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RESEARCH ARTICLE

SUSTAINABLE DEVELOPMENT MODEL FOR SANG BINTANG AREA BASED ON BEEF-CATTLE IN BOLAANG DISTRICT, NORTH MONGONDOW.

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Abstract

This study aims to formulate the Sustainability model of the Sangbintang area based on beef cattle breeding in North Bolaang Mongondow Regency, which carried out from January to June 2018. This research uses a survey method with some data analysis, such as: 1) Analyzing the sustainability status of beef cattle breeding business in the Sangbintangarea, using Rap-KAWSangbintang Multidimensional Scaling (MDS), and 2) Formulating a model for the development of a Sangbintang area based on sustainable beef cattle using the Analytical Hierarchy Process (AHP). The MDS Rap-KAWSangbintang analysis results are that from the aspect of ecological, technological and economic dimensions the results are less sustainable, while the Socio-culture and Institutional dimensions are quite sustainable. AHP weight value indicates an alternative priority model for the development of sustainable beef cattle based in North Bolaang Mongondow Regency, they are 1). Increased human resources, 2).Improvement of infrastructure, 3).Increasing the active role of farmers, 4).Enhancing Cooperation and partnerships, 5). The introduction of cultivation technology, and 6) increasing the role of supporting institutions. There are 6 models of policy development in the area of Sangbintang based on sustainable beef cattle breeding, namely: 1). improvement of human resources, 2) Development and maintenance of infrastructure facilities and infrastructure, 3) increasing the active role of farmers, 4) Increasing cooperation and partnerships 5) Introducing cultivation technology, and 6) increasing the role of supporting institutions. It is recommended that 6 models of the development of Sangbintang area based on sustainable beef cattle breeding in North Bolaang Mongondow District be implemented.

Introduction:-

The paradigm of agricultural development in Indonesia in the future leads to the development of sustainable agriculture that is industrial-oriented and globally competitive and ecosystem-driven. The government in this case provides support for agricultural development with the policy direction are (i) increasing food availability through strengthening domestic production capacity. (ii) Increasing public accessibility to food; (iii) improving the quality of

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food consumption and nutrition for the community; and (iv) mitigation of disruption to food sovereignty. Development in the livestock sub-sector plays a role in improving the quality of human resources in a sustainable manner. Animal husbandry development has a very good and promising role in the future. This phenomenon is caused because the demand for materials derived from livestock tends to increase. The increase occurred along with an increase in population, income and increased public awareness in consuming highly nutritious food.

Livestock resources in this case are an important component in a farming system in various places in Indonesia, including in North Bolaang Mongondow Regency. The problem of the livestock sector at this time is the inability to optimally provide livestock products to meet the nutritional needs of the community for animal protein. Livestock in Bolaang Mongondow Utara Regency not only serves as a source of household income, but also as savings that can be sold at any time if the community needs money. Livestock in this case acts as a source of animal protein from livestock in an effort to improve the intelligence of human resources. The development of livestock commodity population in North Bolaang Mongondow Regency has increased from year to year. The population of beef cattle in 2011 was 12,490, and in 2016 there were 14,690. This shows that the development of beef cattle currently has shown a serious development (Department of Agriculture Kab. Bolmut, 2016)

Various problems in the development of cattle farms in North Bolaang Mongondow Regency, including the high productive slaughtering, small-scale business for each breeder and are generally still limited to side businesses with traditional maintenance systems. The reality on the ground shows that only a small proportion of farmers make cattle business as their main business. The scale of a part-time cattle business is certainly less competitive in the business world. This condition shows that cattle breeding business in North Bolaang Mongondow Regency will be unable to compete with other regions in North Sulawesi. Another problem is the limited capital of farmers so that they are not motivated to develop their livestock businesses. Efforts that can be made are policies that need to be made in relation to investment in cattle farming. Weak institutions are also a problem in the development of cattle farms in this area. The institutional weaknesses are mainly at the level of cattle farmer groups. Another thing that is also a problem in animal husbandry development is the lack of available food resources for cattle. These problems are causing the development of cattle population in North Bolaang Mongondow Regency rather slowly.

Research purposes:-
Based on the above thought, the problem is that the extent of the development of integrated beef cattle in North Bolaang Mongondow Regency still be continued? So it is necessary to do research on the development model of the *SANGBINTANG* area based on sustainable beef cattle breeding in North Bolaang Mongondow Regency.

