Agro-industrial Development in Lamongan District, East Java, Indonesia

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Abstract— ***Lamongan District has considerable potential in the agricultural sector. However, the agricultural sector has not been able to generate added value in the regional development of Lamongan Regency. The high GDP of agriculture sector is not matched with the high GDP of industrial sector. This proves that the results of the agricultural sector has not been used optimally by the industrial sector. To increase the value added of industrial sectors, it would require agro-industrial development based on predominant crops in Lamongan District. The potential area based on agricultural situation and the current status of agro-industrial development is required to provide the strategy of agro-industrial development. The study of current situation of agriculture sector was conducted with three analysis namely agriculture efficiency analysis, location quotient analysis, and shift share analysis. Whereas, the study of current status of agro-industrial development was conducted with descriptive analysis. Furthermore, identification of potential areas was based on the classification of the area using the quartile method which distinguishes the area (sub-district) into four classes namely very low potential, low potential, medium potential and high potential. After identifying the level of agricultural potential, the current level of agro-industrial development was studied based on selected indicators. Following two sets of analyses, the potential sub-districts have been identified for intensification of agro-industrial development relating to predominant crops. In the study, few sub-districts such as Brondong, Deket and Glagah have high potential for agro-industrial development..***

Keywords— agricultural potential, predominant crops, agro-industry, development, East Java.

I. Introduction

In the context of regional development, the industrial area is one activity that acts as a growth center. This means that the industry is one of the centers of economic growth that has appeal to a variety of activities are located in the center of the growth being able to push for the further development of other economic sectors. Industrialization is generally regarded as the key of the acceleration of economic growth in underdeveloped regions. But there are a number of serious obstacles. There is generally a shortage of capital for industrial investment and an inadequate infrastructure; while lack of effective demand on the part of the existing populations means that the home market for manufactured goods is severely restricted. Physical resource may be in short supply, and there are also problems of lack of enterprise, education, and technology. In addition, underdeveloped regions may suffer from locational disadvantages, being remote from major transport routes and centers of population [1].

Agroindustry is an agricultural sub-sector that was expected to play an important role in economic growth, export receipts, employment, poverty reduction and equitability of regional development. However, Indonesia has some issues in the industrialization such as weakened the level of competitiveness and decreased growth of manufacturing industry. In addition, there are several obstacles to the acceleration of industrialization in Indonesia. These are a barrier between logistics and infrastructure, technology, high-cost economy, finance, and regulation.

Most of the population in Lamongan District is engaged in agriculture (approximately 63.71%). Land use in Lamongan dominated by agricultural land uses is equal to 46.61% of the total area of Lamongan District or 84,512 hectares (RTRW Lamongan Year 2009-2029). Based on GDP in the year 2010, the contribution of the agricultural sector (based on constant prices) has been accounted for 50.65% of the overall business sector in Lamongan (in Regency / City Se-East Java 2005-2009). It supports related Spatial Plan of East Java 2020 (Regulation No.02/2006 RTRWP Java) Lamongan as one of the Gerbangkertasusila development, which in District Governor of East Java letter No. 520/1181/202.2/2009, Lamongan designated as a Location of Agropolitan Area Development in East Java. In addition, based on the latest draft of the Provincial Government of East Java, Lamongan District was included in Fast Growth Strategic Zone (KSCT) in the context of agro-industrial development with Gresik.

With this policy suggests that attention regional development of Lamongan should be more focused on agriculture. In case this is not still have to maintain the existence of the field with all the features of traditional agriculture, but it should be more directed to the transformation of modern or industrialized agriculture which is can provide added value to the agricultural sector. The reason is necessary agro-industrial development in particular is because agriculture requires extractive industry that is able to process all agricultural and industrial sectors require raw materials in the processing process [2].

Viewed from the contribution of each sector to the GDP, the agricultural sector has the greatest contribution that 50.65% of the total business sector in the district Lamongan. From this it can be seen that the agricultural potential is quite large and can be used as raw material for industrial activities. However, the contribution of industrial sector to GDP is very small (5.24%). Huge agricultural potential has not been optimally utilized in industrial activity, it can be seen from about ± 450 small and medium industries that exist in Lamongan only about 14% are agro-industry with raw materials of agricultural and plantation (Department of Industry and

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Trade of East Java, 2010). Broadly, it can be concluded the development of agricultural sector has not been able to produce value added in the regional development of Lamongan. It can be seen from the condition level of social welfare that still low. Based on the level of welfare, for 50.64% of the population is at a level Pre-Prosperous & Prosperity-I, while for Prosperity phase-II, III, and Prosperity phase-III+ is only 49.60% (Lamongan in Figures 2011).

Lamongan has a comparative advantage in terms of resources in agriculture, such as agricultural commodities are diverse and the amount of labor that is based on agriculture. The activity in the agricultural sector (on farm) is now a source of income for most rural people, but it have not been able to provide a decent life because of the added value of on-farm activities in general cannot be enjoyed by rural people. This is partly due to the inability of agricultural products to respond the changing demands of today's consumers where the high quality is required, timeliness of supply continuity, as well as competitive prices [5].

Agro-industrial development directed in order to create linkages between the agricultural sector to the industrial sector, so as to encourage greater added value and foster economic activities in these areas. The presence of agro-industrial sector is expected to increase the demand for agricultural commodities, as this sector plays a role in diversifying agricultural products into processed products that can be accepted by consumers. In addition, the presence of agro-industrial sector in the region is expected to increase revenue, expand employment opportunities in both rural and urban areas, increasing the value-added agricultural products, increasing exports of agricultural products, and encourage the growth of other industries that require raw materials from the agricultural sector.

Agriculture is the leading sector in Indonesia including Lamongan District. The agricultural sector has an important role in the development of the region Lamongan. But the agricultural and industrial sectors which was there has not been able to provide added value to the development Lamongan. Agroindustry contributes significantly to a nation's economic development for four reasons. First, agro-industries are a nation's primary method of transforming raw agricultural products, finished products for consumption. Second, agro-industries often constitute the majority of a developing nation's manufacturing sector. Third, agro-industrial products are frequently becomes the major exports from a developing nation. Fourth, the food system provides the nation with nutrients critical to the well-being of an expanding population [2].

Therefore, based on the reason mentioned before this research has been done to find the suitable location based on the predominant crops through studying the agricultural situation and agro-industrial development status. Furthermore, the potential area for agro-processing will found based on these two studies.

II. METHOD

A. Study the current status of agriculture and agro-industrial development

The study of agricultural situation is needed to find the major and minor crops in the study area and also to ensure that the major crop is also predominant crop. The study in this term will held in three analyses. The first is agricultural efficiency to find out which sub-district that has an efficient agriculture. The second is location quotient (LQ) analysis which will provide the basic crop for each sub-district. The third is shift share analysis (SSA) which will be used to determine the competitive advantage of these crops.

