International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET229149

Regional Development Plan Based on Leading Agricultural Commodities in Pasaman Regency, West Sumatera Province, Indonesia

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Article Info
Volume 9, Issue 1
Page Number : 143-152

Publication Issue :
January-February-2022

Article History
Accepted : 08 Feb 2022
Published: 17 Feb 2022

ABSTRACT

In preparing the direction of the regional development plan, it is necessary to pay attention to determining the main focus of development. One of the strategies that can be used in Pasaman Regency is to develop areas based on leading agricultural commodities. This study aims to provide direction for regional development plan based on leading commodities in Pasaman Regency. The area that became the object of research consisted of 12 sub-districts and 62 nagari (villages). In determining the sub-district's leading commodities, each nagari is represented by 2 respondents so that the total number of respondents entirely is 124 people. For the preparation of directions for regional development plan based on leading commodities, interviews were carried out with 5 experts using the AHP questionnaires. The results showed that the leading commodities of food crops in Pasaman Regency were paddy field, rainfed paddy field and corn with a suitable land area of 4.197,9 ha, while the leading commodities of plantation crops were rubber, cocoa and oil palm with a suitable land area of 15.880,3 ha. There are three levels of regional development in Pasaman Regency, namely hierarchy I, II and III. Two sub-districts are included in hierarchy I, five sub-districts are included in hierarchy II, and five sub-districts are included in Hierarchy III. Priority for the direction of the regional development plan based on leading commodities in Pasaman Regency is ordered from priority 1 to priority 12. The results of this study can be used as a reference in preparing the direction of regional development plan based on leading commodities in Pasaman Regency.

Keywords: AHP, Leading Commodities, Regional Development, Scalogram, TOPSIS

I. INTRODUCTION

Regional development is an effort to spur socio-economic development, reduce regional disparities and preserve life. The main focus in regional development is different in each region. According to Susanto (2014) the efforts made to manage and develop the area in a sustainable manner include managing natural resources according to regional competencies and advantages. Judging from regional conditions, Pasaman Regency is dominated by rural areas that have potential in the agricultural sector, but this potential has not

been packaged properly so that the contribution of the agriculture, forestry and fisheries sectors to the Gross Regional Domestic Product (GRDP) of Pasaman Regency in the 2016-2020 period shows a trend which is decreasing every year. Economic growth in the agricultural category, forestry and fisheries in year 2016-2020, is 2,96%, 3,97%, 3,56%, 2,83% and 0,08%, respectively (BPS Pasaman 2021). Based on BPS data from Pasaman Regency in 2021, the biggest contributors to the agricultural sector is food crop and plantation crop commodities, each contributing 30,73% and 19,14% to the formation of added value in the agricultural subcategory. Food crops and plantation commodities are commodities that are widely cultivated in Pasaman Regency. These commodities are the spearhead in meeting the needs of the farming community in Pasaman.

On the other hand, when viewed from the demographic conditions, more than half of the population in Pasaman Regency work as farmers. Of the 78.257 population aged 15 years and over, 45.390 people work in agriculture. This shows how high the potential of the agricultural sector is if it is developed and packaged properly. In regional development, one of the factors that influence regional development is internal factors. This internal factor consists of the potential of natural resources, humans and the right technology in utilizing existing resources (Kuncoro 2014). Judging from the potential of natural resources and human resources in Pasaman Regency, the agricultural sector should be the driving force of the community's economy. But in reality, the agricultural sector has not been able to become the leading sector for the economic growth of the community. Therefore an approach to regional development based on leading commodities is needed. The leading commodity to be developed is a mainstay commodity that has a strategic position based on technical and socio-economic and institutional considerations.

This study aims: 1) analyzing the leading commodities of the agricultural sector in each sub-district in Pasaman Regency, 2) analyzing land that has the potential for development of leading commodities, 3) analyzing the level of development of the sub-district area in Pasaman Regency, 4) preparing directions for regional development plans based on leading commodities of Pasaman Regency.

II. METHODS AND MATERIAL

A. Research Time and Location

The research was conducted from September 2020 to June 2021 in Pasaman Regency, West Sumatra Province, which is located at 00° 55' North Latitude and 00° 06' South Latitude and between 99° 45'–100°21' East Longitude with the capital city Lubuk Sikaping.

