sector is a primary sector that acts as a buffer for food needs in a region. Based on the role of the sector in contributing to the Gross Regional Domestic Product (GDRP), the distribution of the agriculture sector to the GDRP has declined. In 2005, the agriculture sector had a percentage distribution of GDRP is 20.92 percent and declined in 2013 to around 16.81 percent (BPS, various years).

![Figure 1. The Percentage Distribution Agriculture Sector in GDRP](source)

The percentage of distribution that has continued to decline has made the position of the agriculture sector as a driver of economic activity in Central Java questionable. It still relevant depends on the agriculture sector in the future or not. This capability will examine the role of the agriculture sector with other sectors in the economy. In the sector-based economic activity, the relationship between the supply of output and demand for inputs from each sector needs to consider [10]. It means that the economic sector cannot develop if it does not get support from the others. For example, the agriculture sector needs fertilizer to grow crops and restaurant need raw material from the agriculture sector to make some food.
The input-output movement of a sector depicted in the Input-Output Table. The input-output table describes a production process or use of goods and services from the economic sector in generating added value for the economy [8]. From the framework of input-output, we can measure the intersectoral linkage like forward and backward linkage [5]. A forward linkage describes the use of output as intermediary input and a backward linkage describes the use of input to the production process [6]. Not only to measure the linkages, from a framework of input-output we can compute a multiplier effect. Generally, multiplier analysis will focus to determine income, output, and employment multiplier [1].

This research will analyze the role of the agriculture sector in Central Java using input-output analysis and to analyze whether the agricultural sector is still relevant as a driving force for output growth, boosting people's income and creating employment in Central Java.

2. Material and Method

Input-Output Table for Central Java 2008 and 2013 used as data in this research. Data obtained from the Central Bureau of Statistics Indonesia (BPS) Central Java and Development Planning Agency at Sub-National Level (Bappeda) Central Java. In this research, the economic sector aggregate from 88 classification sectors to 9 classification sectors and the agricultural sector divided into 28 sub-sectors agriculture. Interindustrial linkage analysis will analyze the linkages of the agricultural sector to other sectors economic. Interindustrial linkage analysis using calculations and formulation the forward linkage [9]:

\[ Vi = \frac{G_i}{n} \]

The backward linkage can be calculated using the following formula:

\[ Vi = \frac{B1}{n} / B \]

G we called Ghost matrix, where \( G = (1 - F)^{-1} \), with \( F \), is the matrix of row coefficients derived from the intermediate consumption matrix and \( n \) is the number of sectors. \( B \) is the Leontief inverse matrix, \( B1 \) is average of all elements of \( B \) and is the sum of a typical column. Using interindustrial linkage analysis can detect the key sectors [7]. The indicator for the key sector is the value forward and backward linkage must higher than 1. The formula is:

\[ NBL = nBLi / \sum BLi \]

Where \( NFL = nFLi / \sum FLi \) is vector value for backward linkage, \( NBL = [BLi] \) is vector value for forward linkage, and \( n \) is a number of sectors in the table.

Analysis of output, income, and employment multiplier will examine the role of the agricultural sector as an output booster, income booster and creator of employment. Formulates the output multiplier calculation as follows [4]:

\[ \Pi = \ell (\frac{1}{A} - A)^{-2} \]

income multiplier can calculate using the formulation:

\[ \Pi = h (\frac{1}{A} - A)^{-1} \]
the formulation for employment multiplier:

\[ \bar{I} = w' \left( I - \bar{A} \right)^{-1} \]

\[ \left( I - \bar{A} \right)^{-2} \]

represents a Leontief inverse matrix. Symbol \( \bar{w} \), \( \bar{I} \), and \( \bar{I} \) represents output multiplier, income multiplier, and employment multiplier.

3. Result and Discussion

Based on IO Table 2008 and 2013, the result of the analysis shows the agriculture sector has the highest linkage with the agriculture sector. From Table 1, based on IO 2008 the forward and backward linkage is 1,105. Whereas based on IO 2013, the forward and backward linkage is 1,099. These results represent that the agriculture sector has an ability not only to provide output but also an input for the agriculture sector. The agriculture sector, which consists of 28 agriculture sub-sectors, complete each other to comply with the input and output in the production process. From 28 agriculture sub-sectors, one agriculture sub-sector require input from the upstream sector (other agriculture sub-sectors) to produce an output, which it (an output) will use for the downstream sector (other agricultural sub-sectors).

The agriculture sector has forward and backward linkage with others sector economy, but the result show that the value lower than 1. One has the highest from the lower is the manufacturing industry. Based on IO 2008, the forward linkage is 0.127 and the backward linkage is 0.211 and using IO 2013, the forward linkage is 0.177 and the backward linkage is 0.220. The linkages between the agriculture sector with manufacturing industry more higher at backward linkage than forward linkage. This condition shows that it has highly linkage to sustain the upstream sector for the manufacturing industry. The result forward and backward linkage from the agriculture sector provide in Table 1.