1) Agricultural Efficiency

Agricultural efficiency is directly the agricultural production potential. In the words of Prof. Sh in Trueblood and Coggins, agricultural productivity represents species which agricultural efficiency denotes genus. According to him five agricultural efficiency classes may be identified: very high (above 60 per cent), high (45-60), medium (30-45), low (15-30), and very low (0-15). The formulas for agricultural efficiency are mentioned bellow:

$$AAEj=(YE_1A_1+YE_2A_2+YE_3A_3+\cdots+YE_nA_n)/(A_1+A_2+A_3+\cdots+A_n)$$

$$YE_i = (y_i/Y_i)x100$$

Where:

YE = Yield Efficiency
AAE = Aggregate Agricultural Efficiency
A = Agricultural area under different crop
P = Production
Y = Yield
i = Crop
j = Sub-district

2) Location Quotient (LQ) Analysis for Crops Production

LQ measures the relative concentration or the degree of specialization of economic activity through a comparative approach. This analysis is used to determine the basic of agricultural crops in each sub- district in Lamongan. LQ is an economic development tool that is simpler with all the advantages and limitations as well as the method is a method commonly used in the economic model base as a first step to understanding the events that trigger sector growth [4].

Comparison relatively of Location Quotient (LQ) Model can be expressed as follows:

$$LQ = \frac{VAPij/VAPj}{VAPi/VAP}$$

Where:

VAP_{ij} = the value of agricultural production of the i^{th} crop in a sub-district (in Rupiah)
VAP_j = the value of total agricultural production of all crops in sub-district (in Rupiah)
VAP_i = the value of agricultural production of the i^{th} crop in a sub-district in District (in Rupiah)
VAP = the value of total agricultural production of all crops in District (in Rupiah)

If $LQ \geq 1$, then the crop is a basic crop
$LQ \leq 1$, then the crop is non-basic crop

Each method has its advantages and limitations of the analysis, so with the LQ method. The advantages and limitations of the LQ method is [4] :

a. Advantages:

1. Implementation of this method is simple, easy and does not require complex data processing program. Enough with the completion of an analysis of the spread sheet Excel or Lotus.

b. Disadvantages:

1. The method is simple, then sued the accuracy of the data. No matter how good LQ analysis results would not be much benefit if the data used is not valid. Therefore, before deciding to use the LQ analytical tools, validity of the data first is necessary.
2. Weakness in the delineation of the study area. For the study area to be set boundaries and scope of activities, reference is often unclear. As a result the calculation of LQ sometimes is not the same as alleged. For example, a province which is thought to have the advantage in the non-food sector, which emerged from the analysis of LQ even food sector and vice versa.

3) Shift Share Analysis (SSA)

Growth in the region will be different from the other regions due to differences in industrial structure and economic sectors. Shift share analysis is used to analyze the changes in the various indicators of economic activity such as production and employment at two time points in a region. SSA used to know the growth of crops production to ensure the basic crops that it is also have a fast progressive growth and in the specific area (sub-district).

Based on the notation or formula used in Mitchell and Carlson (2005), they use the formula to calculate total national employment growth. In this research the formula will be used to define the growth rate in production of crops in each sub-district comparing with the above level (district level). The notation or formula is:

$$g_n = (P_t - P_t\text{-}1)/P_t\text{-}1 \quad (1)$$

The growth rate in production in crop i at the national level is:

$$g_{in} = (P_{it} - P_{it}\text{-}1)/P_{it}\text{-}1 \quad (2)$$

Finally, the employment growth rate for industry *i* in region r is defined as:

$$g_{ir} = (P_{irt} - P_{irt}\text{-}1)/P_{irt}\text{-}1 \quad (3)$$

The components for each crop i in region r are defined as:

$$NS_{ir} = P_{tir}g_n \quad (4)$$

$$CM_{ir} = P_{tir}(g_{in}\text{-}g_n)$$

$$RS_{ir} = P_{tir}(g_{ir}\text{-}g_{in})$$

Where, P_{tir} = the level of production in crop *i* in region *r* at time *t* (taken to be the start of the period under scrutiny).

Individual industry components are summed across industries to give NS_r, CM_r and RS_r. A derivative measure, the total shift (TS) measures the net variation in total employment that is not predicted by the national share and equals the actual change in employment minus the national share (which by definition is equal to CM+ RS). The decomposition is summarized in Table 1.

Furthermore, after knowing the current status of agricultural development then the study will be conducted to determine the current status related agro-industry development. This study will be carried on perpetually descriptive and focused on the trend and pattern of agro-industrial development. The assessment of agro-industry index will use the Transformed Value (TV) to define the situation of agro-industrial development in each sub-district. The formula that used in this assessment is as follow:

$$TV = \frac{V_{ij} - Min_{ij}}{MAX_{IJ} - MIN_{IJ}}$$

Where:

Vij : the number of ith variable of j sub-district

Maxij : the maximum number of of i^{th} variable of j sub-district

Minij : the minimum number of of i^{th} variable of j sub-district

Therefore, the results of this study will be used to identify potential area for agro-industrial development in the next analysis.

B. Identification of potential area for agro-processing

Identification of potential areas for agro-industry in this research is based on the current situation of agriculture and current status of agro-industrial development. This analysis will use the output from objective one, where the study of current situation of agriculture was carried out with agricultural efficiency, location quotient (LQ) analysis and shift share analysis (SSA). These analysis aims to find the predominant crops as raw materials in agro-industrial development which is assumed as a potential with several requirement. The crops must be classified as basic commodity, have a competitive advantage, fast growth, and is a progressive commodity. While the potential area based on agro-industrial development status will be done with some indicator such as percentage share of value of agro-industrial production to total of the district, share of agro-industrial production to GDP, percentage of formal agro-industrial workers to total workers, percentage of agro-industrial enterprises to total industrial enterprises.

C. Suggest for agro-industrial development

In this part, the suggestion for agro-industrial development will carried out to provide the strategy for agro-industrial development in each sub-district that already found as a potential area with consider to the condition of factors influence for industrial development such as market, infrastructure, utility, and accessibility.

III. RESULT AND DISCUSSION

A. Agricultural Situation

1) Cropping Pattern

Lamongan District area is divided by three type of area. First is southern-center area which is fertile lowland. The area involve Babat, Pucuk, Sukodadi, Lamongan, Kedungpring, Sugio , Kembangbahu, Deket, and Tikung Sub-district. In this region there are 25 irrigation reservoirs to support the agricultural sector. Second is the northern area which is consists of swamp areas with the flood-prone. There is no potential of agriculture in this area. Therefore this area is more widely used for the development of fishponds. Third is the southern plains and the northern part of the mountains consist of limestone and partly of land is rather low with low soil fertility levels, covering Sub-district Mantup, Sambeng, Ngimbang, Bluluk, Modo, Sukorame, Brondong, Paciran and Solokuro. However, this region helped by the forest which covers 17.57% of Lamongan District, and in the north stretches along 47

miles of the coast that is rich in fishery resources and tourism rides.

Based on the depth of the soil, most of the sub-districts territory lies at a depth of > 90 cm which covers an area of 127,719 ha, or 70.45%. Area in this depth is good for the growth of plant roots. While the area that has a depth of 61-90 cm covers an area of 34,656 hectares or 19.12% of the area of Lamongan District entirely. This area is good for seasonal crops such as paddy, corn, soybeans, and peanut. Moreover this land also good enough for annual crops such as coconut and rubber. Region which is at a depth of 31-60 cm in Lamongan District is an area of 12,916 ha or 7.12% of the total area of Lamongan which this condition is quite good for annual crops. The total area in Lamongan District which is at a depth of 0-30 cm is effective ground area of 5,989 hectares or 3.30% of the total area of Lamongan District. On this area is still allow cultivated seasonal crops, but at a depth of 0-10 cm is not good for plant growth.