B. Types and Sources of Data

The data used in this study is primary data in the form of data obtained through interviews, distributing questionnaires and observation. Secondary data are in the form of regional administration maps, land use maps, regional spatial plan (RTRW) maps from the Pasaman Regency Public Works Department, land map units, agreed forest use maps (TGHK), soil physics and chemistry data from the Center for Agricultural Land Resources (BBSDLP), as well as statistical data from various agencies (BPS, Bappeda and the Department of Agriculture of Pasaman Regency).

C. Data Analysis Techniques

1) Identification of Leading Commodities in the Agricultural Sector.

Determination of leading agricultural commodities in Pasaman Regency using the Multi Criteria Decision Maker (MCDM) method using Technique For Others Reference by Similarity to Ideal Solution (TOPSIS) analysis or also known as MCDM-TOPSIS. The determination of leading commodities is done by ranking the Range Unit Value (RUV) values of several agricultural commodities. The determination of the

RUV ranking is based on the analysis results of several analytical criteria, namely commodity comparative analysis (LQ analysis), commodity competitive analysis (SSA analysis), aspects of the average harvested area of agricultural commodities, aspects of agricultural commodity price growth, as well as preferences or opinions of the community/farmers on commodities that are become a leading commodity in a region.

Location Quotient (LQ) analysis and Shift Share Analysis (SSA) are used to determine the economic base or leading commodity in a region. This analysis was introduced by Blakely (1994). LQ analysis is basically an analysis to determine whether a region is a net importer or a net exporter of a particular product or sector, by comparing its production and consumption. According to Zamhari *et al.* (2017) leading commodities are commodities that have an LQ value > 1 and a positive SSA differential shift (DS) component. After the LQ and SSA analysis were carried out, the analysis of the average harvested area, the analysis of aspects of growth in the price of leading commodities, and an analysis of farmer's preferences were also carried out.

2) Analysis of Farmer's Preferences for Leading Agricultural Commodities

The analysis of the preferences of the farming community towards leading agricultural commodities is based on interview data from respondents in the form of a questionnaire. Respondents selected in this study are farmers who are members of farmer groups spread over 62 nagari (villages) within 12 sub-districts in Pasaman Regency. Each nagari is represented by two respondents (total 124 respondents). The results of the interviews in the form of a questionnaire were processed using a Likert Scale. The Likert Scale is a technique used to measure attitudes, responses, and perceptions of individuals or groups of people related to social phenomena (Sugiyono 2017) or a set of statement (items) offered for a real or hypothetical situation under study (Joshi *et al.* 2015). Initially, in the Likert Scale analysis, the weight of each answer to each question posed to the respondent was calculated first. After that, the weights of each question are summed and presented.

3) Analysis of Land Availability of Leading Agricultural Commodities.

Analysis of land availability was carried out to determine the location of land available for the development of agricultural leading commodities based on regional administration maps, regional spatial plan maps (RTRW), agreed forest use maps (TGHK), and maps of existing land use in Pasaman Regency. This available land is an important part in the process of preparing the direction of commodity development because it involves the availability of land resources (Sitorus *et al.* 2012). The analytical technique used is the analysis of overlapping (overlay).

4) Land Suitability Analysis of Leading Agricultural Commodities

Land suitability analysis is carried out by comparing the requirements needed by leading commodities with the characteristics and quality of the land to be developed. The results of the assessment are classified into five classes of suitability, namely: highly suitable (S1), moderately suitable (S2), marginally suitable (S3), currently unsuitble (N1) and permanently unsuitable (N2) (Sitorus 2004). In analyzing land suitability, it was found suitable lands for the development of food crop and plantation crop commodities. In order to avoid overlapping in the development of leading commodity-based areas, several criteria or considerations are used, namely: 1) Aligned with the strategic plan of the Pasaman Regency area, 2) The selection of leading commodities to be developed is determined based on a higher level of land suitability, 3) If the sub-district is a food crop center, it is prioritized for food crop development, 4) If the sub-district is a plantation crop center, it is prioritized for plantation crop development, 5) If the land suitability levels are in the same class, then consider a lower limiting factor (quick repairs can

be made), and 6) In accordance with the designated area that has been determined by the government.