Research Methods:-

Location Determination Method:-
This research will be conducted in North Bolaang Mongondow Regency using survey methods. The approach used in this research is a quantitative approach. Determination of location of Subdistricts in Bolaang Mongondow Utara Regency was carried out intentionally (purposive sampling) namely Sangkub District, Bintauna District and East Bolangitang District.

Sampling :-
The sampling method of determining the sample in this study was taken by purposive random sampling, which is selected 3 districts out of 6 sub-districts in Bolaang Mongondow Utara Regency, which are designated as beef cattle development areas (*Sangbintang*), are samples that represent populations. The number of respondent farmers was determined using the proportionate sampling method using the following Slovin formula:

$$n = \frac{N}{1 + Ne^2}$$

Note:
n = sample
N = Population
e = error rate / error received (10%) So that the following calculation is obtained:
1,106
n = = 91.71 or rounded up to 92 farmers
1 + 1,106 (0,1) 2

Table 1. Number of populations and samples of beef cattle farmers in each district

No.	Sub-distict	Village	Cattle population	Breeder (Person)	Sample
1	Sangkub	Sidodadi	325	142	12
		Tombolango	332	185	15
		Pangkusa	293	102	8
2	Bintauna	Pimpi	215	108	9
		Bintauna	209	107	9
		Padang	204	96	8
3	East Bolangitan	Biontong	316	171	14
		Binjeita	208	94	8
		Bohabak	207	101	8
Total			**2309**	**1106**	**92**

Source: Agriculture Service Data 2016, processed

Sampling or taking respondent for competent policy makers (experts) is determined purposively, with consideration of expertise in their respective fields, at the level of the policy system for beef cattle development and beef cattle breeders at the level of policy implementation in North Bolaang Mongondow Regency. Official policy makers respondents were determined by purposive sampling of 10 people.

Data Collection Method:-

The type of data used is cross section data and time series data, from primary data sources and secondary data. Primary data (cross section a year) obtained from direct interviews with respondents. While secondary data (annual time series) were obtained from the agencies associated with this study and published research data. Data collection techniques are interviews with farmers and direct observations in the field. Information about government policies was obtained from direct interviews with expert respondents. For data validation the triangulation technique is used.

Data Analysis Method:-

The data analysis method used in this study was carried out in the following stages:

MDS Analysis:-

Analysis of the sustainability of the *Sangbintang* area development using a multidimensional scaling (MDS) technique called the Rap-Kaw*Sangbintang* approach (Rapid Appraisal of the *Sangbintang* Beef Farm). This method is the development of the Rapfish approach which is used to assess the sustainability status of capture fisheries (Kavanagh, 2001). The results of the sustainability analysis are stated in the Sustainability Index of the *Sangbintang* Beef Cattle Farm (IK-Kaw*Sangbintang*). Data analysis was carried out through several stages. First, the determination of attributes covering five dimensions of sustainability, namely: the ecological dimension, the economic dimension, the socio-cultural dimension, the technological and infrastructure dimensions as well as the legal and institutional dimensions. Second, the evaluation of each attribute on an ordinal scale based on the sustainability criteria of each dimension. Third, index preparation and sustainability status of the region both multidimensionally and in each dimension.Fourth, the sensitivity analysis (leverage analysis) to determine the variables sensitive to sustainability.Fifth, Monte Carlo Analysis to take into account aspects of uncertainty (Barlas, 2005 and Gao et al. 2008).

The category of sustainability status of regional development based on the index value of the Rap-Kaw*Sangbintang* analysis can be seen in Table 2.