Agricultural areas contained in Lamongan district is around 166,972 Ha of overall area with details: Agriculture rice field area is 87,221 Ha and non-rice field area is 79,032 Ha (Lamongan District in Figure, 2012). Paddy is grown three times in one year. Almost all the areas in each sub-district can be planted with paddy. Therefore the production of paddy is the highest among other plants. The following table 5-1 is the proportion of cropped area.

The proportionate are under paddy in 2001 was around 55.80% of gross cropped area, increased to 59.97% in 2006 and insignificantly decreased in 2011 to 59.57%. Areas under corn were remained stable around 23-24%. Whereas, the areas under ground nut, soybean, and green pea has been decrease year by year.

2) Agriculture Production and Yield

Farm food crops sub-sector is the largest sub-sector accounted for the agricultural sector in GDP of Lamongan 2011. There are five major commodities in the food crops sub-sector, namely paddy, corn, ground nut, soybeans, and green pea. According to the figure 5.1, paddy has the highest production during time periods. Paddy has highest production area among other crops. The production was increased during 2001 until 2006, but decreased from 2006 to 2011. The data can be seen in Figure 1.

Based on the crops production data in each sub-district, the quantitative assessment carried out to some existing crops in Lamongan District. The assessment was conducted in three stages namely Agriculture Efficiency (AE) Analysis, Locations Quotient (LQ) Analysis and Shift Share Analysis (SSA). Where the result of these assessments is the crops which are become the predominant crops in Lamongan District in general and in each particular district.

3) Agriculture Efficiency Analysis

In this research, agriculture efficiency analysis is conducted in 27 sub-districts in Lamongan district. While the crops which have been analyzed are the food crops such as paddy, corn, ground nut, soybeans and green pea. The analysis carried out on the three-year period (2001, 2006, and 2011). It is intended to determine its development from year by year.

In this analysis is assumed that the area that has a value of aggregate agricultural efficiency more than 100% means having a good farm development, and the agriculture sector is efficient in that area (sub-district). Based on the analysis conducted agricultural conditions in Lamongan District obtained the following results (Table 3).

Based on the results of AE (Agriculture Efficiency) analysis that has been done can be seen how the agricultural conditions in each district in the study area. Agricultural conditions of each sub-district vary from year 2001 to 2011. Most of sub-districts had increased and some had decreased. There are 14 out of 27 sub-districts has increased and the rest tends to decrease. According to the performance of aggregate agriculture efficiency (AAE) growth year by year, the sub-districts that have positive growth of AAE are Sukorame, Bluluk, Ngimbang, Sambeng, Kembangbahu, Babat, Pucuk, Sukodadi, Sarirejo, Deket, Glagah, Karangbinangun, Turi, Kalitengah, Karanggeneng, Sekaran, Maduran, Laren, and Solokuro. Meanwhile the rest sub-district has a negative growth such as Mantup, Sugio, Kedungpring, Modo, Lamongan, Tikung, Paciran and Brondong Sub-district.

According to the Average of AAE (Table 3) of each sub-district, the highest value of AAE is 115% (in Glagah Sub-district) and the lowest is 59.70% (in Sarirejo Sub-district).

4) Location quotient (LQ) analysis

Identification of basis commodities is carried out on five crops of food crops same as the crop in the previous analysis, namely paddy, corn, ground nut, soybeans, and green pea in their respective sub-districts in Lamongan District (27 sub-districts). In this LQ analysis, the calculation of the LQ value is using the data from the currency value of production of each crop in year 2011.

LQ analysis calculation is using comparative analysis of agricultural production value of each sub-district to the value of agricultural production of Lamongan District. Hereafter, from the calculation will show whether the crop is basic or not classified in each district. If the value of LQ> 1 then it is declared as a basic crops and vice versa if the value of LQ <1 then it is declared non-basic crops. The following is the basic crops of each sub-district in based on LQ analysis calculations.

Based on the results of LQ analysis, in 2001 the basis crop in the majority of the sub-district is paddy. Paddy is almost become a basis all sub-districts except in coastal areas such as Sub-district Brondong, Paciran, and Solokuro as well as mountainous area such as Sub-district Mantup and Sambeng. In 2006, the condition remains the same as in 2001, the basis crops in 2006 was paddy. Likewise in 2011, paddy became the basis crops in most sub-districts. This is because the condition of the soil in Lamongan most suitable for growing crops such as paddy, and paddy harvesting time often enough that three times in one year.

5) Shift share analysis (SSA)

The data used in this analysis is the production data of five agricultural crops food crops in each sub-district (27 districts) in 2001 and 2011, as well as production data of five types of the same crops in Lamongan district in 2001 and 2011.

Assessment of the three conditions is used to determine what the appropriate crops which are have a potential to be developed as a raw material in the area of agro-

industrial development based on predominant crops in Lamongan District. The following is the result of SSA (competitiveness, growth, progressiveness).

Based on the three analyzes that have been done, the next will be weighed against each value of the analysis to determine the potential level of sub-districts based on the agriculture condition. The formula used is:

CI (Total Weight) = W1+W2+W3

Where:

W1, W2, W3 are the corresponding weight to the variable

W1 = weight of AAE

W2 = weight of LQ analysis

W3 = weight of SSA

The weight was calculated in the basis of classification into four groups following quartile method. The uppermost quartile (Q4) is assessed with weight = 1, Q3= 0.75, Q2= 0.5, Q1= 0.25.

Based on these three analyses of studying the current status of agriculture in the Lamongan District obtained summary result on the maps as follow Map 2-4.

B. Current Status of Agro-industrial Development Trend of agro-industry

The trends of agro-industry will be presented from empirical condition using the most recent data for each sub-district and identifying dynamic trend whenever possible. Agroindustry development in Indonesia started in the first Five-Year Plan (Repelita I, 1969). The development of agro-industry that geared is to increase value-added of agricultural products and maintain food security in Indonesia. As we know that Indonesia has considerable biodiversity. For the plantation sector not less than 145 commodities listed as assisted commodity, while having reliable economic value is only about 10% are oil palm, rubber, coffee, cashew nut. However, in Lamongan District, non-food/plantation crops did not show great potential. Huge potential in the agriculture sector is owned by the food crops sub-sector. Where there are five main crops that have huge production such as paddy, corn, ground nut, soybean, and green pea.

1) Agri-food sector

The agri-food sector usually can be seen as comprising: products for subsistence and local markets (basically root crops), staples for urban domestic markets (predominantly cereals), traditional export commodities (coffee, cocoa, tea, nuts, cotton), components of animal protein diet (dairy products, oils and animal feed) and different meat chains (red meat, pigs, poultry) for both domestic and export markets, fresh or non-traditional products (fruits, hor-ticulture, flowers, seafood/aquiculture), and differentiated traditional exports (fair trade, organics, origin products), which are now oriented also to domestic markets.

In Indonesia, the agri-food sector consists of food such as paddy, corn, cassava, ground nuts, soybean, and green pea. Similarly in Kabupaten Lamongan, agri-food sector has a higher proportion among the other sub-sectors in the agriculture sector. This is evidenced by the percentage distribution of GDP in agri-food sub-sector is 27% (Table 4.3) of the total GDP of Lamongan District.