5) Regional Development Level Analysis in Pasaman Regency

The level of development of an area is calculated using the weighted scalogram method. The scalogram method considers availability of infrastructure in the form of service facilities owned by an area (Mulyawan *et al.* 2015). The type of data used is sourced from the 2021 Podes data with several parameters/variables. The variables used in this study are modified variables with consideration of these variables in line with the research objectives and related to cultivation and agricultural institutions. The determination of the level of development of the sub-district area refers to the value of the District Development Index (GPA). Regions with GPA values > (stdev+average) are classified as Hierarchy I, regions with average values<GPA< (stdev+average) are classified as Hierarchy II, and regions with GPA values<average are classified as Hierarchy III (Panuju and Rustiadi 2013).

6) Directions for Regional Development Plans Based on Leading Commodities

The preparation of the direction of the regional development plan based on leading commodities begins with establishing the necessary considerations in formulating the direction of the regional development plan. In this study, the considerations used in preparing the direction of the regional development plan are as follows: 1) Does not conflict with the RTRW of Pasaman Regency, 2) Aligns with the Pasaman Regency Strategic Plan or directions for its use, 3) In accordance with the potential of an area (sub-district leading commodities, land availability, and land suitability class), 4) Considering farmer's preferences and 5) Paying attention to the level of development of an area.

Directions for regional development plans are prepared using the AHP-TOPSIS analysis, which is a combination of the AHP method (Analytic Hierarchy Process) and Technique for Other Preference by Similarity to Ideal Solution (TOPSIS) (Chamid and Murti 2017). The first step is an analysis using the AHP method to get the weights of the criteria used in regional development planning (Saaty 2001), then a TOPSIS analysis (Olson 2004) is carried out to determine the priority scale in regional development based on leading commodities. The input used in the weighting of the AHP analysis was obtained through interviews with 5 experts who are considered experts in the preparation of regional development plan. This is in accordance with the opinion of Turban *et. al* (2005) who said that the main input in AHP analysis is human perception.

III. RESULTS AND DISCUSSION

A. Leading Agricultural Commodities of Pasaman Regency

The selection of leading agricultural commodities for food crops and plantation crops was analyzed by considering 5 components of the analysis, namely LQ and SSA analysis, average harvested area, commodity price growth and farmer's preferences in cultivating. The determination of the leading commodity is carried out based on the RUV value (Range Unit Value). The five components above were analyzed using the Multi Criteria Decision Maker method with the analysis of Technique for Others Reference by Similarity to Ideal Solution or also called MCDM-TOPSIS. Commodities with the highest RUV are designated as leading commodities in the area. In Table I and Table II, the results of the MCDM-TOPSIS analysis are presented for the leading commodities of food crops and plantation crops, respectively.

Table I
Result of MCDM-TOPSIS Analysis of Food Crops Commodities in Pasaman Regency

No	Sub-Districts	Leading Commodities	RUV
1	Tigo Nagari	Corn	0,73
2	Bonjol	Paddy field	0,66
3	Simpati	Paddy field	0,53
4	Lubuk Sikaping	Paddy field	0,60
5	Dua Koto	Paddy field	0,52
6	Panti	Paddy field	0,74
7	Padang Gelugur	Paddy field	0,57
8	Rao	Paddy field	0,66
9	Rao Utara	Paddy field	0,54
10	Rao Selatan	Paddy field	0,73
11	Mapat Tunggul	Rainfed Paddy field	0,57
12	Mapat Tunggul Selatan	Corn	0,59

The results in Table I show that most of the leading commodity are paddy field, except for three areas that have the leading commodity in the form of rainfed paddy field and corn, which are Mapat Tunggul, Tigo Nagari and Mapat Tunggul Selatan Sub-Districts.

Table II
Result of MCDM-TOPSIS Analysis of Plantation Commodities in Pasaman Regency

No	Sub-Districts	Leading Commodities	RUV
1	Tigo Nagari	Palm oil	0,65
2	Bonjol	Cocoa	0,49
3	Simpati	Rubber	0,51
4	Lubuk Sikapang	Cocoa	0,48
5	Dua Koto	Rubber	0,51
6	Panti	Rubber	0,50
7	Padang Gelugur	Cocoa	0,62
8	Rao	Rubber	0,53
9	Rao Utara	Rubber	0,52
10	Rao Selatan	Palm oil	0,47
11	Mapat Tunggul	Rubber	0,55
12	Mapat Tunggul Selatan	Rubber	0,58

Plantation crops which are the leading commodities in Pasaman Regency are rubber, followed by cocoa and oil palm. Rubber is a leading commodity in 7 sub-districts, cocoa in 3 sub-districts and palm oil in 2 sub-districts.

