



## LAND SUITABILITY AND POTENTIAL AGRICULTURE ANALYSIS TO REGIONAL DEVELOPMENT BASED ON AGRO-TOURISM

### ANALISIS KESESUAIAN LAHAN DAN POTENSI PERTANIAN UNTUK PENGEMBANGAN WILAYAH BERBASIS AGRO-WISATA

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#### ABSTRAK

Kecamatan Bontolempangan salah satu kecamatan yang masuk dalam wilayah perencanaan tata ruang Kabupaten Gowa. Pengembangan potensi pariwisata dan sumberdaya lahan pertanian menjadi bagian utama dalam rencana tata ruang wilayah Kabupaten Gowa (RTRW 2012-2032). Oleh karena itu, penelitian menginvestigasi potensi komoditas pertanian beserta daya dukung lahannya sehingga dapat dijadikan acuan untuk menjadi kawasan wisata berbasis pertanian. Potensi unggulan pertanian dianalisis dengan metode location quotient (LQ) dan dynamic location quotient (DLQ) sedangkan daya dukung lahan pertanian dianalisis menggunakan analisis kesesuaian lahan. Dari analisis LQ dan DLQ, kopi robusta, coklat, jambu mete, kemiri, dan kopi arabika merupakan komoditas pertanian unggulan. Berdasarkan analisis kesesuaian lahan, daya dukung lahan untuk komoditas pertanian unggulan dikategorikan ke dalam kelas cukup layak (S<sub>2</sub>) dengan luas lahan kopi robusta seluas 2968.22 ha, coklat seluas 1202.30 ha, jambu mete seluas 2227.22 ha, kemiri seluas 2253.47 ha, kopi arabika seluas 3235.91 ha, dan ubi jalar seluas 952.78 ha. Dengan demikian, komoditas pertanian unggulan dapat dikembangkan menjadi kawasan wisata berbasis pertanian atau agro-wisata.

**Kata Kunci:** Analisis Location Quotient dan Dynamic Location Quotients, Agro-Wisata, Analisis Kesesuaian Lahan

#### ABSTRACT

Bontolempangan District is one of the districts included in the spatial planning area of the Gowa Regency. The development of tourism potential and agricultural land resources is a major part of the Gowa Regency spatial plan (RTRW 2012-2032). Therefore, this research investigates the potential of agricultural commodities and the carrying capacity of their land so that they can be used as a reference to become an agricultural-based tourism area. The agricultural potential was analyzed using the location quotient (LQ) and dynamic location quotient (DLQ) methods, while the carrying capacity of agricultural land was analyzed using land suitability analysis. From the LQ and DLQ analysis, robusta coffee, cocoa, cashew, candlenut, and arabica coffee are the leading agricultural commodities. Based on the land suitability analysis, the carrying capacity of the land for superior agricultural commodities is categorized into the moderate suitable level (S<sub>2</sub>) with an area of 2968.22 ha for Robusta coffee, 1202.30 ha of chocolate, 2227.22 ha of cashew nuts, 2253.47 ha of candlenut, 3235.91 ha of Arabica coffee ha, and sweet potatoes covering an area of 952.78 ha. Thus, leading agricultural commodities can be developed into agricultural-based tourism areas or agro-tourism.

**Key Words:** Location Quotient and Dynamic Location Quotient Analysis, Agro-Tourism, Land Suitability Analysis

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## 1. INTRODUCTION

The optimal use of natural resources can improve the power of local economic management, organizational capacity, and community economics (Suciati et al., 2019). The tourism sector has

strategic opportunities as the source of economic growth and the opportunities to become a prime mover of growth in other development sectors such as agriculture, plantation, trade, industry, and others by considering the carrying capacity of natural resources and environment (Wibowo & Ma'rif, 2014). Development of the tourism sector is one of the efforts made by increasing tourist attractiveness as development efforts intensify the interested loyalty of existing market segments and expand the scope of areas by utilizing natural resources use sustainability (Elwizan & Damayanti, 2017).

The main principle of tourism development is to preserve environment which based on the principle of sustainable development of resources through the agro-tourism approach such as re-creating farm into agro-tourism (Tugade, 2020). Tourism institutions and their networks should develop in an organized manner such as government, private sector and society, human resources, regulations, and operational mechanisms by optimizing the community role in agro-tourism development (Bhatta et al., 2020; Evgrafova et al., 2020). Imran (2012) revealed that are six factor to area development tourism area where one of them is supporting environmental namely physical conditions and commodities potentials. Public policy or regulations of Gowa regency is supporting area to develop agriculture be tourism or agro-tourism concept as stated in the regional spatial planing (RTRW) Gowa 2012-2032. Bontolempangan District is included in RTRW Gowa 2012-2032, whose agricultural and tourism sector are priority to be developed. In agriculture sector, there are some commodities in the Bontolempangan district, such as rice, coconut, chocolate, arabica and robusta coffee, cassava, peanut, corn, etc (BPS, 2020). The area development based on leading commodities agricultural is one approach that can be used to development regional economic growth.

Leading commodities agricultural is able to recognize by location quotient (LQ) and dynamic location quotient (DLQ) analysis. LQ and DLQ analysis have been used to identify and quantify potential economic sector or leading commodities of the agricultural (Morrissey, 2014; Mulyono, 2020; Simamora & Kifli, 2017). In addition, these methods are used how strongly the commodity is represented effect of district commodities to regional commodities. So, the leading commodities are identified by LQ and DLQ analysis, which might become the focus government support in public policy constructions (Crawley et al., 2013). Following economic theory, LQ and DLQ greater than 1 indicates that commodity in district is proportionally or larger than commodity in region. The others, both LQ and DLQ value are greater than one indicates that the commodity is sustainably potential production to tourism area based on agricultural namely agro-tourism (Sumantra et al., 2017; Tugade, 2020). (Crawley et al., 2013). Crawley et al. (2013) used LQ method as a policy aid in regional spatial analysis and Samodro et al. (2020) stated environmental supporting is usefully in spatial planning. One of method can analyze agricultural potential spatially is land suitability method.

