Regional Economic Improvement Model through Integration of West Sumateran Rubber Market with ASEAN Regional Market

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Abstract—This paper examines the interrelationship between the success of regional economic development with its external regions by requiring to create market integration of the main commodities production. The occurrence of market integration is one of the necessities for the creation of economic agglomerations in the development area. The research approach method used is a regional economic analysis approach. Trade integration is measured using the Grubel Lloyd Index. Research results show that the rubber economy market in West Sumatra has been cointegrated with the economic corridors of Sumatra and ASEAN countries. The market integration of the rubber economy has been captured with the Grubel-Lloyd index which successfully explains the interrelationships between rubber exports and imports with ASEAN countries all this time.

Keywords— market integration; rubber market; intra industry trade of rubber

I. INTRODUCTION

Agro-industry plays an important role in the early stages of economic and rural development [1-3]. Agro-industry improves the quality of agricultural products and increases farmer's household income [4]. In order to activate the agro-industry sub-sector needs the availability of investment resources, skilled labor, availability of new technologies for product development to high added value, availability of capital and labor to overcome the obstacles of economies of scale [4,5].

Agroindustry is the ability to create a products portfolio from raw agricultural products converted into high-value final or semi-final products. The products portfolio are derivatives of raw agricultural products that are converted into valuable products. The steps of the product conversion Jonkman, et al 2015 as follow: 1). developing the portfolio of agricultural products based on composition and functionality from agricultural raw products, 2). develop a synthesis process to create a superstructure of new agricultural products portfolio and 4). Use of a multi-purpose optimization method to develop designs of agricultural products portfolio. To develop products portfolio from agricultural products, need to consider about the structure, functionality, the appropriate aspect of time and space [6].

The driving force of the exchange (market) is economic scale in production and consumption of the end product [7,8]. The development of production networks between regions, intra-industry exchange has expanded between regions at different income levels and different components of the end products that ultimately triggers the creation of economic agglomeration.

Agglomeration relates to geographical concentration and location of economic activities among companies that interact each other to carry out economic and business transactions [9]. There are three factors that influence the concentration of economic activity, namely 1). Technology or externalities that are not related to money, 2). Increasing return to scale, 3). Imperfect / spatial competition. Increasing return to scale is a very important concept to explain the spatial concentration of economic activity. The production costs will decrease as companies and industries concentrate in one location.

Economic agglomeration can also occur by industrial factors and location [10,11]. A company that is located close to each other in the same industry can take advantage of economic localization. The benefits of this inter-industry relationship can be in the form of access to technology transfer, the existence of a buyer-supplier network, and the opportunity for sub-contracting with each other. Agglomeration will occur when transportation costs are increasing that lead to the spatial labor mobility becomes low. Decreasing of the transportation costs will make the industrial companies have an incentive to concentrate their production in certain locations to reduce fixed costs. Transportation costs will be reduced in locations where there is a very good access of market input and output. Market access is a very strong determinant of the creation of agglomeration. Therefore, to create economic agglomeration, the provision of infrastructure quality will enhance the linkages between companies in economic transactions and their business in the center of the market.

According to Mc Cann that the decision of the location of a company depends not only on transportation costs in the form of distance, but also on the value of the shipping goods and the added value of the company. The source of the agglomeration is:
At the corporate level is from improving access to input and market output.

At the industry level is economic localization among existing industries will create transactions between them.

At the regional level is economic urbanization among industries, which describes urban density (income, output, etc.).

II. METHOD

This research used the regional economic analysis approach, namely trade integration and a measure of the creation of economic agglomeration, specifically in the rubber market in West Sumatra and its market integration with the regional markets of Sumatra and ASEAN economic corridors.