B. Farmer's Preferences for Leading Agricultural Commodities in Pasaman Regency

Determination of leading agricultural commodities needs to consider the willingness/preference or interest of farmers who carryout cultivation. Interviews with farmers included several assessment criteria, those are the ease of cultivating a commodity including the technology adopted, the condition of the agricultural land, the benefits and ease of marketing the commodity, production costs and the risk of crop failure. This criterion is used as a benchmark why farmers choose commodity x as the leading commodity in their area. Table III presents the leading commodities based on the preferences of farmers in each sub-district in Pasaman Regency.

Table III
Results of Farmer's Preferences for Leading Commodities of Food Crops and Plantation Crops in Pasaman Regency

No	Sub-Districts	Leading Commodity of Food Crops	Percentage of farmer preference (%)	Leading Commodity of Plantation Crops	Percentage of farmer preference (%)
1	Tigo Nagari	Paddy field	66,7	Palm oil	100,0
		Corn	33,3		
2	Bonjol	Paddy field	100,0	Cocoa	62,5
				Rubber	37,5
3	Simpati	Paddy field	75,0	Rubber	50,0
		Corn	25,0	Cocoa	50,0
4	Lubuk Sikaping	Paddy field	83,3	Cocoa	66,7
		Corn	16,7	Rubber	25,0
				betel nut	8,3
5	Dua Koto	Paddy field	75,0	Rubber	75,0
		Corn	25,0	Cocoa	25,0
6	Panti	Paddy field	83,3	Cocoa	50,0
		Corn	16,7	Palm oil	16,7
				Rubber	33,3
7	Padang Gelugur	Paddy field	87,5	Cocoa	62,5
		Corn	12,5	Rubber	37,5
8	Rao	Paddy field	75,0	Rubber	75,0
		Corn	25,0	Cocoa	25,0
9	Rao Utara	Paddy field	83,3	Rubber	85,3
		Corn	16,7	Cocoa	16,7
10	Rao Selatan	Paddy field	83,3	Rubber	50,0
		Corn	16,7	Coconut	33,3
				Cocoa	16,7
11	Mapat Tunggul	Rainfed Paddy field	66,7	Rubber	83,3
		Corn	33,3	Palm oil	16,7
12	Mapat Tunggul Selatan	Rainfed Paddy field	50,0	Rubber	100,0
		Corn	50,0		

C. Analysis of Potential Land for Regional Development based on Leading Commodities

The first step in determining land that has the potential for regional development is to analyze the availability and suitability of the land. Analysis of land availability refers to the Regional Spatial Plan (RTRW) of Pasaman Regency, which maintains the function of protected areas and agricultural cultivation areas, especially wetland agricultural areas. Based on the analysis, the land area available for agriculture is 77.378,7 ha, while the remaining 302.744,2 ha is unavailable land. The land suitability analysis consists of 4 suitability classes, which are S2, S3, N1 and N2. The land included in the suitability class for S2 is 390,6 ha, S3 class is 19.687,6 ha, N1 class is 18.872,7 ha and N2 class is 37.356,8 ha. According to Jawang *et al.* (2018) land that is suitable for the development of the main leading commodity is land that suitable both of land characteristics and plant growing requirements.

Following in Figure 1 and Figure 2, a map of the availability and suitability of land for food crops and plantation crops is presented in Pasaman Regency.

