

Analysis of the Determination of the Base for Horticultural Plant Commodities in the Region of each sub-district of Dairi Regency

Herlina Yolanda Tambunan¹

Student of Agribusiness Masters Study Program, Universitas Sumatera Utara, Indonesia
Email: herlinayolanda16@gmail.com

Dr. Ir. Salmiah

Lecturer at Faculty of Agriculture, Universitas Sumatera Utara, Indonesia
Email: salmiah1957@yahoo.com

Dr. Ir. Sinar Indra Kesuma

Lecturer at Faculty of Agriculture, Universitas Sumatera Utara, Indonesia
Email: sinarginting@yahoo.co.id

Abstract

As regional autonomy progresses, each sub-district in Dairi Regency has an open opportunity to determine development policies and develop new sources of income as Regional Original Income (PAD) through the utilization of the potential natural resources available in their area as an effort to be able to advance Horticultural Plants sub-sector in regional development and efforts to increase community economic growth. This study aims to identify basic Horticultural Plant commodities, determine proportional growth and regional share growth for basic Horticultural Plant commodities and identify priority development of basic plantation commodities in the area of each sub-district of Dairi Regency. The data used is secondary data. The data analysis used is Location Quotient analysis, Shift Share analysis, and a combination of Location Quotient and Shift Share analysis. The results showed that the commodities that became the basis for Dairi Regency were large chillies, potatoes, cabbage, tomatoes, spinach, long beans, kale, cucumbers, spring onions and shallots. The sub-district that has the most basic horticultural commodities that grow fast is the Sumbul Sub-district with 8 Commodities namely Large Chili, Cabbage, Tomato, Spinach, Long Beans, Kale, Cucumber and Scallions. The horticultural commodities that are the most prioritized for development are Chili Besar in 10 sub-districts, namely the Districts of Sidikalang, Silima Pungapunga, Lae Parira, Siempat Nempu, Siempat Nempu Hulu, Siempat Nempu Hilir, Tiga Lingga, Guung Sitember, Pegagan Hilir and Tanah Pinem.

Keywords: Base, Location Quotient, and Shift Share.

Introduction:

The agricultural sector is one of the sectors that has been relied on by the state so far for the reason that the agricultural sector contributes a lot to long-term economic development and in the context of national economic recovery and in Indonesia itself consists of several sub-sectors,

¹ Corresponding author

namely the food crops, horticulture, livestock and livestock sub-sectors. plantation. The horticulture sub-sector is a commodity that has the potential to be developed in agribusiness because it has high economic value and added value compared to other commodities (Islami, 2017). The agricultural sector can also become a basis for developing rural economic activities through the development of agribusiness and agro-industry-based businesses.

Dairi Regency is included in the 5 rankings of the largest districts in the production of horticultural crops, especially vegetables, in the province of North Sumatra in 2019-2021. Dairi Regency consists of 15 districts with various existing sectors. These sectors were then broken down into leading commodities in Dairi Regency until 2015, the macroeconomic structure of Dairi Regency was still dominated by the agricultural sector even though the role of this sector tended to decrease every year from 49.55% in 2010 to 45.13% in 2015. The agricultural sector is the sector with the main livelihood in Dairi Regency. In general, the Dairi Regency area has agricultural potential that is quite extensive with large yields so that the main livelihood of the population is farming food crops, coffee and horticultural crops such as Scallions, Spinach, Chili, Long Beans, Potatoes, Cucumbers, Cabbage and Tomatoes (*Badan Pusat Statistik Dairi*, 2016).

Dairi Regency is also a supplier of vegetable stock in the market centre of Medan City and other surrounding districts. Horticultural crops or vegetables that have good business opportunities due to the country's large demand for horticultural crop commodities are promising due to the high consumption of horticulture. Leading commodities are the result of community efforts that have high marketing opportunities and are profitable for the community. The importance of determining prime commodities in a region (national, provincial and district/city) is based on the consideration that the availability and ability of resources to produce and market all the commodities they produce are relatively limited.