Index Value	Category
0-25	Bad
26-50	Less
>50-≤75	Adequate
>75-≤100	Good

Source: Kavanagh, 2001

Analytic Hierarchy Process:-

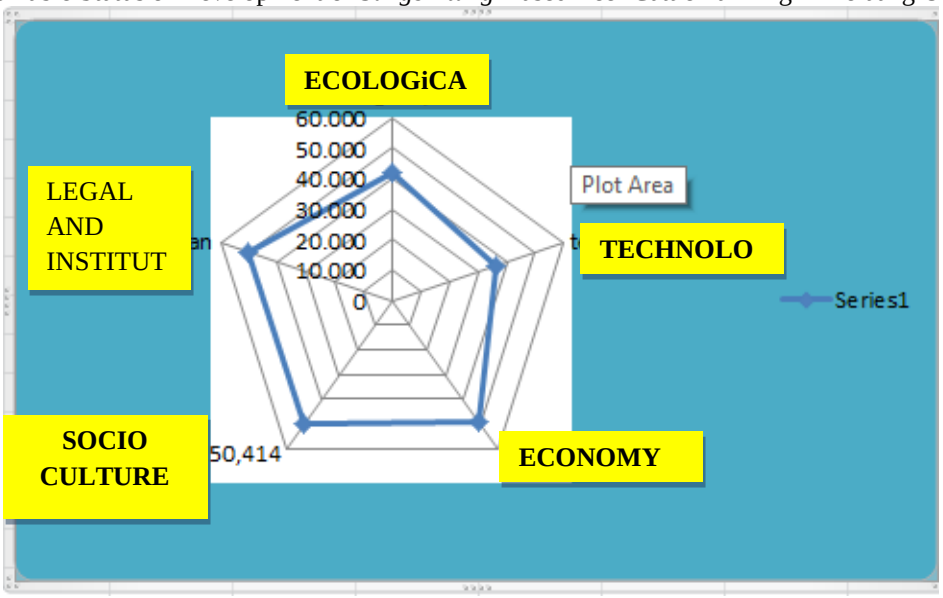
The determination of the policy strategy for the development of the *Sangbintang* area based on sustainable beef cattle was carried out by participatory multi-criteria analysis using AHP analysis tools. Analysis of alternative strategies for beef cattle development in North Bolaang Mongondow Regency is carried out by making criteria based on the views and or opinions of respondents, such as policy makers, professionals and experienced animal husbandry practitioners in North Bolaang Mongondow Regency. Analytic Hierarchy Process (AHP) is used to determine the weight of views related to the development of beef cattle in North Bolaang Mongondow Regency. AHP method is used with the help of computer software (software) Expert Choise (EC). Some principles in solving problems with AHP, such as: decomposition, comparative assessment, priority synthesis, and consistency.

Research result and discussion:-

Multidimensional scaling analysis (mds):-

The Rap-Kaw*Sangbintang* method in this study was conducted to assess the sustainability of the development of beef cattle-based *Sangbintang* area in North Bolaang Mongondow Regency based on five dimensions, there are Sangbintang: 1) ecological dimension; 2) technology; 3) economy; 4) social and cultural; and 5) legal and institutional dimensions. Dimensions which have a relatively unsustainable sustainability index are ecology, technology, and economic dimensions because they have a sustainability index score (<50). This shows that the factors of the three dimensions have not received optimal attention in the development of beef cattle so far. Thus, in the future this dimension needs attention. The Socio-cultural and Legal and Institutional Dimensions are quite sustainable, as shown in Figure 1 below:

Figure 1. Sustainable Status of Development of *Sangbintang*-Based Beef Cattle Farming in Bolaang Utara Regency



Source: MDS Rap-KAW*Sangbintang* data analysis, 2019

The non-metric MDS results in Rap-Kaw*Sangbintang* can be used to find out how big the potential for sustainability in *Sangbintang* North Bolaang Mongondow Regency is based on the 5 dimensions of sustainability used in this study. The results of the Monte Carlo analysis carried out with a number of repetitions turned out to contain errors that did not change the index value of each dimension greatly. Based on Table 3, it can be seen that the value of the *Sangbintang* region's sustainability index status at an interval of 95% confidence gives results that are not much different from the results of the MDS analysis. The relatively small difference in the results of the analysis shows that the analysis uses the MDS method to determine the sustainability of the *Sangbintang* region studied which has a high level of trust.

Table 3:-Results of the Monte Carlo Analysis for the value of the sustainability index with the Rap-Kaw*Sangbintang* Analysis

Index Status	MDS Result	Monte Carlo Result	Difference
Ecological dimension;	42,045	42,369	0,324
Technology dimension	49,061	50,061	1,000
Economy dimension	36,038	33,134	2,904
Social and cultural	50,414	51,074	0,660
Legal and institutional dimensions	50,450	48,681	1,769

Source: Data Primer Analysis method of MDS RAP_KAW *Sangbintang*,2019

Ecological Dimension:-

Sustainability Score Calculation Results Based on the Ecological Dimensions:-

Non-metric MDS shows the potential sustainability of the *Sangbintang* region of North Bolaang Mongondow Regency in the form of a two-dimensional graph called a stimulus configuration where the competitiveness score is viewed through the X-axis coordinates of the stimulus configuration. The results of the MDS non-metric analysis on the ecological dimension are explained in Figure 1.