Suitability among environmental conditions and agriculture in develop tourism objects is observing from the physical conditions of the environment such as rainfall, soil, topography, geology, and drainage. Land suitability is used to assessment and classification of part of land in terms of compatibility for a defined use which is conducting by comparing land quality and land use requirements. Land quality is affected by physical condition so the physical condition as input data in land suitability analysis. The purpose of this research is assessment land suitability of potentials commodities of agricultural. (Rika et al., 2016) used this method to analysis land suitability of agricultural commodities such as rice, corn, and groundnut. Land suitability classification used in this research is referred to FAO system (1976). Land suitability is divided into four categories namely land suitability of level order, land suitability of classes level, land suitability subclass level, and land suitability of order level or two order classification namely suitable and not suitable.

Land suitability of leading agricultural commodities is mapping using information systems (Kaswanto, 2015; Rika et al., 2016; Rusdi et al., 2015) to classification order visualization. The distribution of the agriculture potential is mapping by ArcGIS software where physical condition is required in order classification. Leading agricultural commodities and land suitability assessment has been conducting in Bontolempangan District because this area is one of district in regional spatial planning (RTRW) Gowa 2012-2032. So the main purpose of this research are determine agricultural commodities sector and land

suitability analysis of the leading agricultural commodities. Eventually, results of this research become a reference for regional development as public policy.

The uncorrelated development items have implications for the low development of community life in the Bontolempangan District, especially in rural areas. Agro-tourism is a concept carried out by utilizing agro-business as a tourist attraction with the involvement of rural-based communities (local communities) by paying attention to environmental sustainability, socio-culture by encouraging marketing activities through increased collaboration networks (Imran, 2012; Palit, Talumingan, & Rumagit, 2017).

## 2. DATA AND METHODS

### 2.1. Study Area

This research has been conducted in Bontolempangan District, Gowa Regency, South Sulawesi. Bontolempangan District is divided into eight villages namely Parangpoloa, Pa'ladingang, Bontoloe, Lassa-lassa, Bontolempangan, Julumate'ne, and Ulujangan (BPS, 2020) as revealed in Figure 1.

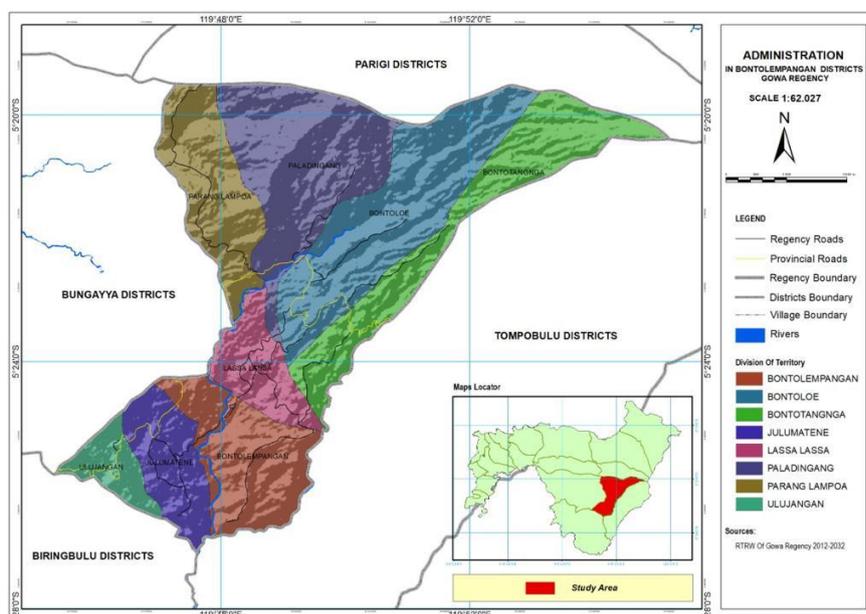


Figure 1. Administrative Map of Bontolempangan Sub-District Gowa District South Sulawesi

Bontolempangan District is one of area in Gowa Regional with wide of area is 142.46 Km<sup>2</sup> with topography condition of Bontolempangan District in the form of slope. In addition, this district has not experienced natural disasters yet such as landslide, earth quake, and tsunami (BPS, 2020). The Agricultural commodities in Bontolempangan District are chocolate, sweet potato, coffee, candlenut, coconut, etc. These commodities, especially coffee, and physical conditions are potentially development to tourism area base on agricultural (Palit et al., 2017; Trimo et al., 2018; Wibowo & Ma'rif, 2014).

### 2.2. Source Data

Data type used in this research is primary and seconder data. The primary data collected directly from field observations, responden, and the seconder data which used in this research are topography, land slope, geology, soil, and commodity agriculture data, are collected from government institution such as meteorology, climatology, and geophysics agency (BMKG), Indonesia Geospatial Portal, statistical agency (BPS), and relevant article of this research (Table 1).

**Table 1.** Source Data and Analysis Technique

The Purpose	Data	Source Data	Analysis Data
To analysis land suitability	Rainfall, drainage, temperature, soil texture, geology	BPS, BMKG, Geospatial portal.	Overlay
Area analysis	Land suitability map	BPS, BMKG, Geospatial portal.	Polygon analysis
To Anlaysis potential sector of agriculture	Agriculture commodities	BPS	Location question (LQ) and dynamic location question (DLQ)

### 2.3. Data Analysis

The analysis method used in this research is a combination of location quotient and dynamic location quotient (DLQ). The analytical method is used the location quotient (LQ) analysis as well as in Equation 1 (Morrissey, 2014).

$$LQ = \frac{RD/NR}{TRE/TDE} \quad 1$$

Where  $LQ$  is location question analysis,  $RC$  is proportion of district commodities,  $NR$  is proportion of regional commodities,  $TRE$  is corresponding to total regional employment, and total district employment ( $TDE$ ). For these analyses, there are some categorized to potential commodity recognize namely leading and non-leading agriculture commodities. For  $LQ > 1$ , the agriculture commodities are leading sector so those commodities are recommended as development sector. For  $LQ \leq 1$ , the agriculture commodities are non-leading sector. This analysis has been applying to recognize the agricultural sector potential, where this method is limited to condition analysis at a limited time or static analysis properly. The dynamic analysis of commodity potential has been conducting to analyze the dynamic prediction of commodity potential and the solution of LQ analysis. This DLQ analysis can determine changes or repositioning of changes in the agricultural sector, whether there is a change from the leading commodities to the non-leading commodities and vice versa. These leading commodities can be the main commodities in agro-tourism development, while these non-leading commodities are used as a supporting sector for agro-tourism development in Bontolempangan Regency, Gowa Regency.