Leading Commodities are mainstay commodities that have a strategic position to be developed in a region. By using the Location Quotient (LQ) approach where sectors that are considered basic are ($LQ > 1$) and not basic ($LQ < 1$). Location Quotient (LQ) analysis is an analysis used to determine the degree of specialization of economic sectors in a region that utilizes the base sector. The LQ technique is widely used to discuss economic conditions, leading to the identification of specializations in economic activities, leading to the identification of specializations of economic activities or measuring the relative concentration of economic activities to get an idea in determining the leading sector as the leading sector of industrial economic activity. Shift share analysis is a technique that is very useful in analyzing structural changes in the regional economy where the purpose of this analysis is to determine the performance or work productivity of the regional economy by comparing it to a wider area. The shift-share analysis also compares the differences in the growth rates of various sectors in our region and the national region. However, this method is sharper than the LQ method.

Helga (2018), shift-share analysis is one technique used to analyze statistical data in the form of income per capita, output, labour and other data. This method too can be used to observe the structure of the regional economy and its changes descriptively by emphasizing the parts of sector or industry growth in the region and projecting economic activity in the area with limited data. Horticultural commodities which are the basis ($LQ > 1$) in Dairi Regency were analyzed using Shift Share Analysis (SSA) for their growth components. The purpose of this research is to identify basic Horticultural Commodities, identify Proportional Growth and Regional Share Growth of Basic Horticultural Commodities, and identify Priorities for the Development of Basic Horticultural Commodities in the Regions of each sub-district of Dairi Regency.

Research methods:

Site Selection Method: The selection of research locations was carried out purposively in Dairi Regency. This research is planned to take secondary data from the Central Statistics Agency (BPS), and the Dairi District Agriculture Office. This research was conducted in March - June 2023.

Method of collecting data: The type of data used in this study is secondary data. Secondary data was obtained from the Department of Agriculture and the Central Statistics Agency for Dairi Regency to support research data in testing. The independent variables in this study are “Total production from 2017-2022 per commodity per district.”

Data analysis method: This study uses several methods of data analysis. The data taken in this study is production data for each commodity per sub-district in Dairi Regency from 2017-2022.

Horticultural commodity identifiers which form the basis of each sub-district in Dairi Regency use Location Quotient (LQ) analysis which is mathematically formulated:

$$LQ = \frac{V_{ij}/V_j}{Y_{in}/Y_n}$$

Descriptions:

LQ = Location Quotient Index

V_{ij} = Production of Commodity A in District B

V_j = Total Production of Commodity A in District B

Y_{in} = Production of Commodity A in Dairy District

Y_n = Total Production of Commodity A in Dairy District

Indicators:

$LQ > 1$; meaning that Horticultural Commodities are basic commodities where production meets the needs of its region and other regions.

$LQ = 1$; meaning that the Horticultural Commodity includes non-basic commodities where production is only able to meet the needs of its region

$LQ < 1$; meaning that the Horticultural Commodities are not sufficient to meet their territory.

Proportional Growth and Regional Share Growth of Basic Horticultural Commodities in the area of each Regency district were analyzed using Shift Share Analysis (SSA). The Shift Share analysis used in this study is mathematically formulated according to Helga Tarigan (2018):

$$\Delta K_{ij} = PP_{ij} + PPW_{ij}$$

Atau

$$K'_{ij} - K_{ij} = \Delta K_{ij} = K_{ij} (R_i - R_a) + K_{ij} (r_i - R_i)$$

$$PP_{ij} = K_{ij} \times (R_i - R_a)$$

$$PPW_{ij} = K_{ij} \times (r_i - R_i)$$

$$R_a = (Y'_{...} - Y_{...})/Y_{...}$$

$$R_i = (Y'_i - Y_i)/Y_i$$

$$r_i = (Y'_{ij} - Y_{ij})/Y_{ij}$$

Descriptions:

- i. If PP_{ij} is positive, then commodity A in District B will grow fast
- ii. If PP_{ij} is negative, then commodity A in District B will grow slowly
- iii. If PPW_{ij} is positive, then commodity A in District B has Competitiveness or a competitive advantage.
- iv. If the PPW_{ij} is negative, then commodity A in District B cannot be competitive.

Horticultural Commodity Development Priority: Determination of priority for the development of basic horticultural commodities using a combination of Location Quotient (LQ) analysis, Proportional Growth Component (PP) and Regional Share Growth (PPW) with the following criteria:

- i. Top Priority: $LQ > 1$ positive PP value Positive PPW.
- ii. Second Priority: $LQ < 1$ Negative PP value Positive PPW or vice versa
- iii. Third Priority: $LQ > 1$ Negative PP value Negative PPW.