Table 1. Forward and Backward Linkage Agriculture Sector

| Sector                      | IO 2008         | IO 2013         |
|-----------------------------|-----------------|-----------------|
|                             | Forward Linkage | Backward Linkage | Forward Linkage | Backward Linkage |
| Agriculture                 | 1,105           | 1,105           | 1,099           | 1,099            |
| Mining and Quarring         | 0.019           | 0.026           | 0.032           | 0.023            |
| Manufacturing Industry      | 0.127           | 0.211           | 0.177           | 0.220            |
| Electricity, Gas and Water  | 0.003           | 0.111           | 0.005           | 0.053            |
| Supply                      | 0.007           | 0.127           | 0.009           | 0.124            |
| Construction                | 0.041           | 0.067           | 0.050           | 0.060            |
| Trade, Hotel, and Restaurant| 0.017           | 0.076           | 0.024           | 0.075            |
| Transport and Communication | 0.012           | 0.023           | 0.019           | 0.017            |
| Financial, Ownership and Business Services | 0.006 | 0.086 | 0.010 | 0.064 |

Source: IO Table of Central Java 2008 and 2013, data processed
Table 2 shows the role of the agricultural sector in Central Java in spurring growth, income, and employment creation. Based on table 2, using IO 2008, the output multiplier is 1,338 and the output multiplier below the overall average value of all the sector with 1,797. The result using IO 2013, the output multiplier is 1,428. This value is still below the average multiplier output value of the entire sector economy with 1,788. Output multiplier in 2008 smaller than output multiplier in 2013.

This condition indicates that the agricultural sector in Central Java cannot rely upon as a booster of growth. The agriculture sector is not reliable in increasing output in Central Java because much productive agriculture lands that change function as a settlement or the others. Not only that, the production process in the agriculture sector still uses traditional methods so that it affects the output produced by the agriculture sector.

The analysis of income and employment multiplier are above the overall value of the economic sector. The result of the analysis input-output 2008, show the income multiplier is 0.105. It's valued smaller than income multiplier using IO 2013 is 0.126. The analysis of income and employment multiplier are above the overall value of the economic sector. The result of the analysis input-output 2008, show that the income multiplier is 0.105. Using IO 2013, the income multiplier is 0.126. It's valued smaller than income multiplier using IO 2013. Whereas the employment multiplier using IO 2008, the employment multiplier is 0.055 and the result with IO 2013 is 0.029.

| Table 2. Output, Income, and Employment Multiplier |
|-----------------------------------------------|
| **IO 2008**                                   |
| Sector | Output Multiplier | Income Multiplier | Employment Multiplier |
|--------|------------------|------------------|----------------------|
| Agriculture | 1,338          | 0,105            | 0,055                |
| Mining and Quarring | 1,357          | 0,245            | 0,025                |
| Manufacturing Industry | 2,027          | -0,194           | -0,021               |
| Electricity, Gas and Water Supply | 2,381          | 0,068            | 0,000                |
| Construction | 2,208          | 0,117            | 0,014                |
| Trade, Hotel, and Restaurant | 1,685          | 0,068            | 0,020                |
| Transport and Communication | 1,953          | 0,096            | 0,009                |
| Financial, Ownership and Business Services | 1,445          | 0,045            | 0,006                |
| Services | 1,777            | 0,451            | 0,028                |
| **Rata-rata** | **1,797** | **0,111**        | **0,015**            |

| **IO 2013**                                   |
| Sector | Output Multiplier | Income Multiplier | Employment Multiplier |
|--------|------------------|------------------|----------------------|
| Agriculture | 1,428          | 0,126            | 0,029                |
| Mining and Quarring | 1,354          | 0,185            | 0,006                |
| Manufacturing Industry | 2,019          | -0,159           | -0,011               |
| Electricity, Gas and Water Supply | 2,195          | 0,059            | -0,001               |
| Construction | 2,234          | 0,098            | 0,006                |
| Trade, Hotel, and Restaurant | 1,688          | 0,092            | 0,011                |
| Transport and Communication | 1,997          | 0,116            | 0,004                |
| Financial, Ownership and Business Services | 1,399          | 0,050            | 0,006                |
| Services | 1,774            | 0,423            | 0,019                |
| **Rata-rata** | **1,788** | **0,110**        | **0,008**            |

Source: IO Table of Central Java 2008 and 2013, data processed

These results indicate the agricultural sector able to boost the revenue and the creation of employment in Central Java. The role of the agriculture sector as a booster for job creation is in line with the ability of the agricultural sector to absorb high employment. A large number of workers in the agriculture sector is due to some agriculture sub-sectors that do not require special education to
work in the agriculture sector. It is quite easy to enter or work in the agriculture sector, especially in the traditional agriculture sector, is also the reason why agriculture sector can absorb high employment. As a sector with high employment absorption, it has an impact on the ability of the agriculture sector to spur increased income for the household. The form of remuneration received by workers in the agricultural sector is wages/salaries. Wages/salaries received will cause an increase in income household.

4. Conclusion
   An analysis of input-output 2008 and input-output 2013 showed the same results about agriculture sector conditions in Central Java. The agriculture sector has a forward and backward linkage with other and the highest linkage with the agriculture sector. From the result, we can get the conclusion that the agriculture sector cannot be relied upon as a driver of economic growth but can be encouraging income and creating employment.

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