The principle of the dynamic location quotient (DLQ) in Equation 2 (Simamora & Kifli, 2017) is to calculate the commodity ratio of district and regency to determine the potential for leading agricultural commodities.

$$DLQ = \frac{[(1 + g1R)/(1 + gR)]^t}{[(1 + G1)/(1 + G)]^t} \quad 2$$

Where,  $g1R$  is growth rate of item the agricultural commodities in Bontolempangan District,  $gR$  is growth rate of total the agricultural commodities in Bontolempangan Sub-district,  $G1$  is growth rate of item the agricultural commodities in Gowa District,  $G$  is growth rate of total the agricultural commodities in Gowa District, and  $t$  is range of time analysis. For  $DLQ > 1$ , the agriculture commodities are going to leading sector so those commodities are recommendation as development sector. For  $DLQ < 1$ , the agriculture commodities are going to non-leading sector.

For mapping land suitability of the leading agricultural commodities, ArcGIS software has used to mapping area of the agricultural (Rika et al., 2016; Sadowski & Wojcieszak, 2019) and land evaluation analysis of agricultural commodities to recognize land suitability in agricultural sector. To mapping land suitability, there are several of the physical conditions that need to be considered such as temperature, rainfall, drainage, texture, and erosion (Table 2).

**Table 2.** Matrix Land Suitability

Physical conditions	Land suitability categories			
	S1	S2	S3	N
Temperature (°C)				
Rainfall (mm)				
Drainage				
Texture				
Erosion				

The physical conditions have different criteria for each type of commodity in land suitability determine. Land suitability of the agricultural is divided into four categories namely highly suitable (S1), moderate suitable (S2), marginal suitable (S3), and not suitable (S2) (Fao, 1976; Ritung, 2011; Wahyunto, 2016). Land suitability is determined by overlay physical conditions in Table 2. Land suitability of leading agricultural commodities is obtained by using overlay technique from physical condition data in Table 2.

### 3. RESULT AND DISCUSSION

#### 3.1. Location Quotients (LQ) and Dynamic Location Quotients Analysis

The purpose of agro-tourism areas development is one of the development approaches by placing agricultural areas as centers in a professional, integrated and sustainable manner by increasing their attractiveness. This approximation is properly enhanced interested tourism that the agricultural as a development center professionally, integrated, and sustainable (Trimo et al., 2018). The data of ricefield and plantation production are used to recognize agriculture potential. So, the public policy for integrated development is conducting appropriately. The other, the location quotient method has been used for the analysis of potential ricefield and plantation.

**Table 3.** Production Data in Ton of Ricefield and Plantations in Bontolempangan District

Ricefield/plantation commodities	Bontolempangan District in years				
	2014	2015	2016	2017	2018
Lowland rice	5,00	13,68	17,50	25,74	19,73
Field rice	3,00	453,00	952,00	0,00	0,00
Corn	7,80	9,31	12,94	15,21	18,93
Peanuts	1,60	26,00	63,00	6,00	0,00
Cassava	13,00	14,07	18,92	10,17	10,67
Sweet potato	77,00	77,00	74,00	563,00	357,00
Hybrid coconut	2,10	2,09	2,05	2,12	1,72
Coconut	16,89	20,87	16,86	14,00	13,78
Robusta coffee	25,64	19,06	14,49	46,25	46,25
Arabika coffe	67,07	60,36	41,58	73,70	73,70
Chocolate	256,75	294,57	192,53	7,88	106,42
Clove	11,68	12,94	8,57	11,50	11,50
Cashew	107,65	89,77	66,74	0,00	3,15
Candlenut	29,14	20,10	10,96	1,30	1,30
Kapok	6,24	3,54	1,58	1,30	1,30
Vanilla	0,17	0,23	0,06	0,02	0,02
Total	488	1003	1414	776	660

Source: BPS, 2019

**Table 4.** Production Data in Ton of Ricefield and Plantation in Gowa Regency

Ricefield/Plantation Commodities	Gowa Regency				
	2014	2015	2016	2017	2018
Lowland rice	335,15	352,89	380,46	0,00	401,98
Field rice	56,11	27,24	28,75	27,28	0,00
Corn	227,22	234,76	241,78	239,63	262,30
Peanuts	1,45	814,00	1,01	686,00	937,00
Cassava	254,42	246,07	225,43	320,63	223,96
Sweet potato	11,22	5,56	5,07	4,05	8,41
Hybrid coconut	1,14	195,59	206,46	170,71	171,00
Coconut	9,82	1402,01	1520,96	1203,17	1203,00
Robusta coffee	8,77	453,90	496,82	352,28	352,00
Arabika coffe	2,79	2119,79	2328,11	1730,71	1731,00
Chocolate	11,37	2,10	2,14	1342,00	1342,00
Clove	1,46	188,08	201,61	147,63	138,47
Cashew	6,74	1276,73	1475,87	0,00	0,00
Candlenut	2,68	339,70	317,22	1099,50	164,00
Kapok	2,51	130,91	162,08	164,47	70,00
Vanilla	408,00	5,50	7,58	2,00	6,00
Total	921	7319	7114	6224	6771

Source: BPS, 2019

By using location quotient (LQ) analysis, it can be used to obtain comparative information on a sector or industry in an area by identifying development sectors, both leading and non-leading commodities in an area by comparing regional strength indicators, namely regencies compared to the role of the equal commodities in District Bontolempangan as follow.