Trade integration is analyzed using Grubel-Lloyd index (1978). Exchange between industries can occur horizontally or vertically. Measurements that are commonly used to find out the trade between these industries in an area use the Grubel-Kelly index [3,12], with the following formula:

\[
GL_{ijkt} = 1 - \frac{(X_{ijkt} - m_{ijkt})}{X_{ijkt} + m_{ijkt}} \\
MII_{ijkt} = 1 - \frac{(\Delta X_{ijkt} - \Delta m_{ijkt})}{(\Delta X_{ijkt}) + (\Delta m_{ijkt})}
\]

Where:

\( GL_{ijkt} \) = Grubel–Lloyd index from region i and j

\( MII_{ijkt} \) = Marginal intra industry trade index from region i to j on product k and time t.

\( X_{ijkt} \) = Export/ sale of industrial product on region i to industry j on time t

\( M_{ijkt} \) = Import/ sale of industrial product on region i from region j on time t

Role of the thumb for the formula:

When \( GL \) index = 0; exchanges only occur in one direction.

When \( GL \) index = 1; balance industry exchanges.

When \( GL \) index between 0 and 1 = imbalance industry exchanges.

III. RESULT AND DISCUSSIONS

The planting and rubber production area in West Sumatra is most dominant in 3 central regions, namely the Dharmasraya, Sijunjung and Pasaman Regency, see figure 1. The highest growth of planting area and rubber production in the last five years is found in Pasaman regency which reached 67% for production and 62% for rubber planting area. Meanwhile, the number of households that cultivate rubber is most dominant in Sijunjung Regency reached 40% and Dharmasraya is 36%. Pasaman Regency as a center of rubber production and planting area has the lowest number of farmer households.

It shows that the productivity of rubber farmer households in Pasaman Regency is higher than Dharmasraya and Sijunjung. Another implication of this condition was that the average land ownership per household in Pasaman was higher than the average land ownership in Dharmasraya and Sijunjung. The average land area per household of rubber farmers in Pasaman district is 1.37 ha/household which is bigger than Sijunjung as 0.814 ha/household and in Dharmasraya reaches an average of 0.910 ha/household. The difference in the average ownership of rubber land is also accompanied by the rate of production growth and the growth rate of the planted area.

![Fig. 1. Comparison of rubber planting and production area in the in West Sumatra.](image)

From the figure 1 above that Pasaman has advantages in terms of planting area and rubber production, compared to Sijunjung and Dharmasraya. This advantage is due to the fact that the average area of land ownership per farmer household in Pasaman reaches more than 1.37 ha/household. However, table 1 show the percentage of households in the rubber commodity exploitation was greater in the Dharmasraya which reached 71.65% followed by Sijunjung with 61.15%. Pasaman has only 51.57% of rubber farmer households. Therefor that the biggest rubber production centers and households are in Dharmasraya and Sijunjung even though their rubber cultivation is still under 1 ha/household.
TABLE I.

<table>
<thead>
<tr>
<th>Regency</th>
<th>Number of households</th>
<th>Number of rubber farmer household</th>
<th>Percentage of rubber farmer household (%)</th>
<th>Rubber cultivation area (ha)</th>
<th>Average of land ownership (ha/hh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dharmasraya</td>
<td>56974</td>
<td>40823</td>
<td>71.65</td>
<td>37176</td>
<td>1.10</td>
</tr>
<tr>
<td>Sijunjung</td>
<td>54569</td>
<td>40996</td>
<td>75.12</td>
<td>33370</td>
<td>1.23</td>
</tr>
<tr>
<td>Pasaman</td>
<td>64769</td>
<td>33402</td>
<td>51.57</td>
<td>24439</td>
<td>1.37</td>
</tr>
<tr>
<td>Sumatera Barat</td>
<td>1264097</td>
<td>186091</td>
<td>14.72</td>
<td>181002</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Research result in 2018 and data analysis from BPS Sumbar 2018.

It shows that the number of households that cultivate rubber as their main livelihood in West Sumatra reaches 14.72% of the total number of households. The most dominant of the three production and planting area is Sijunjung district which reaches 75.12% of households. It followed by Dharmasraya regency at 71.65% and Pasaman with 51.57%.

Figure 2 provides information that there are three regions as centers for planting and rubber production in West Sumatra, namely Pasaman, Sijunjung and Dharmasraya regencies. The role of other kabupaten shares is relatively small, such as the Lima Puluh Kota, Pesisir Selatan and South Solok districts which are less than 10%.