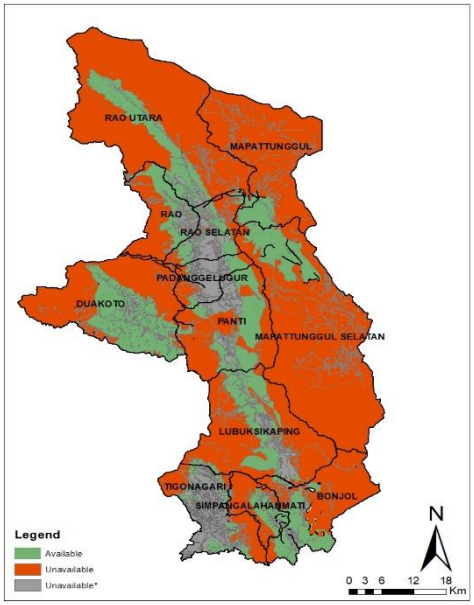

Figure 1: Map of Agricultural Land Availability

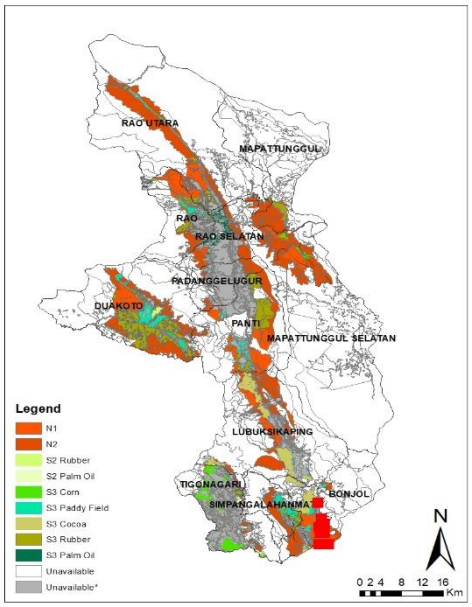

Figure 2: Map of Land Suitability for Food Crops and Plantation Commodities

Based on Figure 1, we can see that the area of land that can be used for agricultural cultivation is not much compared to the area of land that is not available. The highest available land area is in Dua Koto Sub-District, while the lowest available land area is in Padang Gelugur Sub-District.

D. Analysis of The Level of Develompent of The Pasaman Regency

Analysis of the level of regional development is used to make it easier to develop a regional development plan direction. Lower levels of development tend to have a wider area of agricultural land, so it has more potential to be developed. The level of regional development can be seen from the value of the District Development Index (GPA), the greater the GPA value of a sub-district, the more developed the area. With this method, a hierarchical level of regional development is obtained based on the number of facilities available, the area, the population and the distance traveled from the area to the service center (Panuju and Rustiadi 2013).

Based on scalogram analysis result that has been carried out in 12 sub-districts in Pasaman Regency, the regional hierarchy in Pasaman is grouped into 3 hierarchical classes, namely hierarchy I (high level of regional development), hierarchy II (medium level of regional development) and hierarchy III (low level of regional development). Figure 3 shows the level of development of the sub-district in Pasaman Regency.

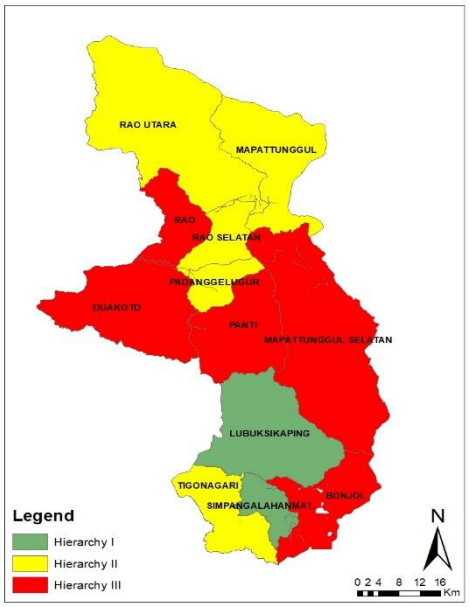

Figure 3: Map of the Development Level of the Sub-District of Pasaman Regency

E. Directions of Regional Development Plans Based on Leading Commodities

The regional development plan direction is carried out by making a priority scale for regional development based on leading commodities by considering the following criteria: 1) Availability and suitability of land, 2) Main agricultural commodities, 3) Regional development level, and 4) Farming community preferences. Determination of criteria is the most important factor because it will be used as the basis for determining the priority scale (Muntasar *et al.* 2011). After determining the criteria used in the analysis, then the weight of each criterion is calculated. This weighting is done to reduce the subjectivity of the assessment on the criteria that are used as input in the TOPSIS analysis.

Based on the AHP analysis, the value of the pairwise comparison matrix was obtained for each expert. The pairwise comparison values are combined with the geometric mean method. The results of the weighting of each criterion and the Consistency Ratio (CR) value can be seen in Table IV.