Based on the analysis results of the location quotient analysis for ricefield and plantation plants in 2014 until 2018, the commodities that are scored more than 2 are peanuts, sweet potatoes, hybrid coconut, coconut, robusta coffee, arabica coffee, chocolate, cashew cloves, candlenut, and kapok. Therefore, these commodities are categorized as the leading commodities. In 2015, the commodities that scored more than 1, as leading commodities, are field rice, sweet potatoes, and cocholate. In 2016, the commodities that obtained a value of more than 1, as leading commodities, are field rice, peanuts, sweet potatoes, and cocoa. In 2017, the commodities that scored more than 1, leading commodities are sweet potatoes and robusta coffee. In 2018, the commodities that received a value of more than 1, as leading commodities, were sweet potatoes and robusta coffee. Therefore, sweet potato is one of the leading commodities that is potentially useful to regional development as an agro-tourism. It is based on location quotient analysis where this analysis shows that sweet potato has the the highest value of 347.52 at showed Table 5.

**Table 5.** Results of Location Quotient Analysis of Ricefield and Plantation in Both Bontolempangan District and Gowa Regency

Commodities	Location Quotient (LQ)					Average	Category
	2014	2015	2016	2017	2018		
Lowland rice	0,03	0,28	0,23	0,00	0,50	0,21	non basis
Field rice	0,10	121,37	166,57	0,00	-	57,61	Basis
Corn	0,06	0,29	0,27	0,51	0,74	0,37	non basis

Commodities	Location Quotient (LQ)					Average	Category
	2014	2015	2016	2017	2018		
Peanuts	2,09	0,23	313,74	0,07	-	63,23	Basis
Cassava	0,10	0,42	0,42	0,25	0,49	0,34	non basis
Sweet potato	12,96	100,99	73,39	1114,77	435,50	347,52	Basis
Hybrid coconut	3,47	0,08	0,05	0,10	0,10	0,76	non basis
Coconut	3,25	0,11	0,06	0,09	0,12	0,73	non basis
Robusta coffee	5,52	0,31	0,15	1,05	1,35	1,68	Basis
Arabika coffe	45,47	0,21	0,09	0,34	0,44	9,31	Basis
Chocolate	42,67	1024,08	452,95	0,05	0,81	304,11	Basis
Clove	15,15	0,50	0,21	0,63	0,85	3,47	Basis
Cashew	30,19	0,51	0,23	0,00	-	6,19	Basis
Candlenut	20,52	0,43	0,17	0,01	0,08	4,24	Basis
Kapok	4,71	0,20	0,05	0,06	0,19	1,04	Basis
Vanilla	0,00	0,31	0,04	0,08	0,03	0,09	non basis

**Table 6.** Results of Dynamic Location Quotient (DLQ) Analysis in 2014-2018

Ricefield/Plantation Commodities	Bontolempangan District		Gowa Regency	
	Average in 2014-2018	DLQ	Average in 2014-2018	DLQ
Lowland rice	16,33	0,35	294,10	1,14
Field rice	281,60	0,23	27,87	0,19
Corn	12,84	0,51	241,14	0,77
Peanuts	19,32	0,15	487,89	0,01
Cassava	13,36	0,81	254,10	0,87
Sweet potato	229,60	4,50	6,87	0,04
Hybrid coconut	2,02	0,18	148,98	0,03
Coconut	16,48	1,03	1067,79	0,01
Robusta coffee	30,34	1,54	332,75	0,04
Arabika coffe	63,28	3,93	1582,48	0,03
Chocolate	171,63	14,87	539,92	0,01
Clove	11,24	0,73	135,45	0,04
Cashew	53,46	6,27	551,87	0,01
Candlenut	12,56	1,74	384,62	0,03
Kapok	2,79	0,42	105,99	0,01
Vanilla	0,10	0,00	85,82	1,39
Total	868,04	28,19	5669,86	1217,0

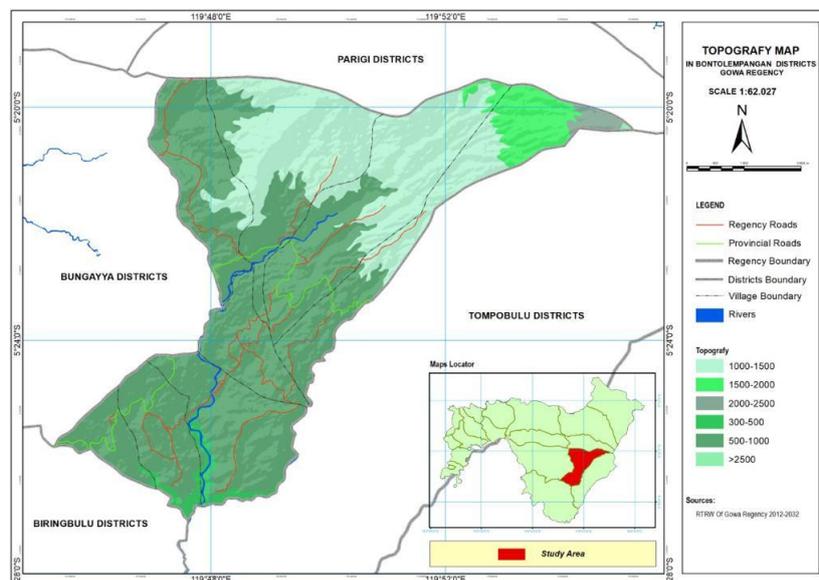
Dynamic location quotient analysis is used to recognize the leading sectors and the average growth rate of growth each year in Bontolempangan District, Gowa Regency South Sulawesi. Based on the results in Table 6, the dynamic location quotient method has been using successfully to recognize potential commodities. Several commodities are that have a DLQ value of more than one, namely sweet potato, coconut, robusta coffee, arabica coffee, chocolate, cashew nuts, and candlelnut, while for commodities whose value is DLQ more than one in Gowa Regency, namely lowland rice and vanilla commodities. The leading commodities of the Agricultural is determined by combination between LQ and DLQ analysis with the commodities condition must be leading commodities commodities (Table 7). The symbol,  $\sqrt{\phantom{x}}$ , indicator LQ and DLQ value greater than one.

