The role of agriculture, forestry and fishery sector in the development of Malinau District (location quotient and shift share approach)

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Abstract. This study aims to reveal the role, the role changes in the future, and the causative factors of these changes in the sector and each subsector of Agriculture, Forestry and Fishery in Malinau District. The basic method of this study was descriptive method. The analytical tool used were Location Quotient (LQ), Dynamic Location Quotient (DLQ) and Shift Share. This study was located in Malinau District, North Kalimantan Province. The types of data used were secondary data in the form of Gross Regional Domestic Product (GRDP) on the basis of constant prices in 2010 of Malinau and North Kalimantanin 2012-2016. The results show that the Agriculture, Forestry and Fishery sector in Malinau District is a non-basis sector with an average LQ <1 of 0.76. The basic subsector in Malinau District is the Forestry and Logging subsector with an LQ> 1 value of 136,269.17. Based on a combined analysis of LQ and DLQ, the sectors of Agriculture, Forestry and Fishery have not undergone a role change where the sector remains a non-basis sector at present and in the future. While the subsectors of Agriculture, Animal Husbandry, Agricultural Services and Hunting and the Fishery become the basis subsector and the Forestry and Loggingsubsector becomes the non-basis subsector in the future.

1. Introduction

National economic development aims to create a fair and prosperous society. One of the economic sectors which become the main priority in national economic development is the Agriculture, Forestry and Fishery sector. The agricultural sector is the biggest support of Indonesia's economy, where almost all of Indonesia's economic activities are centered on the agricultural sector. This can be seen in the formation of GDP, foreign exchange earnings, employment, food supply, and supply of industrial raw materials [1]. Malinau District is one of the districts located in the youngest province in Indonesia, namely North Kalimantan. Based on the data from Central Bureau of Statistics (BPS) of Malinau District in 2016, the economic sector that provides the largest contribution is the Mining and Excavation sector with the main coal output, which accounts for around 52% of the GRDP [2]. This condition reflects that Malinau District in its regional economy relies heavily on the economic sector with non-renewable resources. Therefore, Malinau District must develop the economic sector with the use of long-term or sustainable resources, namely the Agriculture, Forestry and Fishery sector. It is important for Malinau District to know the role, the role changes, and the causative factors of the changes in the roles of the sectors and each subsector of Agriculture, Forestry and Fishery in the
development of their regions. This is in line with one of the Malinau District's missions, namely increasing the role of Agriculture, Forestry and Fishery sectors in the regional economy. Through this research Malinau District is expected to be able to take policies in the Agriculture, Forestry and Fishery sectors as well as an evaluation of the policies that have been carried out, so that in the future Malinau District has a leading sector with long-term use of resources, while preserving the environment.

2. Research Method
This study used secondary data in the form of time series data, namely the Gross Regional Domestic Product (GRDP) of Malinau District and North Kalimantan Province based on the 2010 constant price throughout the year of 2012 to 2016, and other sources relevant to this study. These data were obtained from the Central Bureau of Statistics (BPS) of the Malinau District and North Kalimantan Province. The location of the study was chosen deliberately / purposively namely Malinau District with the consideration that Malinau District had one mission to increase the role of the Agriculture, Forestry and Fishery sectors in the regional economy, in addition to this is because Malinau District is the border district of Indonesia - Malaysia. The analytical tool used in this study were:

2.1. Location Quotient (LQ)
The LQ analysis is a comparison of the magnitude of the role of the sector / industry in an area towards the magnitude of the role of the sector / industry nationally. The LQ analysis in this study was used to determine the position of the sectors and the respective subsectors of Agriculture, Forestry and Fishery in Malinau District [3]. The formula of LQ is:

\[ LQ = \frac{X_r / RV_r}{X_n / RV_n} \]