Table IV
Result of Weighting Criteria and CR Values

No	Criteria	Weight	*Consistency Ratio*(CR)
1	LQ and SSA values	0,29	0,04
2	Land Availability and Suitability	0,43	
3	Regional Development Hierarchy	0,12	
4	Farmer's Preference	0,16	

The criteria with the highest weight are the most important criteria in formulating the direction of the regional development plan based on leading commodities. In Table IV it can be seen that the criteria for land availability and suitability have the highest weight (0,43). The next most important criteria, are LQ and SSA values (0,29), farmer's preferences (0,16) and the hierarchy of regional development (0,12), respectively. The results of the consistency test on the AHP analysis showed a consistency ratio (CR) value of 0,04. This shows that the paired matrix of criteria used in the weighting process is consistent, this is in accordance with the opinion of Oktapiani *et al.* (2020).

The preparation of the direction of the regional development plan based on leading commodities is carried out by combining the AHP with TOPSIS analysis based on the RUV (Range Unit Value) value for each leading commodity spread in each sub-district. Based on the calculation results from the following AHP-TOPSIS analysis, Figure 4 is presented map of

regional development directions based on leading agricultural commodities in Pasaman Regency.

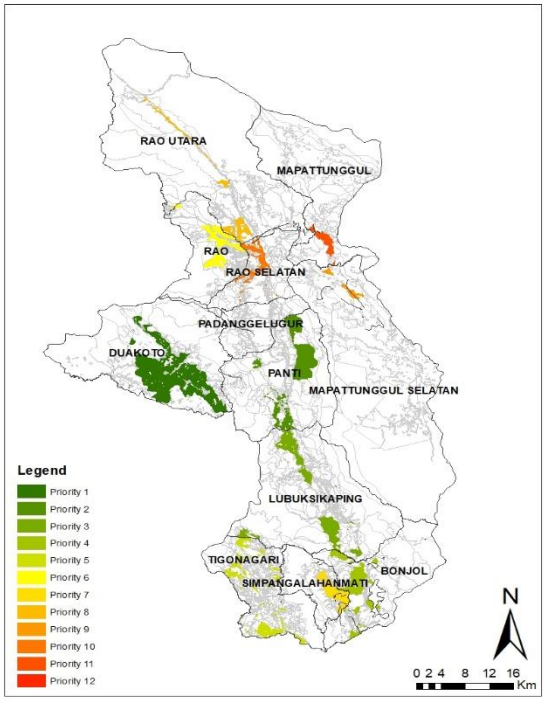

Figure 4: Map of Regional Development Plan Directions Based on Leading Agricultural Commodities

IV. CONCLUSION

Based on this research, it can be concluded that the leading commodities of food crops in Pasaman Regency are paddy field which is spread in 9 sub-districts, rainfed paddy field in 1 sub-district and corn in 2 sub-districts, while the leading commodities of plantation crops are rubber which is spread in 7 sub-districts, cocoa in 3 sub-districts, and oil palm in 2 sub-districts. Land that has the potential for the development of leading commodities consists of S2 and S3 land classes. The area of land suitable (S3) for paddy and corn is 2.582,9 ha and 1.615,0 ha, respectively. Meanwhile, the area of land suitable for rubber (S2 and S3), cocoa (S3), oil palm (S2 and S3) are 11.210,2 ha, 3.840,0 ha, and 830,1 ha, respectively. In preparing the regional development plan based on leading commodities, there are three levels of regional development used. Two sub-districts are included in Hierarchy I (Sub-Districts Simpati and Lubuk Sikaping), five sub-districts are included in Hierarchy II (Sub-Districts Tigo Nagari, Padang Gelugur, Rao Utara, Rao Selatan, and Mapat Tunggul) and five sub-districts are classified into Hierarchy III, (Sub-Districts Bonjol, Dua Koto, Panti, Rao and Mapat Tunggul Selatan). The priority directions for the regional development plan based on leading commodities in Pasaman Regency are sorted from priority 1 to priority 12. Those are: Dua Koto, Panti, Lubuk Sikaping, Bonjol, Tigo Nagari, Rao, Simpati, Rao Utara, Mapat Tunggul Selatan, Rao Selatan, Mapat Tunggul dan Padang Gelugur Sub-Districts, respectively.

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Cite this article as :

Suci Ramadhani, Santun R. P. Sitorus, Didit O. Pribadi, "Regional Development Plan Based on Leading Agricultural Commodities in Pasaman Regency, West Sumatera Province, Indonesia", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 1, pp. 143-152, January-February 2022. Available at doi : https://doi.org/10.32628/IJSRSET229149
Journal URL : https://ijsrset.com/IJSRSET229149