2) Agro processing production value

Production value of industry sector in Lamongan Distrit showed increasing performance from 2001 to 2011. Especially in 2011, the production increased dramatically from the industry sector IDR 123 billion in 2001, IDR 323 billion in 2006 and IDR 939 billion in 2011. Similar condition is happen with the production value of agro-industry in the Lamongan District. If seen from figure 5.6, the growth of production value of agro-industrial sector is increasing in each sub-district.

3) Contribution to GDP

Based on the data obtained, the industry sector has particularly contributed to the overall GDP by an average of 5.31% over the last 3 years and is increasing every year. As for the industry sector, sub-sector of the food industry as a whole the proportion of the industry amounted to 54.29% and 2.88% of the total GDP of Lamongan District. This suggests that the food industry raw materials from the agricultural sector has good potential to be developed to see the potential of agriculture sector in Lamongan District is also quite large and dominates Lamongan GDP, amounting to 48.44% in 2011 (Table 6).

4) Level of formal employment

From the total employment in the industrial sector, 72% are non-formal employment who works at home industry. The existence of the home industry has a lot to absorb labor. However, most of the home industry is non-formal industry. As we know, working in the informal sector is vulnerable jobs with social issues. In this case, in term of social protection to informal workers is very weak.

In this study, the scope of the industry under study is a small-medium industry and is the formal industry. Of the total industrial employment in the formal sector is only about 6% which is a worker in the agro-industry sub-sector. In addition, based on ILO research, in developing countries with an average of 60% of workers in the food and beverage industry are employments in the informal economy.

5) Agro-industrial Pattern

The number of agro-industrial Company is not too huge. Based on the data of industrial department of Lamongan District, the number of formal industrial companies/enterprises which were engaged in food sector or which were uses agricultural raw materials are only about 15% of the existing formal industry (63 out of 450) and mostly of them are small scale enterprises. Beside of that, the non-formal industry (home industry) is quite dominated in the industrial sector. Most of the industry that exists is cigarette industry with use tobacco as raw material. While the food industry that already exists are rice flour, crackers, and soy sauce.

Based on these data found that the the highest number of agro-industry enterprise is most abundant in the Kedungpring Sub-district. There were of 11 units of small-medium industry with kind of industry is the tobacco industry (cigarette), flour, and soy sauce. The second sub-district is Sambeng that was dominated by the tobacco industry (cigarette). This indicates that the industry which is use food crops as a raw material was limited in Lamongan district, so the opportunities for the development of agro-industry is still very large.

I this research, the discussion of the existing agro-industry is limited in the use of paddy, corn, ground nut, soybean, and green pea as raw materials. Based on the data obtained, the formal agro-industry in Lamongan District contained only industry that uses paddy, corn and soybean as a raw material. Therefore, the discussion

focused on the three raw materials.
Here are the data of agro-industries in each district based on the number of industry, number of employees, and production capacity.

Based on the data obtained, the number of industry enterprises that use paddy, corn and soybeans as raw material is only 15 (25% of the total number of agro-industry). Out of 16 agro-industrial enterprises, eight was use soybeans, four was use paddy and three was use corn as raw materials.

Based on data from the existing agricultural sector, predominant crops identified in most of the sub-district is paddy. As for the corn, based on analysis of LQ and the SSA that has been done, the corn crop is seeded only in some sub-district such as Brondong, Paciran, Sekaran, and Sambeng. For soybeans, the sub-district has soybeans as predominant crop is Sambeng and Kembangbahu sub-district.

In term of raw material supply, for paddy the enterprise get the supply from the agro-indutrial enterprises get the raw material from several sub-district such as Laren, Sekaran, Maduran, Karangbinangun, Karangggeneng, Kalitengah, Turi, Deket, Glagah, Sukodadi, Lamongan, Kedungpring, Sugio, Kedungpring, Modo, and Sukorame.

While for Corn and Soy bean, even these crops were not as predominant crops they get the raw material from several sub-district. For corn, they get from Brondong, Paciran, Sekaran, and Sambeng Sub-district. And fro soybean, they get from Kembangbahu, Tikung, Sambeng, and Mantup.

C. Potential Area Based On Agriculture Situation

In determining of the potential area in terms of its agricultural system, in this study has been conducted several assessment for agricultural production in previous analisys, namely agriculture efficiency, location quotient and shift share analysis. From these three assessments obtained multiple locations or sub-districts that have the potential to be developed as an agro-industrial center.

From the agriculture efficiency analysis obtained the sub-districts that have an average value of agriculture aggregate efficiency more than 100% over the last ten years. The sub-districts among others are Bluluk, Mantup, Sugio, Modo, Deket, Glagah, Karangbinangun, Karanggeneng, Sekaran, Solokuro, Paciran, dan Brondong.

Furthermore, from the result of aggregate agriculture efficiency is looking forward for predominant commodities/crops in each sub-district. Assessment of predominant commodities that has been done is by using LQ analysis and SSA, where from the results of these analysis obtained several crops that had been a predominant crop in particular sub-district.

Based on the result of the analysis found a combination of several sub-districts that have the potential to be developed as an agro-industrial center based agricultural conditions. Assessment of potential is seen from the composite index which is owned by their respective districts. Composite index which is calculated based on the weight of each indicator in each district. Based on the results obtained from the stretcher weighting, the regions are divided into four groups. The first group of the districts with very low potential agriculture, the second group is the low potential, the third group is moderate potential, and the last group is a sub-district with a high potential.

Of weighting is done, the district was included in the third group and the fourth is a district that has a high potential in the agricultural sector. The sub-districts included are Brondong, Mantup, Turi, Solokuro, Sukorame, Bluluk, Modo Deket, Kalitengah, Karanggeneng, Laren, Glagah, Karangbinangun.

D. Potential Area Based on Agro-industrial Status

After conducted a descriptive analysis of the current status of agroindustry development in Lamongan District which is includes trend and pattern of agro-industrial development such as agri-food production, agro-processing production value, its contribution to total GDP, the level of formal employment and also number of enterprises that already exist now the next step is to define the potential sub-district base on these indocator. In determining the potential sub-district was used the 0-1 Transformed Value (TV) Method as a regionalization formula. The concept of this method is give the transformed value "1" for highest value of positive indicators and "0" for highest value for negative indicator. in this research, the indicator is only positive indicator. The formula used is:

$$TV = \frac{V_{ij} - Min_{ij}}{MAX_{IJ} - MIN_{IJ}}$$

Where:
V_{ij} : the number of i^{th} variable of j sub-district
Max_{ij} : the maximum number of of i^{th} variable of j sub-district
Min_{ij} : the minimum number of of i^{th} variable of j sub-district
The indicator that used in this study are

1. Percentage share of value of agro-industrial production to total of the district
2. Share of agro-industrial production to GDP
3. Percentage of formal agro-industrial workers to total workers
4. Percentage of agro-industrial enterprises to total industrial enterprises

According to data set, which consist of positive indicator such as percentage of agri-food production value, contribution to GDP, level of formal employment, and percentage of agro-industry enterprise. Thus the suitable technique for TV calculation is only the first formula (for positive indicator). Following is the result of classification of the region based on agro-industrial development status.