**Table 7.** Leading Sector Potention in Bontolempangan District, Gowa Regency

Commodities	LQ	DLQ	Leading Commodities of Agricultural
Lowland rice	-	-	-
Field rice	√	-	-
Corn	-	-	-
Peanuts	√	-	-
Cassava	√	-	-
Sweet potato	√	√	Sweet Potato
Hybrid coconut	-	-	-
Coconut	-	√	-
Robusta coffee	√	√	Robusta Coffee
Arabika coffe	√	√	Arabika coffee
Chocolate	√	√	Chocolate
Clove	√	-	-
Cashew	√	√	Cashew
Candlenut	√	√	Cendlenut
Kapok	√	-	-
Vanilla	-	-	-

### 3.2 Topography Condition

Bontolempangan Subdistrict Gowa Regency has an area that is mostly highlands and also a groundwater recharge area. The topography of this area is ranging from 300-1000 meters above sea level. Other than that, the range of this area's slope is 0-40%. The following is the Topographic map of Bontolempangan District, Gowa Regency, South Sulawesi Province (Figure 2).



**Figure 2.** Topography of Bontolempangan District of Gowa Regency

Bontolempangan sub-district is a slope area consisting of Paranglompoa, La'ladingang, Bontoloe, Lassa-lassa, Bontolempangan, Julumate'ne, Ulujangang villages with a population of 12,326 people. The majority of the population of Bontolempangan District are farmers with a rice field area of 2,337 Ha, a plantation area of 10,822 Ha with the division of the region based on the topography of 300 - 500 meters above sea level and 500-1000 meters above sea level.

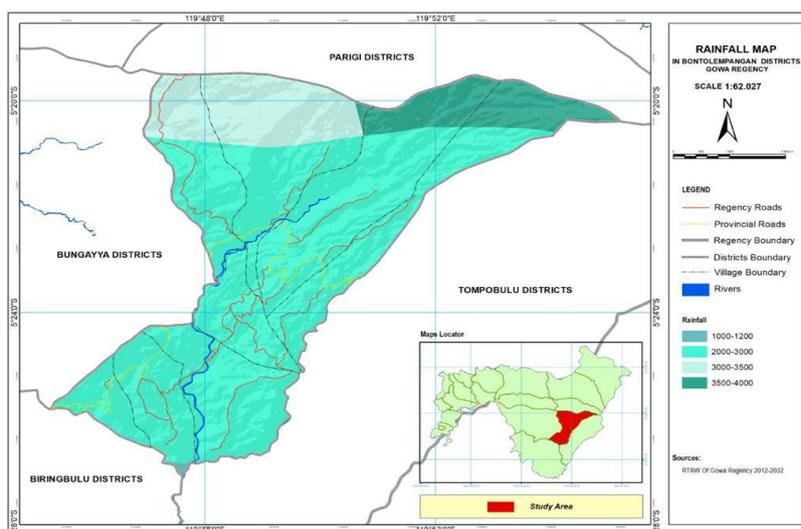
**Table 8.** Land Suitability of Leading Commodities Based on Topography Conditions

Commodity	Land Usage Evaluation (mdpl)		Category of Land Equality
	Condition	Technical	
Sweet potato	500	500-1000	S1
Robusta coffee	600-1.500	500-2.000	S2
Arabika Coffee	600-2.000	500-2.000	S2
Chocolate	100-400	1-600	S2
Cashew	100-300	1-700	S2
Candlenut	400-600	0-800	S2

Based on land equality analysis, sweet potato is a more potential commodity than robusta coffee, arabica coffee, chocolate, cashew nuts, and candlenut. Therefore, sweet potato is categorized a prime commodity (S1), and the others are categorized as moderate suitable (S2). All of the commodity is developed in all areas of Bontolempangan District with their respective altitude conditions from above sea levels: 300-500 in the village area of Julumatene, Bontolempangan, 500-1,000 in the area of the village of Ulujangan, Julumatene, Bontolempangan, Lassa-Lassa, Paranglompoo, Paladingang and Bontoloe, 1,000-1,500 in the village area of Bontoloe, Bontotangnga, Paladingang. 1,500-2,000 are in the Bontotangnga Village area, 2,000-2,500 are in the Bontotangnga Village area, and over 2,500 are in the Bontotangnga Village.

### 3.3. Rainfall Conditions

Climatology is a weather condition when averaged over a long period. Rainfall intensity is the amount of rainfall that falls/time. The rainfall is the amount of rain that falls in an area within a certain period. The general climatological condition in Gowa Regency is with an average rainfall of 2,653 mm/every year where the highest rainfall in December, January, and February, and the lowest rainfall is from August to November. The following is a map on Figure 3 of the rainfall in Bontolempangan District, Gowa Regency, South Sulawesi Province.



**Figure 3.** Rainfall of Bontolempangan District Gowa Regency

In Bontolempangan District, the rainfall reaches 2500-3500 mm/year so that this is very potential to cultivate leading commodities.

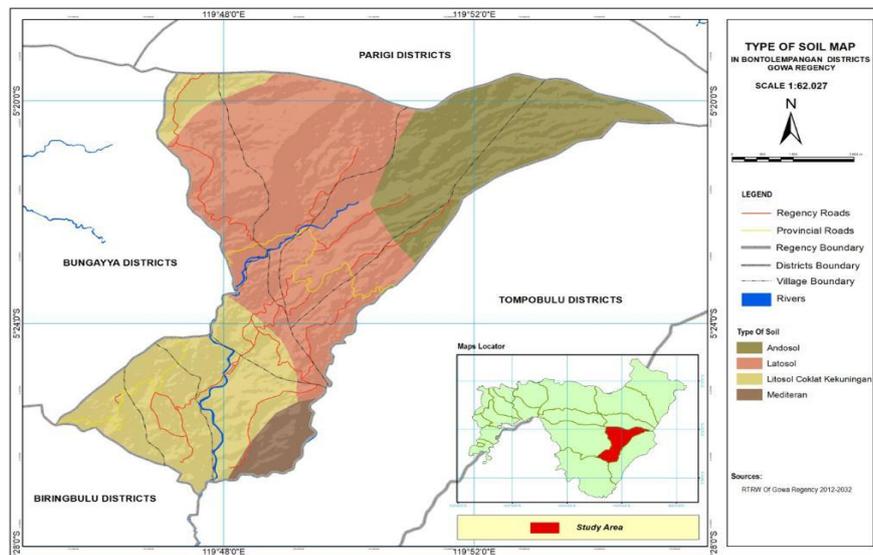
**Table 9.** Land Suitability of Leading Commodities Based on Rainfall Conditions