Results and Discussion:

Basic Commodity in the District area: Identification of basic horticultural commodities in the area of each sub-district of Dairi Regency uses the Location Quotient (LQ) approach, which calculates the LQ value of each horticultural commodity produced in Dairi Regency with the criteria that become the basis for commodities that have an LQ value > 1 , while horticultural commodities that are included non-basic are horticultural commodities with $LQ < 1$ and $LQ = 1$.

Table 1: Horticultural Commodities in Dairi Regency²

District	No of Commodity	Horticulture Commodities Basis
Sidikalang	9	Large Chillies, Tomatoes, Spinach, Beans, Long Beans, Kale, Eggplant, Scallions, Carrots
Berampu	9	Big Chilli, Spinach, Beans, Long Beans, Kale, Cucumber, Siamese Pumpkin, Eggplant, Scallions
Sitinjo	10	Cabbage, Tomato, Spinach, Red Beans, Long Beans, Kale, Cucumber, Pumpkin Siam, Petsai/Sawi, Wortel
Parbulan	4	Potato, Cabbage, Tomato, Cucumber
Sumbul	10	Large Chillies, Cabbage, Tomatoes, Spinach, Long Beans, Kale, Cauliflower, Cucumbers, Petsai/Mushrooms, Onions
Silahisabungan	1	Red onion
Silima Punggapungga	2	Big Chili, Rawit Chili

² Source: Processed Secondary Data (2023)

Lae Parira	6	Large Chili, Cayenne Pepper, Long Beans, Siamese Pumpkin, Eggplant, Onions
Siempat Nempu	7	Large Chili, Cayenne Pepper, Spinach, Long Beans, Chinese Petsai/Mushrooms, Eggplant, Scallions
Siempat Nempu Hulu	3	Big Chili, Cayenne Pepper, Long Beans
Siempat Nempu Hilir	3	Big Chili, Cayenne Pepper, Long Beans
Tigalingga	2	Big Chili, Cayenne Pepper
Gunung Sitember	2	Big Chili, Cayenne Pepper
Pegagan Hilir	9	Large Chili, Cabbage, Spinach, Beans, Cucumber, Chayote, Eggplant, Scallion, Carrot
Tanah Pinem	5	Big Chili, Cayenne Pepper, Spinach, Cucumber, Green Onion

Based on the table above, it can be seen that horticultural commodities in Dairi Regency which are basic horticultural commodities are Shallots, Large Chilies, Cayenne Pepper, Potatoes, Cabbage, Spinach, Red Beans, Beans, Long Beans, Kale, Cauliflower, Cucumber, Siamese Pumpkin, Petsai / Mustard Greens, Eggplant, Scallions and Carrots. The sub-districts that have the most base commodities are Sitinjo and Sumbul sub-districts where each has 10 types of commodities, followed by Sidikalang, Berampu and Pegagan Hilir Sub-districts each with 9 types of commodities. Silahisabung sub-district is the sub-district that has the least number of commodities.

The Horticultural Commodity that is most widely used as a base is Big Chili. Chili Besar is cultivated in 12 sub-districts in Dairi Regency, namely Sidikalang, Berampu, Sumbul, Silima Pungapunga, Lae Parira, Siempat Nempu, Siempat Nempu Hulu, Siempat Nempu Hilir, Tigalingga, Mount Sitember, Pegagan Hilir and Tanah Pinem.