Based on the classification of all indicators of agro-industrial status, the potential area is decided by the composite index (CI) value that include in the moderate and high potential. The sub-district includes Sukodadi, Tikung, Maduran, Lamongan, Glagah, Deket, Sambeng, Sarirejo, Brondong, Babat, Ngimbang, Kedungpring, and Paciran.

Based on combination of these two assessments are found the areas or sub-districts that actually have the potential to be developed as agroindustry center. The sub-districts are Brondong, Deket, and Glagah, as shown in the table below.

Viewed from the situation agriculture side Brondong

Sub-district were in the medium level and at the level of potential high potential in terms of agro-industrial status. While for Deket and Glagah Sub-district had high potential in term of and medium potential in agro-industry status. The predominant crops of Brondong Sub-district is corn and ground nut, whereas Deket and Glagah Sub-district is paddy. The potential area based on combination of these two potential can be seen in Map 5.

E. Agro-industrial Development

Based on the analysis that had been done from the previous chapter related to a potential sub-district to be the center of agro-industry development based on the potential of agriculture and agro-industry development status of existing potentially obtained the three sub-districts that is Brondong, Deket, and Glagah.

Based on the administrative location, two sub-districts (Deket and Glagah) was border each other and located in the centre-southern region of Lamongan District and is bordered by Gresik District. Whereas Brondong Sub-district is located in the northern of Lamongan District and it is a coastal area.

1) Characteristics of the selected area

a. Raw material

Based on the analysis of agriculture status, the predominant crop in Brondong is corn and ground nut. Whereas in Deket and Glagah Sub-district is paddy. Viewed from its potential level in term of agricultural status, Deket and Glagah Sub-district had high potential level. For the availability of raw material, these two sub-districts are surrounded by the sub-districts that have high raw material production. The sub-districts include Karangbinangun, Lamongan, and Tikung.

b. Infrastructure

In terms of infrastructure, the aspects that will be considered are availability of electricity, water supply, and transport facilities. Based on data from the existing condition, 90% of the electricity service is a household, including household industry.

For water supply, some of Deket Sub-district area is reached by water supply service from the government and some area using the ground water source to their daily needs. Whereas, local communities in Brondong and Glagah are using the ground water sources for their daily needs. This is because the water services of the government do not reach this area. However, the presence of large groundwater sources in the two districts is not a problem in the availability of water for daily needs or even for the industry.

Whereas for the transportation facilities are include availability and road conditions, as well as supporting other transport infrastructure such as the availability of terminals in the area and the surrounding area. Based on the existing condition of the main road, more than 50% of the surface condition in Deket Sub-district was severe damage, and around 40% was in good condition. While in Glagah Sub-district, the road condition is 90% in minor damage and it is only 10% in good condition. by the condition of road, it will be affect to accessibility of these sub-district. In terms of accessibility, Deket Sub-district has a strategic location that is one of the sub-districts which is passed by provincial road connecting between districts, which connects Lamongan and Gresik, as well as connecting Gresik with Bojonegoro and Tuban.

2) Market

Market presence greatly influenced the development of agro-industry. Market presence will affect the marketing process of the product agro-industry. Brondong Sub-district is one of the sub-districts that h ave high market unit. While Glagah Sub-district has three market and Deket Sub-district is only one market. By a limited market presence in the area meant that the producers will be difficult to sell their production goods. Moreover, the existing market scale is only local market. On the one hand, both the sub-district (Deket and Glagah) location is not far from the center of Lamongan District, so that the producers can sell their goods to the central market. On the other hand, both the district directly adjacent to Gresik District, in which it is also a huge market opportunity for the producers later to expand market area.

3) Agro-industrial Development Strategy

According to its characteristic that agro-industry is resoursces based industry, the direction of its development strategy should be based on a regional approach to the resource potential remains grounded in the concept of dynamic comparative advantage, which is necessary to be able to direct the government's role in the long-term comparative advantage [1]. In this research, it was found that agricultural resources that have a comparative advantage based on the analysis conducted are paddy and corn. However, based on the data in the study area conditions, beside paddy and corn, the majority of the existing agro-industry is using soybean as raw materials. Therefore, the development of agro-industry suggested for agro-processing industry which are use the paddy, corn, and soy bean as raw material.

However, as it is known that Indonesia is a country where rice is the main food for the population. In this case, the production of paddy which can be used as raw material for industry is a surplus of paddy that used for daily consumption. Based on data from FAO (2011), rice consumption per capita for Indonesia is about 170 kg/year. Therefore, it is assumed that the per capita consumption in Lamongan is also equal to the average consumption of the population in Indonesia. With these assumptions earned surplus of rice production that can be used as raw materials of agro-industry.

According to the result, the sub-districts that identified become the agro-processing center do not have the agro-processing enterprise exist. Therefore, for these sub-district we can add the enterprises with the paddy, corn, and soybean as raw material and get the supply from the sub-district that already mentioned before. The number of agro-inndustrial enterprises can be change based on the capacity of production of the industry.

As known that most of the community in Lamongan District is engaged in agriculture sector as a farmer. Small-scale agro-industry has the potential to improve small farmers livelihood quality by providing them with an additional source of income. In this way, small-scale agro-industry could be established within a sustainable rural development strategy [3]. Based on the Research and Development Department of Agriculture in the prospect and direction of development of agribusiness (2005), the type of industry that can be developed with

paddy as raw material is compost industry, feed industry, flour industry, starch industry, vermicelli industry, oil industry, and textiles industry. As the predominant crops in Lamongan District is paddy, these kinds of industry can be established in the selected sub-district.

In the industrial sector, the main characteristic is the high flexibility of the resulting product. Spasticity in developing both types of diversification and product quality will make the sector more easy-access to markets as well as to adjust the location. This excess is an opportunity for industry to be more attuned to the agricultural sector, particularly in the development of agro-industry based on predominant crops [7]. Therefore, the product of agro-industry that will be develop in Lamongan District should be have a good flexibility in due to the location of market is not in both sub-district but in Babat Sub-district.

In addition, the management of agro-industry is almost unique, because the raw materials derived from agriculture such as crops has three characteristics, namely seasonality perishability, and variability. The sustainability of the raw materials is the most important thing that should be consider to develop the agro-industry. Therefore, development of raw material sources is necessary to maintain the sustainability of the industry. In this case, the role of government as policy makers is needed in order to maintain the stability of agricultural production, such as maintaining price stability for both inputs (seeds, fertilizers, etc.) as well as the prices of agricultural products. So that the farmers can still make a profit by producing raw materials for the agro-industry.

Based on the approach of agropolitan conception, development of agro-industry will defided into producer of raw material, production center, and then global market. In this research, the selected sub-district as producer of raw material are the sub-district that have good performance and high potential in agriculture situation such as Laren, Karanggeneng, Solokuro, Turi, Modo, Sukorame, Kalitengah, Bluluk, Kembangbahu, Pucuk, and Mantup. Whereas, the production center of agro-industry will be in the selected area that having potential in both agriculture and agro-industry development situation, namely Brondong, Deket, And Glagah Sub-ditrict.

IV. Conclusion

Based on study of agriculture situation that has been done, most of sub-districts with aggregate agriculture efficiency > 100% has paddy as predominant crops. Further, based on study of the current status of agro-industrial development which is done by reviewing relevant indicators of agro-industrial trend and pattern is obtained that the number of agro-industrial enterprises currently only about 14 % of the total existing industrial enterprises with scale of industry is small-medium industry. While the agro-industry that already exist using paddy, corn, and soybean as raw material is only around 16% of the total agro-industrial establishment.