Commodity	Land usage evaluation (mm/year)		Category of land suitability
	Condition	Technical	
Ubi jalar	3.000-4.000	3.000-4.500	S2
Sweet potato	3.000-4.000	1.250-5.000	S2
Robusta coffee	3.000-4.000	2.500-3.500	S2
Arabika Coffee	3.000-4.000	1.800-3.000	S3
Chocolate	3.000-4.000	900-1.100	S3
Cashew	3.000-4.000	640-4.290	S2

Based on the results on table of land equality analysis, sweet potato commodities, coconut, robusta coffee, arabica coffee, cocoa, and cashew nuts and candlenuts are quite suitable (S2) to be developed in all areas of Bontolempangan District with rainfall conditions of 3,000-4,000 mm/year almost evenly in District of Bontolempangan, Gowa Regency

### 3.4 Soil Type

Soil is the type of materials in which it contains sedimented solid mineral grains and comes from the weathering of organic matter, liquids, and gases compounds that fill the spaces in solid particles. The following is a map on Figure 4 of soil types in Bontolempangan District, Gowa Regency, South Sulawesi Province.



**Figure 4.** Type of soil in Bontolempangan District, Gowa Regency

Types of soil in Bontolempangan District, Gowa Regency, namely andosal, latosol, and mediteran are compatible for agricultural and plantation activities.

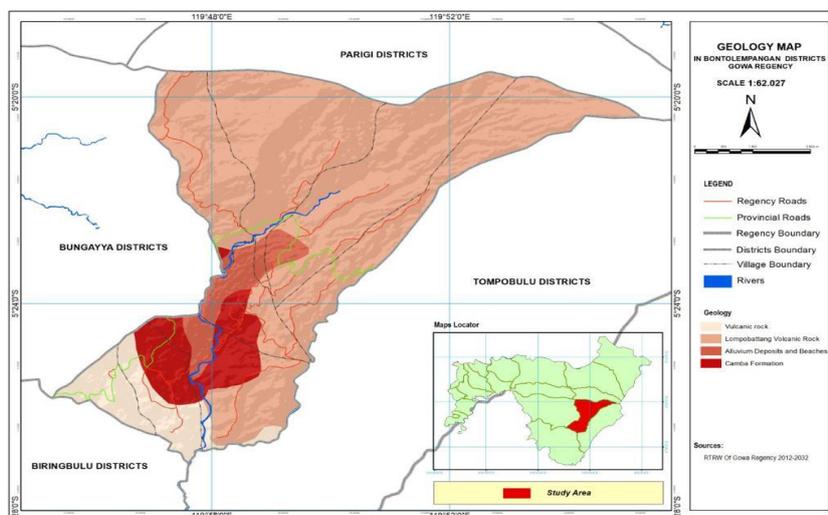
**Table 10.** Land Suitability of Leading Commodities Based on Type of Soil

Commodity	Land Usage Evaluation (Thickness in cm)		Category of Land Suitability
	Condition	Technical	
Sweet potato	Andasol, Latasol, Mediteran	Gambut thickness 60-140	S2
Coconut	Andasol, Latasol, Mediteran	Gambut thickness 60-200	S2
Robusta coffee	Andasol, Latasol, Mediteran	Gambut thickness 140-200	S2
Arabika Coffee	Andasol, Latasol, Mediteran	Gambut thickness 140-200	S2
Chocolate	Andasol, Latasol, Mediteran	Gambut thickness 140-200	S2
Cashew	Andasol, Latasol, Mediteran	Gambut thickness 60-200	S2
Candlenut	Andasol, Latasol, Mediteran	Gambut thickness 60-200	S2

Based on the results on Table 10 of land equality analysis, the commodities of sweet potato, coconut, robusta coffee, arabica coffee, cocoa, cashew nuts, and candlenut are quite suitable (S2) to be developed in all areas of Bontolempangan District with the soil type conditions of each andosol in Bontoloe Village, Bontotangnga, Latasol in the villages of Paranglompoa, Paladingang, Lassa-Lassa, Bontotangnga and Bontoloe, Mediteran in the Villages of Ulujangan, Julumatene, Bontolempangan, and Lassa-Lassa.

### 3.5 Geology Condition

Geological conditions can provide an overview of rock types, namely igneous, sedimentary, and metamorphic rocks in an area. Where rock are solid objects made naturally from minerals of silica. Geology condition in Bontolempangan District, Gowa Regency is provided on Figure 5.