The three centers in the span of the last five years show its dominance from sixteen other regency in West Sumatra. Dharmasraya Regency in the last five years has always been the biggest producer of rubber commodities, but since 2015 it can be followed by the Pasaman regency which surpassed Sijunjung and Dharmasraya.

The potential of rubber planting area and production is spread among regencies in West Sumatra. There are at least six regencies that have large planting and production areas over the past five years such as: Pasaman, Dharmasraya, Sijunjung, Pesisir Selatan, Lima Puluh Kota and Solok Selatan. The remaining are below the average of West Sumatra as 9526 ha for planting area and 8621 tons for production. This number is still far below compared to other rubber production provinces in Sumatra.
Figure 3 shows that economic potential West Sumatra rubber apparently still much smaller than South Sumatra, Riau, Jambi and North Sumatra. These top four provinces for rubber cultivation and production in the Sumatran regional region have been the center of the rubber commodity market in the central region. The results of Ansofino shows that the production center and rubber planting area of West Sumatra has been cointegrated with the Riau, South Sumatra and North Sumatra regions through rubber trading system. The vertical integration of the rubber commodity market is created with this external region, especially with Riau and South Sumatra for farmers and rubber traders in Sijunjung and Dharmasraya districts, as well as with North Sumatra for the Pasaman region.

Table 2 provides information that there are 4.40% of households in Indonesia operating rubber plantation as their main livelihood. The number of rubber farmer households in the Sumatra region which reaches 15.15% of national households. The most rubber farmer households are found in the South Sumatra which reaches 27.93% of the existing households, and 26.1% of households in the Sumatra economic corridor, followed by Jambi and Bengkulu provinces, each of which reached 24.18% and 20.51%.

The average ownership of rubber land in Indonesia reaches 1.6 ha /household and in Sumatra's economic corridor reaches 1.8 ha / household. Aceh, South Sumatra, Riau and Jambi have average rubber land ownership above the national average level. However, West Sumatra, North Sumatra and Lampung, which have been the provinces with the highest rubber production in the Sumatra corridor region have an average rubber cultivation area per household below the national average.
BASE ON FIGURE 4 THAT REGIONS WHICH HAVE HIGH PRODUCTION QUANTITIES SUCH AS NORTH SUMATRA AND WEST SUMATRA ARE NOT ALWAYS IDENTICAL WITH THE AVERAGE NUMBER OF RUBBER LAND OWNERSHIP PER FARMER'S HOUSEHOLD. IT IS MORE DETERMINED BY RUBBER PLANTING AREA AND THE OPPORTUNITY TO INTENSIFY HARVESTING BY OPENING NEW ARABLE LAND. THE HIGH DEMAND FOR RUBBER MARKET MAKES SUBSISTENCE RUBBER FARMER HAS AN ENCOURAGEMENT TO INCREASE THEIR PRODUCTION THROUGH EXTENSIFICATION. IT HAS HAPPENED IN SJUNJUNG WHERE THE AREA OF RUBBER PLANTATION CONTINUES TO INCREASE EVERY YEAR.