Table 2: Comparison of LQ Analysis of Dairi Regency and North Sumatra Province³

Commodity	Production Year (Tons)						Total	Mean	Descriptions
	2017	2018	2019	2020	2021	2022			
Red onion	9,352773053	13,97459235	23,01007025	2,296954759	2,485732949	3,411368617	54,53149198	9,088581997	Basic
Big Chili	6,791993188	8,175510277	18,61618799	2,078282314	2,493950916	18,00927961	56,1652043	9,360867383	Basic
Cayenne pepper	0,00	0,00	45,64784936	4,00736971	3,142540919	3,466514519	56,26427451	9,377379085	Basic
Potato	1,535518929	2,809186323	0,350600936	1,513633256	1,109255773	1,583096551	8,901291768	1,483548628	Basic
Cabbage	1,915437997	0,296218459	0,215576946	0,638374153	0,486075091	1,014942539	4,566625185	0,761104198	Not Basic
Tomato	0,934760302	1,156517321	0,4836229	0,388147289	0,444459229	0,815207451	4,222714493	0,703785749	Not Basic
Spinach	0,068959868	0,356589175	2,182372646	1,087828588	0,74178885	0,435091692	4,872630818	0,812105136	Not Basic
Beans	0,00	0,00	6,566699262	0,729804779	0,704078778	0,56346478	8,564047601	1,427341267	Basic
Red beans	0,00	0,00	1,725998789	0,00	0,00	0,00	1,725998789	0,287666465	Not Basic
Long beans	0,373628298	0,773191981	3,050815446	0,479943179	0,463574465	0,666201972	5,80735534	0,967892557	Not Basic
Spinach	0,198791143	0,630387178	0,905249201	0,198453261	0,046817541	0,056476953	2,036175277	0,339362546	Not Basic
Cauliflower	0,00	0,00	0,306970083	0,048836652	0,02377575	0,000840946	0,380423431	0,063403905	Not Basic
Cucumber	0,272429925	0,989916782	0,386133099	0,745117059	0,284611359	0,064583571	2,742791796	0,457131966	Not Basic
Chayote	0,00	0,00	0,43145677	0,912057053	0,187882268	0,384749414	1,916145504	0,319357584	Not Basic

³ Source: Processed Secondary Data (2023)

Petsai/Sawi	0,00	0,00	0,024763837	0,080810015	0,07052986	0,159276654	0,335380365	0,055896728	Not Basic
Eggplant	0,00	0,00	0,193680138	0,231063321	0,628730198	0,586706181	1,640179838	0,273363306	Not Basic
Garlic	0,00	0,00	0,248083469	0,54297472	0,00	0,00	0,791058189	0,131843031	Not Basic
Spring onion	0,192299307	2,641126802	4,044210046	0,865144497	525,0790762	2,560074414	535,3819313	89,23032188	Basic
Carrot	0,00	0,00	0,032612584	0,054338009	0,041704338	0,069100364	0,197755296	0,032959216	Not Basic

Based on the data in the table above, we can see that the horticultural commodities in Dairi Regency which are basic horticultural commodities are Shallots, Large Chilies, Cayenne Pepper, Potatoes, Beans and Scallions which is in line with the results of the Location Quotient (LQ) analysis found in sub-districts in Dairi Regency where the commodity of Big Chili is one of the most basic commodities and Sitingjo sub-district is the sub-district that has the most basic horticultural commodities and seen from the results of the LQ of Dairi Regency with the results of the LQ of the District in Dairi Regency especially vegetables are one of the agricultural sectors that can be developed in Dairi Regency.

Table 3: Analysis of Proportional Growth and Regional Share Growth⁴

Districts	Commodity	$\frac{P_{ij}}{K_{ij}} = \frac{R_i - R_a}{R_i}$	$\frac{PP_{ij}}{K_{ij}} = \frac{P_{ij}}{K_{ij}} * 100\%$	Criteria	$\frac{PPW_{ij}}{K_{ij}} = \frac{P_{ij} - R_i}{R_i}$	$\frac{PPW_{ij}}{K_{ij}} = \frac{PPW_{ij}}{K_{ij}} * 100\%$	Criteria
Sidikalang	Big Chili	194,26	0,42	Fast	309,90	0,55	Competitive
	Tomato	46,39	1,92	Fast	271,56	0,85	Competitive
Berampu	Big Chili	335,74	0,42	Fast	-39,97	-0,05	Not Competitive
	Spinach	69,41	6,31	Fast	-32,56	-2,96	Not Competitive
	Long beans	111,13	1,18	Fast	-79,11	-0,84	Not Competitive
	Spinach	8,45	0,36	Fast	-3,05	-0,13	Not Competitive
	Cucumber	4543,74	142,93	Fast	-7,31	-0,23	Not Competitive
	Spring onion	229,57	3,01	Fast	-195,25	-2,56	Not Competitive
Sitingjo	Cabbage	262,79	1,32	Fast	101,53	0,51	Competitive
	Tomato	221,82	1,92	Fast	21,95	0,19	Competitive
	Long beans	56,33	1,18	Fast	-37,24	-0,78	Not Competitive
Parbuluan	Potato	4083,32	1,85	Fast	-1986,48	-0,90	Not Competitive
	Cabbage	3358,95	1,32	Fast	-2162,96	-0,85	Not Competitive
	Tomato	2062,12	1,92	Fast	-1364,01	-1,27	Not Competitive
	Cucumber	4,57	0,10	Fast	16,47	0,36	Competitive
Sumbul	Big Chili	2190,61	0,42	Fast	-104,31	-0,02	Not Competitive
	Cabbage	743,58	1,32	Fast	2129,35	3,78	Competitive
	Tomato	24,96	0,11	Fast	1005,52	4,45	Competitive
	Spinach	82,03	6,31	Fast	-60,06	-4,62	Not Competitive
	Long beans	162,51	1,18	Fast	-134,97	-0,98	Not Competitive
	Spinach	11,68	0,36	Fast	-10,38	-0,32	Not Competitive