Information:
- \(X_r\) = GRDP of the Agriculture, Forestry and Fishery sector or the GRDP of the subsectors in Malinau District in a given year
- \(RV_r\) = Total GRDP or total GRDP of Agriculture, Forestry and Fishery sector in Malinau District
- \(X_n\) = GRDP of the Agriculture, Forestry and Fishery sector or the GRDP of the subsectors in North Kalimantan in a given year
- \(RV_n\) = Total GRDP or total GRDP of Agriculture, Forestry and Fishery sector in North Kalimantan

From the Location Quotient (LQ) analysis, there are two criteria that will be generated:
- \(LQ > 1\), means that the sector/subsector is the basis sector, which means it is able to meet the needs of local communities and the surplus is exported outside the region.
- \(LQ < 1\), means that the sector/subsector is the non-basis sector, which means it is unable to meet the needs of local communities and the deficits imported from outside the region.

2.2. Dynamic Location Quotient (DLQ)
Dynamic Location Quotient (DLQ) analysis is carried out by introducing the growth rate with the assumption that each sector value added and GRDP has an average growth rate per year on its own over a period of time (0) and year (t) [4]. The DLQ analysis in this study was used to find out whether the sectors and the respective subsectors of Agriculture, Forestry and Fishery in Malinau District experienced a change of role in the future. The formula for DLQ analysis is as follows) [4]:
\[ DLQ_{ij} = \frac{\left(1 + g_{ij}/(1 + g_j)\right)^t}{(1 + G_i)/(1 + G)} \] 

Information:
- \( DLQ_{ij} \): Potential index of Agriculture, Forestry and Fishery sector / subsector
- \( g_{ij} \): Average growth rate of Agriculture, Forestry and Fishery subsector in Malinau District
- \( G_j \): Average growth rate of total GRDP/GDRP of Agriculture, Forestry and Fishery sector in Malinau District
- \( G_i \): Average growth rate of GDRP of Agriculture, Forestry and Fishery sector/subsector in Malinau District
- \( G \): Average growth rate of total GDRP/GDRP of Agriculture, Forestry and Fishery sector in North Kalimantan
- \( t \): the research period

From the Dynamic Location Quotient (DLQ) analysis, there are two criteria that will be generated:
- \( DLQ > 1 \), means that the sector / subsector of Agriculture, Forestry and Fishery in Malinau District is estimated to be the basis sector / subsector in the future.
- \( DLQ < 1 \), means that the sector / subsector of Agriculture, Forestry and Fishery in Malinau District is estimated to be non-basis sector / subsector in the future.

2.3. Combined Analysis of Location Quotient (LQ) and Dynamic Location Quotient (DLQ)
A combination of Location Quotient Analysis (LQ) and Dynamic Location Quotient (DLQ) analysis is used to determine how changes in roles occur in the sector and subsector of Agriculture, Forestry and Fishery in Malinau District) [5]. There are four criteria resulting from this combination of analysis, namely:
- \( LQ > 1 \) and \( DLQ > 1 \), means that Agriculture, Forestry and Fishery sector/subsector remains basis both in the present and in the future.
- \( LQ > 1 \) and \( DLQ < 1 \), means that the sector/subsector of Agriculture, Forestry and Fishery will has changed position from basis to non-basis in the future.
- \( LQ < 1 \) and \( DLQ > 1 \), means that the sector/subsector of Agriculture, Forestry and Fishery will has changed position from non-basis to basis in the future.
- \( LQ < 1 \) and \( DLQ < 1 \), means that Agriculture, Forestry and Fishery sector/subsector remains non-basis both in the present and in the future.

2.4. Shift Share
Shift share analysis in this study is used to determine the factors that cause role changes that occur in the sector and each subsector of Agriculture, Forestry and Fishery in Malinau District. The formula for Shift Share analysis is as follows) [6]:

\[ TSS = SSS + LSS \]
\[ SSS = \sum (g_{n} - g_{in})X_{ino} + \sum (G_{i} - G)X_{ino} \]
\[ LSS = \sum (g_{in} - G_{i})X_{ino} \] 