IV. CONCLUSION

BASED ON THE DATA ANALYSIS OF RUBBER PLANTING AREA AND PRODUCTION OF WEST SUMATRA, THE FOLLOWING CONCLUSIONS CAN BE EXPRESSED: THE FIRST THE PRODUCTIVITY OF RUBBER FARMER HOUSEHOLDS IN PASAMAN IS HIGHER THAN DHARMASRAYA AND SJUNJUNG. THE IMPLICATION OF THIS CONDITION IS THAT THE AVERAGE LAND OWNERSHIP PER HOUSEHOLD IN PASAMAN DISTRICT IS HIGHER THAN DHARMASRAYA AND SJUNJUNG. SECOND; THE ECONOMIC POTENTIAL OF RUBBER IN WEST SUMATRA WITH ITS PLANTED AREA AND PRODUCTION LOCATED IN 3 REGENCIES IS STILL LOWER COMPARED TO THE SOUTH SUMATRA, RIAU, JAMBI AND NORTH SUMATRA. THREE; WEST SUMATRA PRODUCTION CENTER AND RUBBER PLANTING AREA HAD BEEN CONINTEGRATED WITH THE RIAU, SOUTH SUMATRA AND NORTH SUMATRA REGIONS IN THE RUBBER TRADING SYSTEM. THE VERTICAL INTEGRATION OF THE RUBBER COMMODITY MARKET IS CREATED WITH THIS EXTERNAL REGION, ESPECIALLY WITH RIAU AND SOUTH SUMATRA FOR FARMERS AND RUBBER TRADERS IN SJUNJUNG AND DHARMASRAYA DISTRICTS, AS WELL AS WITH NORTH SUMATRA FOR THE PASAMAN REGION. FOURTH; WEST SUMATRA, NORTH SUMATRA AND LAMPUANG WHICH HAVE BEEN THE PROVINCES WITH THE HIGHEST RUBBER PRODUCTION IN THE SUMATRA CORRIDOR REGION TURNED OUT TO HAVE AN AVERAGE RUBBER CULTIVATION AREA PER HOUSEHOLD BELOW THE NATIONAL AVERAGE. FIFTH; RUBBER GROWING CENTERS AND PRODUCTION AREAS IN SUMATRA ECONOMIC CORRIDORS HAVE NOT HAD A VERTICAL MARKET LINK WITH THE LARGEST RUBBER IMPORTING COUNTRIES IN ASEAN. IT MEANS THE EXCHANGE BETWEEN THE ECONOMIC CORRIDORS OF SUMATRA AND SINGAPORE IN TRADE RUBBER ONLY OCCURS IN ONE DIRECTION.

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REFERENCES


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THE MODEL OF REGIONAL ECONOMIC IMPROVEMENT: INTEGRATION OF WEST SUMATERAN RUBBER MARKET WITH ASEAN REGIONAL MARKET

ANSOFINO
ECONOMIC DEPARTMENT
STKIP PGRI WEST SUMATRA
2018
Rubber Plantation

Traditional "Bokar" processing

Packaging "Bokar"

Transaction Farmers rubber with Nagaries Traders "Bokar"
BACKGROUND

- The center of Sumatra economic corridors are the city of Medan, Pekanbaru, Palembang, and Lampung have industrial areas as well as its buffer zone (hinterland).
- The center of Sumatera economic corridor need to build a spatial interaction with the hinterland that produced featured commodities such as oil palm, rubber, coal, and iron ore.
- West Sumatra Province is one of the hinterland region for the centers of Sumatra economic corridor.
- This study obtained to find a model for market integration of West Sumatera featured commodity with the center of Sumatra economic corridor.
- It also provide the market integration with Sumatra economic corridors as well as ASEAN countries and building regional cooperation between West Sumatra Province with centers of the Sumatra Economic corridor.
West Sumatra Rubber Economic Potential Area
Research Question

• The research question on this study are:

1. How to develop the rubber economic of West Sumatra Province to support the development of Sumatra’s economic corridors?

2. Are economic centers and industrial clusters integrated to the economic network system in the Sumatera’s business corridor and ASEAN Economic Community?
METHOD

• This study use a growth center model and regional economic analysis approach

• The empirical data of this study are primary and secondary data, Primary and secondary data are obtained by observation, interviews and publish data on BI, BPS, and world bank data.

• Analysis method for regional integrated industries using Index Grubel-Llyord, while to examine the degree of trade integration between the growth centers using panel data regression.