Furthermore, The suggested strategy to develop agro-industry is development of agro-industry based on predominant crops in the selected area (sub-district). The agro-industry center development will be in the Brondong, Deket, and Glagah Sub-district with corn and ground nut as predominant crops in Brondong Sub-district and paddy in Deket and Glagah Sub-district. The sub-district that has a potential in agricultural sector will be the producer of raw material to support the selected sub-district as a production center of agro-industry.

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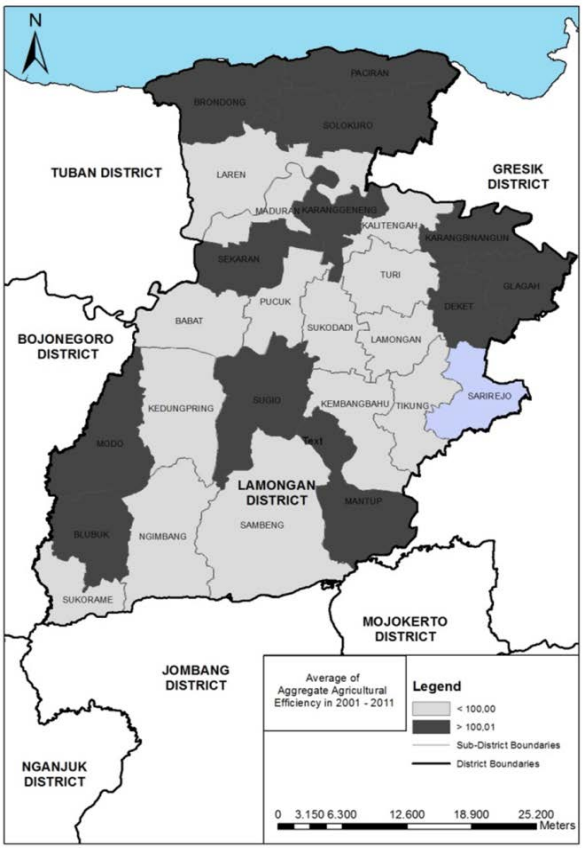
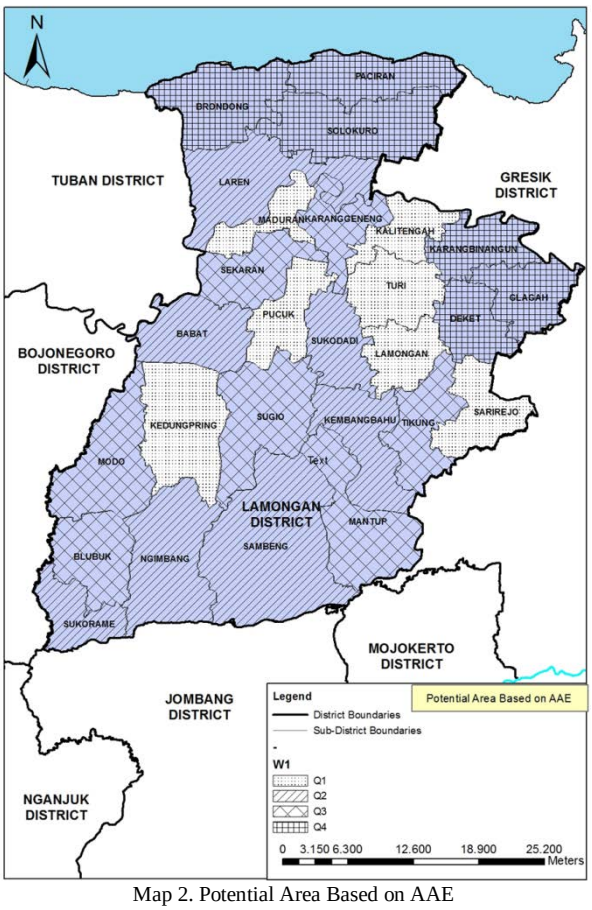
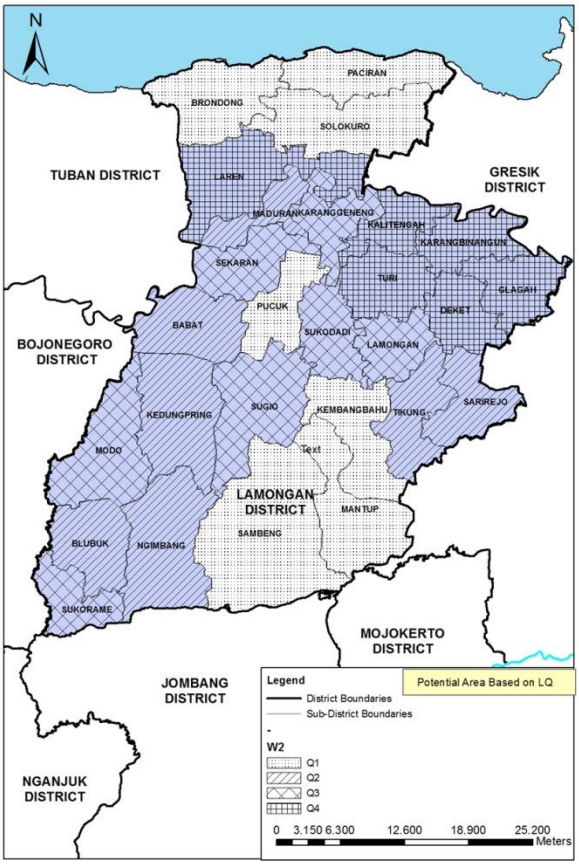


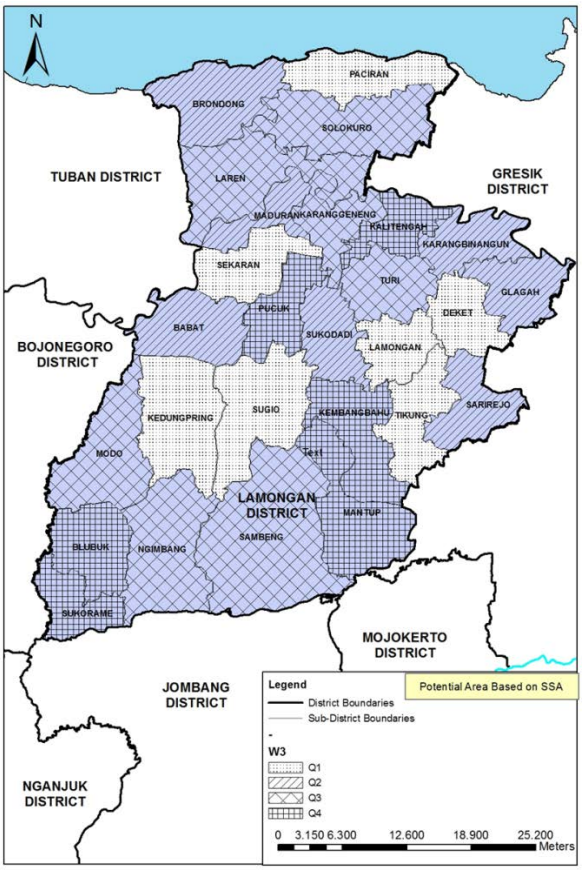
Map 1. Average of Aggregate Agricultural Efficiency in 2001 – 2011