Information:
- \( TSS \): Total Shift Share
- \( SSS \): Structural Shift Share
- \( LSS \): Locational Shift Share
- \( g_{n} \): Average growth rate of total GRDP / GRDP of Agriculture, Forestry and Fishery sector in Malinau District
- \( g_{in} \): Average growth rate of GRDP of Agriculture, Forestry and Fishery sector / subsector in Malinau District
Gi = Average growth rate of GRDP of Agriculture, Forestry and Fishery sector / subsector in North Kalimantan Province
G = Average growth rate of total GRDP / GRDP of Agriculture, Forestry and Fishery sector in North Kalimantan Province

From this analysis, there are two criteria that will be generated:
SSS > LSS, means that the most determining factor on the occurrence of changes in Agriculture, Forestry and Fishery sector and subsector in Malinau Districts the factor of its economic structure.
SSS < LSS, means that the most determining factor for the change of sector and subsector of Agriculture, Forestry and Fishery in Malinau District is the location factor.

3. Result and Discussion

3.1. Location Quotient (LQ)
The results of the LQ analysis for the sector and respective subsectors of Agriculture, Forestry and Fishery in Malinau District can be seen in Table 1.

| Sector/Subsector | Year | Average of LQ | Info. |
|------------------|------|---------------|-------|
| Agriculture, Forestry and Fishery Sector | 2012 | 0.91 | Non Basis |
| 1. Agriculture, Animal Husbandry, Hunting and Agricultural Services | 2013 | 0.83 | Non Basis |
| | 2014 | 0.90 | | |
| | 2015 | 0.93 | | |
| | 2016 | 0.93 | | |
| | | 0.89 | | |
| Agriculture, Animal Husbandry, Hunting and Agricultural Services | | 0.76 | | |
| | | 0.91 | | |
| | | 0.81 | | |
| | | 0.73 | | |
| | | 0.69 | | |
| | | 0.69 | | |
| | | 0.76 | | |
| Forestry and Logging | 2012 | 0.06 | Non Basis |
| 2. Forestry and Logging | 2013 | 0.06 | Basis |
| | 2014 | 0.07 | | |
| | 2015 | 0.07 | | |
| | 2016 | 0.07 | | |
| | | 0.07 | | |
| | | 0.07 | | |
| | | 0.07 | | |
| | | 0.07 | | |
| | | 0.06 | | |
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| | | 0.06 | | |
| | | 0.06 | | |

Source: Secondary Data Analysis

Based on the Location Quotient (LQ) analysis in the sectors of Agriculture, Forestry and Fishery throughout 2012-2016, the LQ value tends to decrease with an average LQ < 1 value of 0.76. This means that the sector of Agriculture, Forestry and Fishery is non-basis sector which means that this sector is unable to meet the needs of local communities so that these needs are obtained from outside the region. Several factors that cause the Agriculture, Forestry and Fishery sector to become a non-basis sector are due to geographical conditions that are different from other regions, infrastructure that is not evenly distributed [7] so that it has an impact on the high prices of agricultural inputs to farmers. The high price of inputs affects the output prices of agricultural products which tend to be high so that it is difficult to compete with agricultural products from other regions [8]. Based on the LQ analysis of each of the Agriculture, Forestry and Fishery subsectors, the Agriculture, Animal Husbandry, Hunting and Agricultural Services subsector has an LQ value that tends to increase throughout 2012-2016, but the resulting average value of LQ < 1 is 0.89. At present, Malinau District is improving food security through rice field generating programs, by providing assistance to farmers in the form of seeds, and irrigation facilities and infrastructure in the form of ponds. However, this is considered less than optimal considering that there are still many obstacles faced by farmers, namely pests and diseases that attack crops, especially rice, and the high price of inputs to farmers [9]. The Forestry and Logging Subsector has an LQ value > 1, which is 2.29. This shows that the Forestry and Logging subsector is the basis subsector so that it is able to meet the needs of local communities and the surplus is exported to other regions. Malinau District has abundant potential in this subsector, of which 52% of forests in North Kalimantan are in Malinau District. In 2016 the total forest area in Malinau District reached 3.6
million Ha, of which a total area of 1.5 million Ha could be utilized by both the private sector and the government.