⁴ Source: Processed Secondary Data (2023)

	Cucumber	6,45	0,10	Fast	-8,39	-0,13	Not Competitive
	Spring onion	287,09	3,01	Fast	32,43	0,34	Competitive
Silahisabungan	Red onion	3844,13	1,70	Fast	-1809,00	-0,80	Not Competitive
Silima Pungapunga	Big Chili	123,49	0,42	Fast	473,39	1,61	Competitive
Lae Parira	Big Chili	115,61	0,42	Fast	52,30	0,19	Competitive
Siempat Nempu	Big Chili	178,67	0,42	Fast	51,05	0,12	Competitive
Siempat Nempu Hulu	Big Chili	296,91	0,42	Fast	0,00	0,00	Competitive
Siempat Nempu Hilir	Big Chili	230,48	0,42	Fast	159,14	0,29	Competitive
Tiga Lingga	Big Chili	144,98	0,42	Fast	100,11	0,29	Compete
Gunung Sitember	Big Chili	297,59	0,42	Fast	-219,65	-0,31	Not Competitive
Pegagan Hilir	Big Chili	555,85	0,42	Fast	1257,29	0,95	Competitive
	Cabbage	153,25	1,32	Fast	105,65	0,91	Competitive
Tanah Pinem	Big Chili	172,96	0,42	Fast	57,65	0,14	Competitive

Based on the data in the table above, it can be seen that Sidikalang District has 2 Types of Commodities with Fast Growth and Competitiveness, Berampu District has 6 Types of Commodities with Fast Growth but the Commodities are Not Competitive, Stitinjo District has 3 Types of Commodities with Fast Growth but only Uncompetitive Long Beans Commodity, Parbuluan Subdistrict has 4 Fast Growing Commodity Types and only Cucumber Competitors are Competitive, Sumbul District has 8 Fast Growing Commodity Types but only Cabbage, Tomatoes and Scallions are Competitive, Silahisabung District only has 1 Type of Commodity that is Fast Growing but Not Competitive, Districts of Silima Pungapunga, Lae Parira, Siempat Nempu, Siempat Nempu Upstream, Siempat Nempu Downstream and Tiga Lingga, Tanah Pinem has 1 type of commodity that is Fast Growing and Competitive namely Large Chili Commodity. Gunung Sitember District has 1 type of commodity, namely Large Chili which grows fast but is not competitive, and Pegagan Hilir Subdistrict has 2 types of commodity, namely Chili and Cabbage which have fast growth and are competitive. Determination of Horticultural Commodity Development Priorities based on Location Analysis, Proportional Growth Components and Regional Share Growth.

Table 4: Basic Horticultural Commodities For Development In Each Sub-District⁵

Districts	Development Priority		
	Main	Second	Third
Sidikalang	Big Chili and Tomato		Spinach, Beans, Long Beans, Kale, Eggplant, Scallions and Carrots
Berampu		Large Chili, Spinach, Long Beans, Kale, Cucumber and Scallions	Chickpeas, Chayote and Eggplant
Sitinjo	Cabbage and	Long beans	Spinach, Long Beans, Kale,

⁵ Source: Processed Secondary Data (2023)