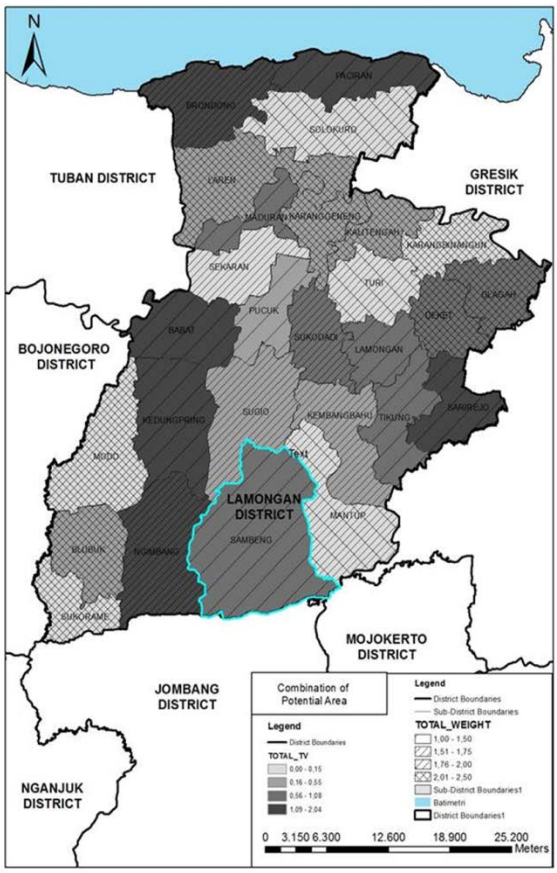
Map 2. Potential Area Based on AAE



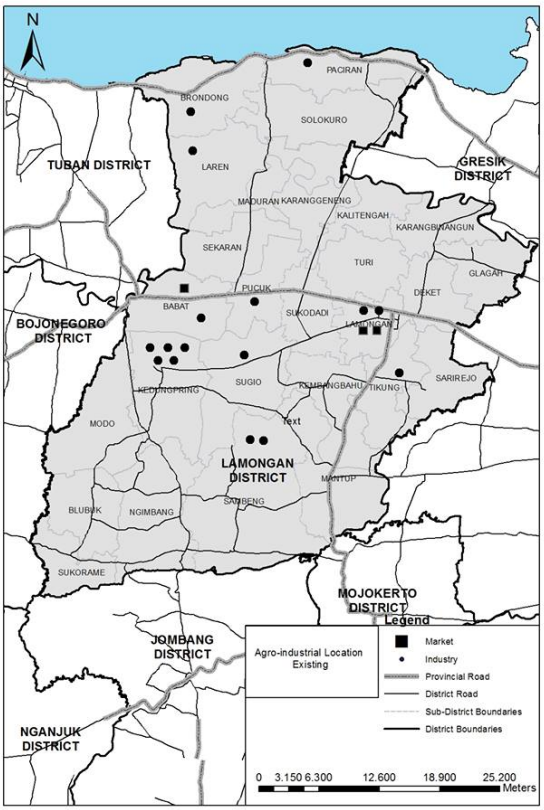
Map 3. Potential Area Based on LQ



Map 4. Potential Area Based on SSA



Map 5. Map 6.3 Combination of Potential Area



Map 6. Location of Agro-industry existing based on paddy, corn, and soybean as raw material

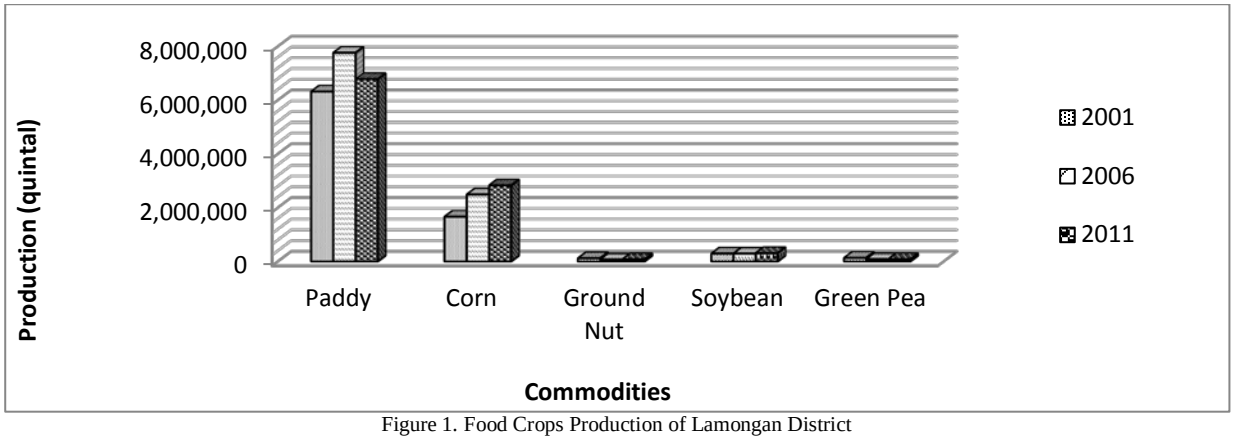


Figure 1. Food Crops Production of Lamongan District

TABLE 1
DECOMPOSITION OF REGIONAL PRODUCTION

Decom-position	Formula	Explanation
National Share (National growth)	$NS_{ir} = P^t_{ir} g_n$	The regional production change that would have occurred if crop *i* production in region *r* had grown at the same rate as the nation *n*. this measure holds the production shares in crop *i* region *r* constant.
Crops mix (structural effect, composition, proportional effect)	$CM_{ir} = P^t_{ir}(g_{in}-g_n)$	The share of regional production change that can be attributed to the local crop mix and reflects the degree to which the region specializes in crop that are either growing fast or slow nationality. A region with a lot of crop that are growing fast nationally will have a positive *CM* whereas a region with a concentration of crop that are growing slowly (or declining) nationally will have a negative *CM*.
Regional Share (local,-factor effect, competitive effect, differential effect)	$RS_{ir} = P^t_{ir}(g_{ir}-g_{in})$	The change in regional production due to differences between the local crop growth (decline) rate and the crops national growth rate. This component indicates growth or decline in crops due to local factors. Berzeg (1978: 464) says that the regional share represents "how significantly the growth rates vary from on region to the next."
Total Shift	$TS = CM + RS$	The net variation in total production that is not predicted by the national share

TABLE 2
SHIFT of CROPPING PATTERN (HARVESTING AREA) in LAMONGAN DISTRICT (PERCENT)

Crop	2001	2006	2011
Paddy (C1)	55.80	59.97	59.57
Corn (C2)	23.40	23.33	24.14
Ground Nut (C3)	3.11	2.62	2.66
Soybean (C4)	12.57	11.06	10.76
Green Pea (C5)	5.12	3.01	2.86

Source: Lamongan District in Figure, 2002, 2007, 2012

TABLE 3
RESULT OF AGGREGATE AGRICULTURE EFFICIENCY (AAE)