3.2. Dynamic Location Quotient (DLQ)

The results of DLQ analysis for the sector and subsector of Agriculture, Forestry and Fishery in Malinau District can be seen in Table 2.

| Sector/Subsector | DLQ    | Information         |
|------------------|--------|---------------------|
| Agriculture, Forestry and Fishery Sector | 0.00   | Non Basis           |
| 1. Agriculture, Animal Husbandry, Hunting and Agricultural Services | 237.26 | Basis               |
| 2. Forestry and Logging                | 0.00   | Non Basis           |
| 3. Fishery                                | 172.873.04 | Basis              |

Source: Secondary Data Analysis

Based on the results of the Dynamic Location Quotient (DLQ) analysis, the Agriculture, Forestry and Fishery sector is estimated to remain a non-basis sector in the future, with the value of DLQ <1 which is 0.00. Based on DLQ analysis in each subsector of Agriculture, Forestry and Fishery in Malinau District, the subsectors of Agriculture, Animal Husbandry, Hunting and Agricultural Services and Fishery are expected to be the basis subsector in the future with DLQ> 1 values of 237.26 and 172,873.04. The Forestry and Logging Subsector is expected to become a non-basis subsector in the future with the value of DLQ <1 which is 0.00.

3.3. Combined Analysis of Location Quotient (LQ) and Dynamic Location Quotient (DLQ)

The combination of LQ and DLQ analysis in the sectors and respective subsectors of Agriculture, Forestry and Fishery in Malinau District can be seen in Table 3.

| Sector/Subsector | Average of LQ | DLQ    | Information         |
|------------------|---------------|--------|---------------------|
| Agriculture, Forestry and Fishery Sector | 0.76 | 0.00 | Remains Non-Basis |
| 1. Agriculture, Animal Husbandry, Hunting and Agricultural Services | 0.89 | 236.26 | Non Basis → Basis |
| 2. Forestry and Logging                | 2.29 | 0.00 | Basis → Non Basis  |
| 3. Fishery                                | 0.06 | 172.873.04 | Non Basis → Basis |

Source: Secondary Data Analysis

Based on a combination of Location Quotient (LQ) and Dynamic Location Quotient (DLQ) analysis, the Agriculture, Forestry and Fishery sector is expected to remain a non-basis sector in the future. While the subsector of Agriculture, Animal Husbandry, Hunting and Agricultural Services and the Fishery subsector experienced a change of position, namely from the non-basis subsector to the basis subsector in the future. There is no change in position / role in the Agriculture, Forestry and Fishery sector in general where it remains a basis sector due to the uneven infrastructure that can be used by the community. Therefore, the local government of Malinau District still has to focus on building infrastructure, especially in the border area in the future. Infrastructure development is expected to facilitate the accessibility of the community, especially the border community, one of which is in obtaining affordable agricultural inputs and marketing agricultural products. The existence of this infrastructure is expected to foster economic activities of the people in this sector. In each
The subsector of Agriculture, Forestry and Fishery in Malinau District, there are two analysis criteria for combined LQ and DLQ generated, namely the subsectors that change roles from non-basis subsectors to basis and subsectors that experience a change in role from basis to non-basis. The Agriculture, Animal Husbandry, Hunting and Agricultural Services subsector and Fishery subsector experience a change from the role of the non-basis subsector at present to be the basis subsector in the future. This condition shows that the current Malinau District government effort in developing these subsectors can succeed in the future or can make these two subsectors become the regional superior subsector. One example in supporting the central government program is to create food security, the local government prepares 207 ha of paddy fields to be planted and the construction of irrigation facilities in the form of ponds. In addition, in changing the traditional pattern of society, which tends to store their crops in the granary rather than being sold, the local government through Perusda (Regional Company) buys rice grain owned by farmers and then milled, packed in such a way, and marketed by Perusda. This can not only improve the regional economy, but also improve the economy of the farming community. In the Fishery subsector, the local government policy in supporting this subsector is the establishment of the Minapolitan area in the North Malinau District, as well as the construction of facilities and infrastructure to the region. Forestry and Logging Subsectors experience a change in the role of the basis subsector, becoming a non-basis subsector in the future. Although the Forestry and Logging subsector has a significant contribution to the regional economy, the regional government cannot continue to depend on this subsector because in the future the forest area that can be utilized will certainly decrease along with the increase in development [10], in addition Malinau District as a conservation district based on the Malinau District Regulation No. 4 of 2007 which refers to Law No. 32 of 2004 concerning Regional Government [11], it is necessary to preserve existing forests.