• Research locations for rubber production centers are Sijunjun and Dharmasraya districts
Based on the figure; provides information that there are three regions as centers for planting and rubber production in West Sumatra, namely Pasaman, Sijunjung and Dharmasraya regencies. The role of other kabupaten shares is relatively small, such as the Lima Puluha Kota, Pesisir Selatan and South Solok districts which are less than 10%.
RESULT AND DISCUSS: Rubber Economics Potential

The growth of Rubber Planting Area in West Sumatra

- Sijunjung
- Pasaman
- Dharmasraya

The growth of rubber production in West Sumatera on 2010 - 2016

- Sijunjung
- Pasaman
- Dharmasraya

The planting and rubber production area in West Sumatra is most dominant in 3 central regions, namely the Dharmasraya, Sijunjung and Pasaman Regency. The highest growth of planting area and rubber production in the last five years is found in Pasaman regency which reached 67% for production and 62% for rubber planting area. Meanwhile, the number of households that cultivate rubber is most dominant in Sijunjung Regency reached 40% and Dharmasraya is 36%.
Comparison number the household of rubber farmer among regency central rubber

- Pasaman Regency as a center of rubber production and planting area has the lowest number of farmer households.
- The average land area per household of rubber farmers in Pasaman district is 1.37 ha/household which is bigger than Sijunjung as 0.814 ha/household and in Dharmasraya reaches an average of 0.910 ha/household. The difference in the average ownership of rubber land is also accompanied by the rate of production growth and the growth rate of the planted area.
Position West Sumatra province in Sumatra’s Rubber economics

- West Sumatra Province as a research area gives a portion of rubber production by 5.79% while it contribute 4.51% into the national production.
- The portion of rubber planting area in the region is 5.02% equal to national average of 4.95%.
- Therefor West Sumatra Province is a buffer zone for rubber production in the Sumatra and National level.
- As part of buffer zone then it is necessary to make connection and integration of West Sumatra’s rubber production and trading to Sumatra and National level.

![Bar chart showing rubber plantation and production for West Sumatra province and other regions in Sumatra.](chart.png)
Comparison of production growth and rubber plantation area in Indonesia

• The potential economic of rubber in Indonesia then only dominated by Sumatra eventhough in Kalimantan had a large planting area with low growth of production to Sumatra region.

• The role of Sumatra is 98.50% in the national rubber planting area while the production portion of Sumatra is 78% of national rubber production. The rest of national production and rubber planting area are contributed by Kalimantan for production of 19.48% and planting area of 24.84%, Nusa Tenggara for production of 3.74% and planting area of 3.87%.

• Sumatra consists of ten provinces and potential of the rubber planting area are dominated by South Sumatra, Riau, Jambi and North Sumatra and West Sumatra and Lampung.
Number of Rubber Farmer Household in Sumatera and related to Indonesia

1. Table side provides information that there are 4.40% of households in Indonesia operating rubber plantation as their main livelihood. The number of rubber farmer households in the Sumatra region which reaches 15.15% of national households. The most rubber farmer households are found in the South Sumatra which reaches 27.93% of the existing households, and 26.1% of households in the Sumatra economic corridor, followed by Jambi and Bengkulu provinces, each of which reached 24.18% and 20.51%.

2. Regions which have high production quantities such as North Sumatra and West Sumatra are not always identical with the average number of rubber land ownership per farmer's household. It is more determined by rubber planting area and the opportunity to intensify harvesting by opening new arable land.

3. The high demand for rubber market make subsistence rubber farmer has an encouragement to increase their production through extensification. It as happened in Sijunjung where the area of rubber plantation continues to increase every year.

<table>
<thead>
<tr>
<th>Province</th>
<th>Number of household (HH)</th>
<th>Number of rubber farmer HH</th>
<th>Percentage of rubber Karet (%)</th>
<th>Rubber planting area (ha)</th>
<th>Average of rubber land ownership (ha/HH)</th>
<th>Rubber production (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumbar</td>
<td>1264097</td>
<td>149745</td>
<td>11,85</td>
<td>181002</td>
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<td>Aceh</td>
<td>1231058</td>
<td>61972</td>
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<td>66671</td>
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<td>1825538</td>
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</tr>
<tr>
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<td>4,40</td>
<td>4542094</td>
<td>1,6</td>
<td>3774000</td>
</tr>
</tbody>
</table>
Intra industry trade between corridor economic of Sumatra with ASEAN Economic Community

1. Measurements that are commonly used to find out the trade between these industries in an area use the Grubel-Kelly index.