	Tomatoes		Cucumber, Siamese Pumpkin, Petsai / Mustard Greens and Carrots
Parbuluan	Cucumber	Potatoes, Cabbage and Tomatoes	
Sumbul	Cabbage, Tomatoes and Onions	Large Chili, Spinach, Long Beans, Kale and Cucumber	Cauliflower and Petsai / Mustard Greens
Silahisabungan		Red onion	
Silima Pungapunga	Big Chili		Cayenne pepper
Lae Parira	Big Chili		Cayenne Pepper, Long Beans, Siamese Pumpkin, Eggplant and Scallions
Siempat Nempu	Big Chili		Cayenne Pepper, Spinach, Long Beans, Chinese Petsai/Sawi, Eggplant and Scallions
Siempat Nempu Hulu	Big Chili		Cayenne Pepper and Long Beans
Siempat Nempu Hilir	Big Chili		Cayenne Pepper and Long Beans
Tiga Lingga	Big Chili		Cayenne pepper
Gunung Sitember	Big Chili		Cayenne pepper
Pegagan Hilir	Big Chili and Cabbage		Spinach, Beans, Cucumber, Siamese Pumpkin, Eggplant, Scallions and Carrots
Tanah Pinem	Big Chili		Cayenne Pepper, Spinach, Cucumber and Scallions

Based on the data in the table above, basic Horticultural commodities are the main priority for development in each sub-district, namely the Big Chili Commodity in 10 Sub-Districts in Dairi Regency, namely Sidikalang, Silima Pungapunga, Lae Parira, Siempat Nempu, Siempat Nempu Hulu, Siempat Nempu Districts. Downstream, Three Lingga, Mount Sitember, Pegagan Hilir, and Tanah Pinem. The basic horticultural commodity which is the Second Priority is the long bean commodity which is found in 3 sub-districts namely Berampu, Sitinjo and Sumbul sub-districts. The horticultural commodity that is the Third Priority is Chili Rawit which is located in 8 sub-districts, namely the Districts of Silima Pungapunga, Lae Parira, Siempat Nempu, Siempat Nempu Upstream, Siempat Nempu Downstream, Tiga Lingga, Gunung Sitember and Tanah Pinem.

Each sub-district has opportunities and opportunities to develop basic horticultural commodities that are by the conditions of each of the existing sub-districts. Commodity development for each sub-district that has more than one type of commodity needs to consider other aspects that are also owned by other sub-districts such as ease of access to markets, both facilities and infrastructure for horticultural production.

A large number of Regional Share Growth indicates a locational advantage in the sub-district where the higher number of PPW on basic horticultural commodities means that the sub-district concerned has competitiveness so that it increases production and of course will have a positive effect on the regional income.

Conclusion:

Based on the results of the study it can be concluded that for basic horticultural commodities in the area of each sub-district of Dairi Regency, the basic commodities are Long Beans, Cayenne Pepper, Large Chili, Spinach, Onions, Cucumber, Eggplant, Siamese Pumpkin, Kale, Petsai/Sawi, Beans, Carrots, Tomatoes, Cabbage, Potatoes, Cauliflower, Red Beans and Shallots and districts that have many commodities are Sitinjo and Sumbul as many as 10 Types of Commodities

The results of the Proportional Growth of basic horticultural commodities in the Dairi Regency sub-district, namely Big Chili, Potatoes, Cabbage, Tomatoes, Spinach, Long Beans, Kale, Cucumbers, Scallions and Shallots and the sub-districts that have the most basic horticultural commodities are the Sumbul and Commodity Sub-Districts which Competitive namely Large Chili, Tomato, Cabbage, Cucumber, and Onion and for the sub-district that is Competitive is Sumbul District.

The results of the commodity development priority that became the Main Priority were Chili Besar and its sub-district Sumbul, the commodity that became the Second Priority the most was the Long Beans Commodity and its sub-district Berampu District, the Commodity that became the Third Priority was Rawit Chili Commodity and its districts Sidikalang and Sitinjo.

References

- Badan Pusat Statistik Dairi. (2016). *Dairi Dalam Angka 2016*. Provinsi Sumatera Utara.
- Tarigan, H. (2018). Analisis Sektor Basis Tanaman Pangan Pada Masing-masing Kecamatan Kabupaten Karo. Fakultas Pertanian Universitas Methodist Indonesia.
- Islami Nurul, 2017. Pengembangan Kawasan Perdesaan Berbasis Komoditi Hortikultura Di Kecamatan Ma'Rang Kabupaten Pangkajene dan Kepulauan. Fakultas Sains dan Teknologi UIN Alauddin Makassar.