No.	Sub District	AAE			Average Situation
		2001	2006	2011	
1	Sukorame	89.40	101.51	108.80	99.90
2	Bluluk	97.73	103.74	110.61	104.03
3	Ngimbang	96.81	95.90	99.69	97.47
4	Sambeng	88.43	101.56	100.44	96.81
5	Mantup	111.33	100.68	98.27	103.43
6	Kembangbahu	94.47	94.42	104.89	97.93
7	Sugio	102.90	103.64	94.77	100.44
8	Kedungpring	103.98	92.12	86.47	94.19
9	Modo	99.10	108.25	96.76	101.37
10	Babat	91.23	97.32	103.49	97.35
11	Pucuk	74.90	94.71	89.72	86.44
12	Sukodadi	93.07	98.75	101.49	97.77
13	Lamongan	96.61	94.32	89.74	93.56
14	Tikung	104.63	102.14	93.01	99.93
15	Sarirejo	0.00	88.44	90.66	59.70
16	Deket	95.48	107.38	109.33	104.06
17	Glagah	111.53	114.55	120.14	115.41
18	Karangbinangun	107.47	107.48	111.40	108.78
19	Turi	91.18	92.70	93.68	92.52
20	Kalitengah	87.27	92.74	105.35	95.12
21	Karanggeneng	90.28	110.06	110.39	103.57
22	Sekaran	103.38	96.98	103.66	101.34
23	Maduran	94.37	93.51	99.78	95.89
24	Laren	101.45	87.22	107.03	98.57
25	Solokuro	104.47	100.80	111.63	105.63
26	Paciran	111.09	119.96	101.56	110.87
27	Brondong	109.08	116.11	100.93	108.71

TABLE 4
BASIC CROPS BASED ON LQ ANALYSIS

No	Sub-district	Basic Crops			Summary
		2001	2006	2011	
1	Sukorame	C1	C1,C2	C1	C1
2	Bluluk	C5	C2,C5	C1	C5
3	Ngimbang	C1,C2, C5	C2	C1,C2	C2
4	Sambeng	C2,C3, C4,C5	C2,C4	C2,C3, C4	C2,C4
5	Mantup	C2,C4	C4	C4	C4
6	Kembangbahu	C4	C2,C3, C4	C1,C4	C4
7	Sugio	C1,C4	C1,C4, C5	C1,C5	C1,C5
8	Kedungpring	C1	C1,C4	C1,C2, C4	C1,C4
9	Modo	C1,C5	C1,C2	C1	C1
10	Babat	C1,C5	C1,C5	C2	C1,C5
11	Pucuk	C2,C5	C5	C1,C5	C5
12	Sukodadi	C1,C3	C1,C3	C1	C1
13	Lamongan	C1	C1	C1	C1
14	Tikung	C2,C4	C1,C4	C1,C4, C5	C4
15	Sarirejo	N/A	C1,C4	C4	C4
16	Deket	C1	C1	C1	C1
17	Glagah	C1	C1	C1	C1
18	Karangbinangun	C1	C1	C1	C1
19	Turi	C1,C2, C5	C1	C1	C1
20	Kalitengah	C1	C1	C1	C1
21	Karanggeneng	C1	C1	C1,C5	C1
22	Sekaran	C1,C5	C1,C5	C1,C5	C1,C5
23	Maduran	C1,C5	C1,C5	C1,C5	C1,C5
24	Laren	C1	C1	C1	C1
25	Solokuro	C2,C3	C2,C3, C5	C2,C3, C5	C2,C3,C5
26	Paciran	C2,C3	C2,C3	C2,C3	C2,C3
27	Brondong	C2,C3	C2,C3	C2,C3	C2,C3

Note:

C1 = Paddy
C2 = Corn
C3 = Ground Nut
C4 = Soybean
C5 = Green

TABLE 5
SSA RESULT on TOTAL SHIFT

No	Sub-district	TS > 0
1	Sukorame	C1,C2,C4
2	Bluluk	C1,C2,C4
3	Ngimbang	C1,C2,C3
4	Sambeng	C1,C2,C3,C4
5	Mantup	C1,C4
6	Kembangbahu	C1,C3,C5
7	Sugio	C3,C5
8	Kedungpring	C4,C5
9	Modo	C1,C2,C3,C4
10	Babat	C2,C4
11	Pucuk	C2
12	Sukodadi	C2
13	Lamongan	C2
14	Tikung	C5
15	Sarirejo	0
16	Deket	0
17	Glagah	0
18	Karangbinangun	0
19	Turi	C1,C4
20	Kalitengah	C1,C2,C5
21	Karanggeneng	C1,C2,C5
22	Sekaran	C2,C5
23	Maduran	C2,C3,C5
24	Laren	C1,C2,C5
25	Solokuro	C1,C2,C3,C5
26	Paciran	C2,C3
27	Brondong	C2,C3,C5

TABLE 6
PROPORTION OF GDP

GDP	2009	2010	2011
Total	5,792,095.09	6,181,066.49	6,625,823.05
Industry	301,444.97	324,437.74	363,511.48
Food Industry	163,684.12	176,169.16	197,386.13
%GDP of Food Industry	54.30	54.30	54.30
%GDP of F. Ind to Total	2.82	2.85	2.98
%GDP of Industry	5.20	5.25	5.49

Source: Lamongan District in Figure, 2012

TABLE 7
AGRO-INDUSTRIAL ENTERPRISES CONDITION

No.	Sub-district	No. of Enterprises			Workers	Production Capacity (ton/year)		
		Paddy	Corn	Soybean		Paddy	Corn	Soybean
1	Babat	-	-	1	41	-	-	66.2
2	Brondong	1	-	-	20	30	-	-
3	Kedungpring	3	-	2	95	40	-	77.5
4	Lamongan	-	-	2	28	-	-	315
5	Laren	1	-	-	14	0.8	-	-
6	Paciran	-	-	1	0	-	-	6
7	Sambeng	-	2	-	32	-	405.85	-
8	Sugio	-	-	1	26	-	-	135
9	Tikung	-	-	1	29	-	-	12

Source: Department of Trade and Industry of East Java Province, 2012

TABLE 8
CLASSIFICATION OF THE SUB-DISTRICT WITH THE RESPECT TO AGRICULTURAL SITUATION

Quartile	Class	Name of Sub-districts
1	Very low potential	Kedungpring, Lamongan, Sarirejo, Maduran, Sambeng, Babat, Pucuk
2	Low potential	Tikung, Paciran, Ngimbang, Kembangbahu, Sugio, Sukodadi, Sekaran
3	Medium potential	Brondong, Mantup, Turi, Solokuro, Sukorame, Bluluk, Modo
4	High potential	Deket, Kalitengah, Karanggeneng, Laren, Glagah, Karangbinangun

TABLE 8
CLASSIFICATION OF REGION WITH THE RESPECT TO THE AGRO-INDUSTRIAL DEVELOPMENT STATUS

Quartile	Class	Name of Sub-districts
1	Very low potential	Sukorame, Sekaran, Solokuro, Turi, Modo, Mantup, Karangbinangun
2	Low potential	Kalitengah, Karanggeneng, Kambangbahu, Bluluk, Laren, Pucuk, Sugio
3	Medium potential	Sukodadi, Tikung, Maduran, Lamongan, Glagah, Deket
4	High potential	Sambeng, Sarirejo, Brondong, Babat, Ngimbang, Kedungpring, Paciran