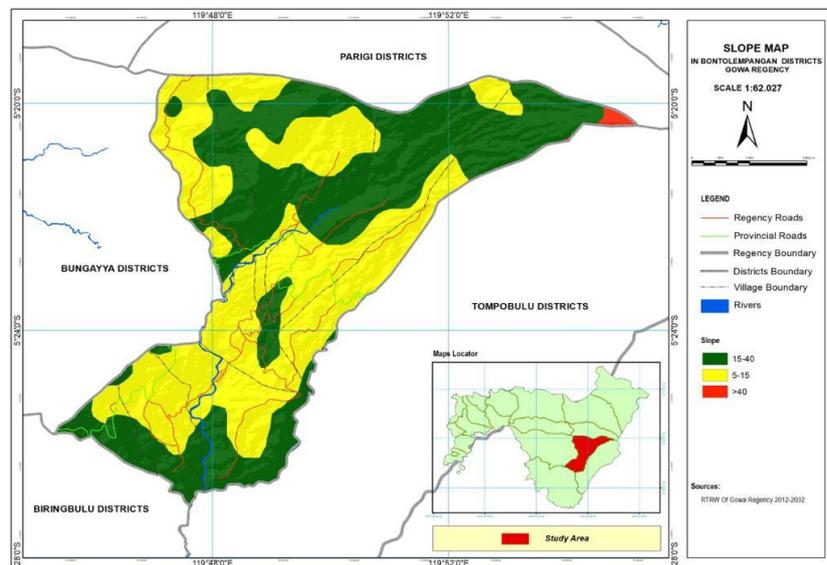


**Figure 5.** Type of Rock in Bontolempangan District, Gowa Regency

Types of rocks in the District of Bontolempangan, namely sedimentary rocks and volcanoes, are found in the subdistrict of Lassa-Lassa. Types of rock in Julumatene villages, namely sand gravel, clay, mud, limestone. The type of coral is found in the area of Lassa-Lassa Village whereas the type of conglomerate, lava, breccias, lava deposits, tuffs are found in the villages of Bontotangnga and Bontoloe, Ulujangan, Julumatene, Paranglompoa and Paladingang that are compatible for agricultural and plantation activities.

### 3.6 Slope Condition

Bontolempangan District, Gowa Regency is bordered by the North of Lassa-Lassa Village, the East side of Tompobulu District, the Southern District of Biringbulu District, and the North borders Julumatene Village. With an area of 142.46 km<sup>2</sup> which has different slope conditions. The following is a map on Figure 6 of the Slope Slope of Bontolempangan District, Gowa Regency, South Sulawesi Province.



**Figure 6.** The slope of Bontolempangan District of Gowa Bontolempangan

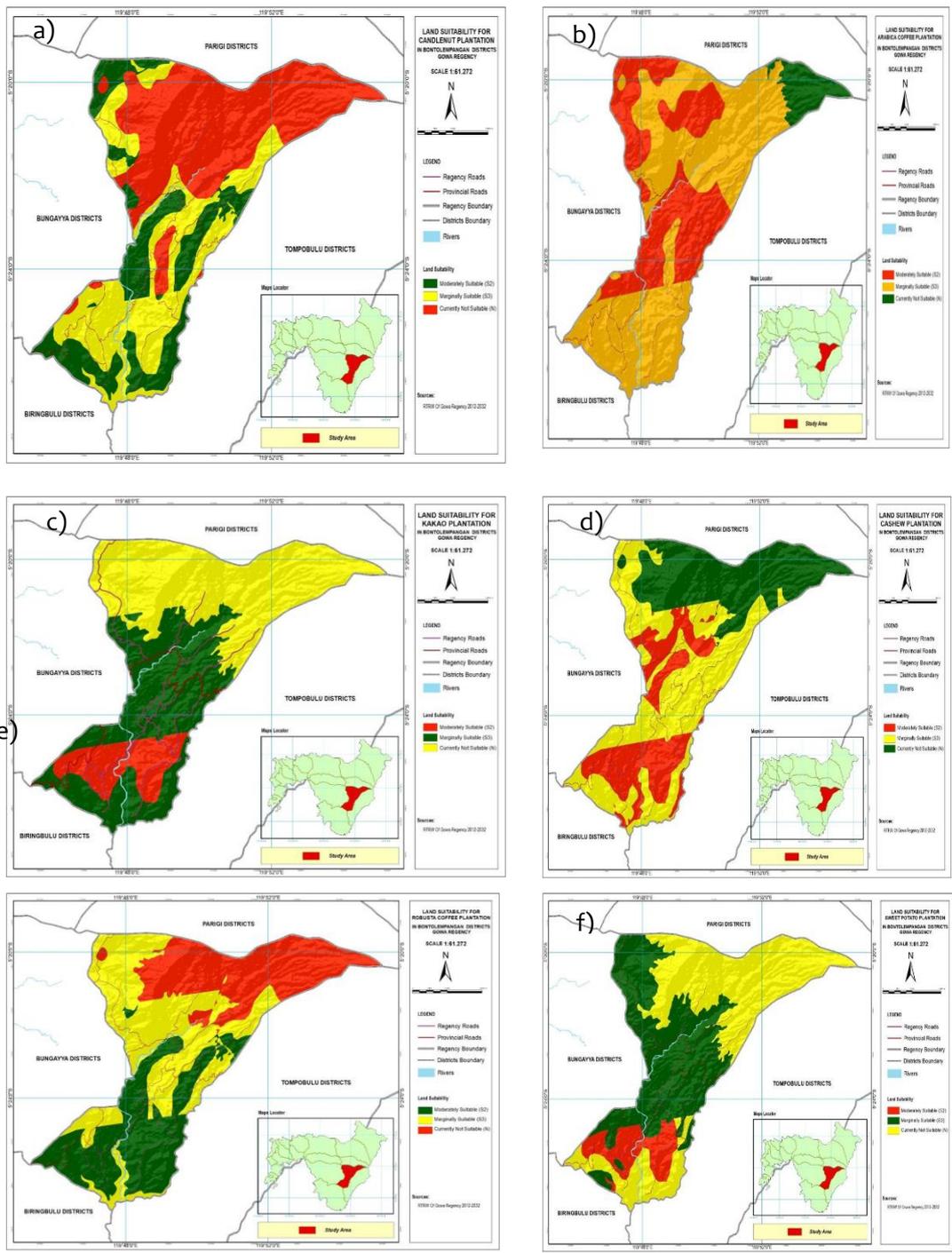
Bontolempangan District of Gowa Regency has a proper slope of 0-8%, 8-15%, 15-25%, and 25-40%, respectively.