2. Table 3 provide information that there are three province as center as plantation and production rubber in Sumatra corridor of economic have the integrated rubber market with export Singapore i.e. North Sumatra, South Sumatra and Lampung province. Its province have balances industry exchange with Singapore.

<table>
<thead>
<tr>
<th>Rubber production centre</th>
<th>Singapore</th>
<th>Malaysia</th>
<th>Thailand</th>
<th>Vietnam</th>
<th>Philippine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumbar</td>
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</tr>
<tr>
<td>Aceh</td>
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<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Sumut</td>
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<td>0,1</td>
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</tr>
<tr>
<td>Riau</td>
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<tr>
<td>Jambi</td>
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</tr>
</tbody>
</table>
Index Grubel-Llyord Rubber Trading between Sumatra corridor economic with Singapore

Grubel-Llyord Index of Rubber Trading Between Sumatera Economic Corridor with Singapore

- IGL Aceh-singapore
- IGL Sumbar_singapore
- IGL Bengkulu_singapore
- IGL Lampung_singapore
- IGL Jambi Singapore
- IGL Sumsel_singapore
- IGL Riau-Singapore
- IGL Babel_Singapore
- IGL Kepri_singapore

The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.
The graph on figure 5 provides information that cultivation centers and rubber production areas in the economic corridor of Sumatra do not have vertical market linkages with the largest rubber importing countries in ASEAN.

It can be seen from the Grubel-Llyord Index for the last ten years tends to be less than 1. It means that the exchange between Sumatra economic corridor and Singapore in the rubber trade only occurs in one direction.

Trade exchanges between Sumatra's economic corridors and Singapore have not been balanced. Singapore's imports of Indonesian rubber commodities in the form of processed rubber or crumb rubber still give benefit to Singapore.
CONCLUSION

1. The productivity of rubber farmer households in Pasaman is higher than Dharmasraya and Sijunjung. The implication of this condition is that the average land ownership per household in Pasaman district is higher than Dharmasraya and Sijunjung. However, the percentage of households in the rubber commodity exploitation was greater in the Dharmasraya region which reached 71.65% followed by Sijunjung as 61.15%.

2. The economic potential of rubber in West Sumatra with its planted area and production located in 3 regencies is still lower compared to the South Sumatra, Riau, Jambi and North Sumatra. The top four provinces in the area of rubber cultivation and production in the Sumatran regional region have been the center of the rubber commodity market in the central region.

3. West Sumatra production center and rubber planting area had been cointegrated with the Riau, South Sumatra and North Sumatra regions in the rubber trading system. The vertical integration of the rubber commodity market is created with this external region, especially with Riau and South Sumatra for farmers and rubber traders in Sijunjung and Dharmasraya districts, as well as with North Sumatra for the Pasaman region.

4. The rubber planting are and production centers in the Sumatra economic corridor is found in the province of South Sumatra with 27.93% of the existing households, and 26.1% of households in the economic corridor of Sumatra. It followed by Jambi and Bengkulu with 24.18% and 20.51% respectively. The average ownership of land per rubber farmer household in Indonesia reaches 1.6 ha / HH and for Sumatra economic corridor reaches 1.8 ha / HH.

5. Aceh, South Sumatra, Riau and Jambi have average rubber land ownership per household above the national level. However, West Sumatra, North Sumatra and Lampung which have been the provinces with the highest rubber production in the Sumatra corridor region turned out to have an average rubber cultivation area per household below the national average.

6. Rubber growing centers and production areas in Sumatra economic corridors have not had a vertical market link with the largest rubber importing countries in ASEAN since its Grubel-Llyord Index for the past ten years tends to be less than 1. It means the exchange between the economic corridors of Sumatra and Singapore in trade rubber only occurs in one direction.
thank you
STRATEGI 1:
PENGEMBANGAN 3 KORIDOR EKONOMI

- Koridor I: Padang – Bukittinggi- Payakumbuh (Koridor Gerbang Timur)
- Koridor II: Padang- Solok- Sijunjung- Dharmasraya (Koridor Lintas Sumatera)
- Koridor III: Pantai Barat