3.4. Shift Share

The results of the Shift Share analysis with the Total Shift Share formula in the sector and each subsector of Agriculture, Forestry and Fishery in Malinau District can be seen in Table 4.

| Subsector                                 | SSS        | LSS        | Information         |
|-------------------------------------------|------------|------------|---------------------|
| 1. Agriculture, Animal Husbandry, Hunting and Agricultural Services | -2,212,736.51 | -3,107,467.59 | Economic structure  |
| 2. Forestry and Logging                   | -2,428,854.75 | -2,891,349.35 | Economic structure  |
| 3. Fishery                               | -3,038,892.40 | -2,281,311.70 | Location            |

Source: Secondary Data Analysis

In the previous combination of LQ and DLQ analysis, it is known that the Agriculture, Forestry and Fishery sector does not experience a change in role in the future, therefore the Shift Share analysis in this study is only carried out in the agriculture, forestry and fishery subsectors that have changed roles. Based on the Shift Share analysis, the subsector of Agriculture, Animal Husbandry, Hunting and Agricultural Services which has undergone a change in role from the non-basis subsector is currently the basis subsector in the future due to the economic structure of Malinau District. This is because there are regional government policies that encourage the growth of primary activities in addition to Mining and Excavation. The Forestry and Logging Subsector also experienced a change in the role of the basis subsector at present to a non-basis subsector in the future due to the economic structure of Malinau District. Factors of economic structure in this subsector are influenced by the government's policy of preserving forests, considering that Malinau District is a conservation district. Fishery subsectors experience a change in the role of the non-basis subsector at present being the basis subsector in the future due to location factors. The high public demand for freshwater fish encourages the Malinau District government to develop freshwater aquaculture in the Minapolitan area located in North Malinau Subdistrict, this is because the area is a tidal river area so that the water availability is guaranteed [12]. In addition, there are also several assistances from the regional government, for
example the creation of ponds, the help of fish seeds, and the construction of facilities and infrastructure in the Minapolitan area to facilitate the accessibility of farmers in order to encourage the growth of this subsector.

4. Conclusions and Recommendations

4.1. Conclusions

Based on the results and discussion above, the conclusions that can be drawn in this study are:

1. The Agriculture and Forestry Sector in Malinau District is not a basis sector during 2012 - 2016.
2. The basis subsector in Malinau District throughout 2012 - 2016 is the subsector of Forestry and Logging.
3. The Agriculture, Forestry and Fishery Sector in Malinau District remains a non-basis sector at present and in the future.
4. The subsector that is predicted to be the basis subsector in Malinau District in the future is the subsector of Agriculture, Animal Husbandry, Hunting and Agricultural Services, and the Fishery Subsector.
5. The Agriculture, Animal Husbandry, Hunting and Agricultural Services subsector and the Forestry and Logging subsector will experience a role change in the future due to factors of economic structure while Fishery subsector will change due to location factors.

4.2. Recommendations

Suggestions that can be given based on this research is highly needed for Malinau District government to side in developing an economic sector that utilizes renewable resources, namely the Agriculture, Forestry and Fishery sectors, given the largest contribution to GRDP is the Mining and Excavation sector. This is because Malinau District has enormous potential resources in the Agriculture, Forestry and Fishery sectors which have not been utilized optimally and at the same time can preserve the environment because Malinau District is a conservation district.

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