**Table 11.** Land Suitability of Leading Commodities Based on Type of Slope

Commodity	Land Evaluation Usage (Slope %)		Category of Land Suitability
	Condition	Technical	
Sweet potato	0-15	3-15	S2
Robusta coffee	0-15	8-16	S2
Arabika Coffee	0-15	8-16	S2
Chocolate	0-15	8-16	S2
Cashew	0-15	8-16	S2
Candlenut	0-15	8-16	S2

Based on the results of land suitability analysis, the commodities of sweet potato, coconut, robusta coffee, arabica coffee, chocolate, and cashew nuts and candlenut are quite suitable (S<sub>2</sub>) to be developed in all areas of Bontolempangan District with slope conditions of 0-8%, 8- 15% and 15-25% of all Village areas in Bontolempangan District, and 25-40% slope only in Bontotangnga, Paladingang, Bontoloe, Bontolempangan, Ulujangan villages and village areas with a slope of more than 40% are Bontotangnga villages.

3.7 Leading agriculture commodities analysis



**Figure 7.** Land Suitability of Leading Sector a) Candlenut, b) Arabika Coffee, c) Chocolate, d) Cashew, e) Robusta Coffee, and f) Sweet Potato

Based on LQ and DLQ analysis in Table 7, candlenut, arabika coffee, chocolate, cashew, robusta coffee, and sweet potato are leading commodities that can be developed sustainably for economic supporting in Bontolempangan District, Gowa Regency. LQ and DLQ analysis are also revealed average production of six commodities with value greater than one ( $LQ > 1$  and  $DLQ > 1$ ) as show in Table 7. This value is indicated

that the commodities can be used to supply food needs at Bontolempangan District level, and that value is also indicated able to supply in regency level, Gowa Regency. The main point in this value is that agricultural commodities can be produce continuously (Morrissey, 2014). Therefore, these commodities can be used to regional economic development, especially Bontolempangan Sub-district.

The six commodities above can be main capital for local communities to develop tourism base on agriculture or agrotourism with nature concervation concept (Imran, 2012; Stanovčić et al., 2018). This concept has been applied to agro-tourism development in Bandung Regency as revealed by Trimo et al. (2018). The carrying capacity of the agrotourism area is major factor to development of agrotourism area such as rainfall, geology, soil, slope condition. The carrying capacity of agrotourism environment has been analyzed by ArcGis Software as conducted by Rika et al. (2016). The Area distribution of leading commodities at Figure 7 is mapped by physical condition in Table 7 with overlay technique of physical condition is used to produce land suitability. Land suitability analysis is divided into four level namely highly suitable (S1), moderate suitable (S2), marginal suitable (S1), and currently not suitable (N). Based on physical condition, Bontolempangan Sub-district, Gowa Regency is in all level except highly suitable level (S1).

Land suitability analysis is also used to area extraction of each leading agricultural commodities as shown in Table 9. The porposed development of agrotourism is in moderate suitable (S2), while non-agrotourism area is in marginal suitable (S3) and currently not suitable (N). This is because moderate suitable level (S2) have enough support in physical condition such as soil, topography, geology, and others physical condition, slope, rainfall, and others (Ahmadi et al., 2017; Rusdi et al., 2015). For axample, if physical condition like highly slope then infrastructure for supporting tourism area can not build, and also potentially landslide. Geology condition is also effect to water supply in area tourism.

**Table 12.** Development Area Recommendation for Agrotourism and Non-Agrotourism

No	Development Rekomendation	Leading Commodities	Categories	Area (Ha)	Persen area (%)
1	Agrotourism area	Robusta coffee	S2	2968.22	30.20
	non-agrowisata tourism		S3	3950.39	40.20
			N	2908.55	29.60
2	Agrotourism area	Cocholate	S2	1202.30	12.24
	non-agrowisata tourism		S3	4046.21	41.17
			N	4578.64	46.59
3	Agrotourism area	Cashew	S2	2227.22	22.67
	non-agrowisata tourism		S3	4383.15	44.60
			N	3216.78	32.73
4	Agrotourism area	Candlenut	S2	2253.47	22.93
	non-agrowisata tourism		S3	3144.08	31.99
			N	4429.59	45.08
5	Agrotourism area	Arabica coffee	S2	3235.91	32.93
	non-agrowisata tourism		S3	5952.29	60.57
			N	638.94	6.50
6	Agrotourism area	Sweet potato	S2	952.78	9.70
	non-agrowisata tourism		S3	4153.82	42.26
			N	4720.55	48.04

The environmental carrying capacity of the tourism area development in Bontolempangan District is in the quite appropriate category (S2). This indicates that this area has the potential to be developed into an agricultural-based tourism object with commodity types, namely 2968.22 ha for Robusta coffee, 1202.30 ha of cocholate, 2227.22 ha of cashew, 2253.47 ha of candlenut, 3235.91 ha of Arabica coffee ha, and sweet potatoes covering an area of 952.78 ha as shown in Table 9. The results of the analysis can be used as

reference for development agrotourism area in Bontolempangan District, Gowa Regency. This is in accordance with the Gowa Regency spatial plan for 2012-2032 article 4 regarding "determination of the location and function of space for investment in Gowa Regency, article 66 on spatial planning where agriculture and innovation tourism are part of the planning, and article 7 on land management policies where some of regional policy is improvement of agriculture potential and tourism area development in RTRW Gowa 2012-2023.

#### 4. CONCLUSION

Based on the analysis, the agricultural sector in Bontolempangan District of Gowa Regency, namely sweet potato, coconut, robusta coffee, arabica coffee, chocolate, cashewnuts, and candlenuts, are potential to develop because of leading commodities. The land suitability for the leading agricultural commodities of Bontolempangan District, Gowa Regency based on the basically physical condition of the area and evaluation of land use for agricultural commodities is in the moderate suitable level (S<sub>2</sub>) that can be developed to tourism area based on agriculture. The recommended land area for agrotourism area namely 2968.22 ha for Robusta coffee, 1202.30 ha of chocolate, 2227.22 ha of cashew, 2253.47 ha of candlenut, 3235.91 ha of Arabica coffee ha, and sweet potatoes covering an area of 952.78 ha. These results can be used as a public policy for Gowa Regency Government. Besides physical condition and agriculture, Government must concern with infrastructure building, financial capital, technology capital, human resource, and social model so that the concept of agrotourism can be applied and developed.

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