Figure 1 shows the potential sustainability score of the *Sangbintang* area of North Bolaang Mongondow Regency based on the ecological dimension of 42.046%. The non-metric MDS results on the ecological dimension show a value that is between 25.0% - 50.0% which means that the sustainability potential of the Sangbintang beef cattle development in North Bolaang Mongondow Regency based on the ecological dimension is less sustainable.

Results of Leverage Analysis Using the Jacknife Method in the Ecological Dimension:-

Leverage analysis using the Jacknife method is used to find out the sensitive attributes to improve the potential sustainability status of the Sangbintang area of North Bolaang Mongondow Regency. The results of leverage analysis are changes in the value of Root Mean Square (RMS) which shows the estimated change in the non-metric MDS result score if one attribute is removed from the model. The greater the change in the value of the Root Mean Square (RMS) given by an attribute shows the increasingly important role that attribute plays in determining the sustainability status of the area's potential based on the dimensions formed. The results of the leverage analysis using the Jacknife method on the ecological dimension attributes are explained in figure 2.

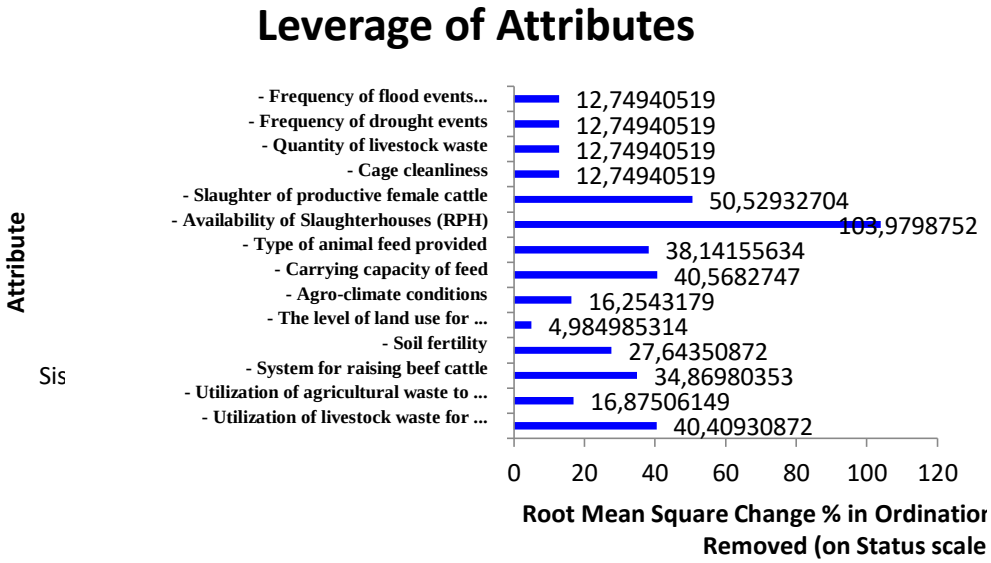


Figure 2:-Results of Ecological Dimension Leverage Analysis

In the ecological dimension, there are 7 attributes that are sensitive to the value of the ecological dimension sustainability index, namely: **1) The availability of slaughterhouses**, is still very lacking in the *Sangbintang* area, only 2 units are available and includes type C. So that in the future the number of RPHs this needs to be improved in quantity and quality, so that it can become a type B RPH, according to the number of slaughterhouses and the target market, **2) Slaughter of productive female cattle**, in the *Sangbintang* Region this often occurs and has a large volume, due to low knowledge factors and sudden economic needs. Both of these factors are due to the education of farmers in the *Sangbintang* region, which are generally low and the level of income of beef cattle farmers is also low because the maintenance system is still extensively traditional, in this case, beef cattle are bound in a mobile manner, **3) Carrying capacity of animal feed** in the *Sangbintang* region in the safe and reasonably available category. Feed is one of the determining factors for the growth of beef cattle, so the feed support capacity needs to be improved. Feed in the *Sangbintang* region comes from agricultural waste, such as rice straw, corn, peanuts, soybeans, and grasses that grow naturally or are cultivated, as well as industrial waste such as rice bran, corn cobs, tofu pulp, and coconut cake. , which is sufficiently available in the *Sangbintang* region, **4) Utilization of livestock waste for new organic ferti**lizer is only a small portion used by farmers, beef cattle waste production in the form of feces and urine can be processed as organic fertilizer in the form of solids and liquid, but by most farmers in the area *Sangbintang* has not utilized livestock waste, caused due to low knowledge and low farmer's internal motivation. In the future this needs to be considered and empowered livestock farmers so that they know, want and be able to utilize livestock waste for solid and liquid organic fertilizer that can be sold and used alone, so as to increase the income of farmers, **5) The system of raising beef cattle** in general is extensive and traditional maintenance system, i.e. uses shifting and released patterns of bonding, where cattle are brought to plantations where there is fodder (HPT) or in grazing fields where animals are bound to graze there. In general, breeders do this in the morning, then during the day the cattle are seen to be moved to another place where HPT is still possible, then the farmer is herded to the river or to the source of drinking water, and so on, at night the cattle cows sleep in the bonding place, while the breeders' enclosures are herded. This maintenance system is certainly not good from the recommended aspects of cattle farming, as suggested by Hardjosubroto and Astuti (1994), that there are seven business guidelines (animal husbandry business sapta) that must be carried out by farmers, namely: (1) selection of seedlings good, (2) prevention and eradication of disease, (3) use of eligible pens, (4) supplementary feeding, (5) reproduction management, (6) post-harvest handling and procurement, and (7) good business management. In the future it is necessary to increase the livestock raising system to an intensive system so that the purpose of raising livestock is to produce high meat at the planned time, so as to increase the income of farmers, **6) Types of beef cattle feed**, in the *Sangbintang* area there are several types of forage livestock (HPT), including: elephant grass, bede grass (australi grass), king grass, legume *(turi, lamtoro, gamal, centrosema), setaria* grass, *odot* grass (edward), in general the HPT grows wild or not in cultivated by farmers, except turi, lamtoro, gamal and elephant grass and odot / edward grass in general are cultivated by farmers. In addition to HPT in the *Sangbintang* region there are also types of cattle feed from agricultural waste such as rice straw, cob and cornhusk, rice bran and coconut cake. Feed is one of the basic requirements in animal husbandry business, so feed is an important component that affects the development of livestock weight and animal health. So that in the future it is necessary to increase the cultivation of HPT and agricultural waste in the *Sangbintang* area in the context of fulfilling the nutrition of beef cattle that are kept,**7) Utilization of Agricultural Waste for Animal Feed**, in the *Sangbintang* region has not been fully utilized by farmers, when connected with the typology of beef cattle breeding systems, where in the *Sangbintang* area most have extensive and traditional typology, so that cattle are not fed in cages with HPT as well as agricultural waste, but cattle feed from mixed grasses in pasture fields or in lawn gardens, only a small proportion of farmers in the *Sangbintang* area contain cattle, which is 22.83%, generally cattle that are caged are fed with agricultural waste in the form of rice straw, bran, and corn cobs as well as HPT such as elephant grass, odot grass, and king grass. So that in the future for the sustainable development of beef cattle in the *Sangbintang* region, it is necessary to optimize the utilization of agricultural waste for cattle feed, so that the beef cattle breeding system needs to change from traditional and intensive to semi-intensive and intensive systems.

Dimensions of Technology:-

Sustainability Score Calculation Results Based on Technology Dimensions:-

Non-metric MDS shows the potential sustainability of the *Sangbintang* Region of North Bolaang Mongondow District in the form of a two-dimensional graph called a stimulus configuration where the competitiveness score is viewed through the X-axis coordinates of the stimulus configuration. The results of the MDS non-metric analysis on the technological dimensions are explained in Figure 1.

In figure 1 shows the potential sustainability score of the *Sangbintang* region in North Bolaang Mongondow Regency based on the technological dimension is 36,038%. The non-metric MDS results on the technological dimension show that the value is between 25.0% - 50.0% which means that the sustainability potential of *Sangbintang* beef cattle development in the North Bolaang Mongondow Regency based on the technological dimension is less sustainable.

Results of Leverage Analysis Using the Jacknife Method in the Technology Dimension:-

Leverage analysis using the *Jacknife* method is used to find out the sensitive attributes to improve the potential sustainability status of the *Sangbintang* region of North Bolaang Mongondow Regency. The results of leverage analysis are changes in the value of Root Mean Square (RMS) which shows the estimated change in the non-metric MDS result score if one attributes is removed from the model. The greater the change in the value of Root Mean Square (RMS) given by an attribute shows the increasingly important role of these attributes in determining the sustainability status of the area potential based on the dimensions formed. The results of the leverage analysis using the Jacknife method of the technological dimension attributes are explained in Figure 3.

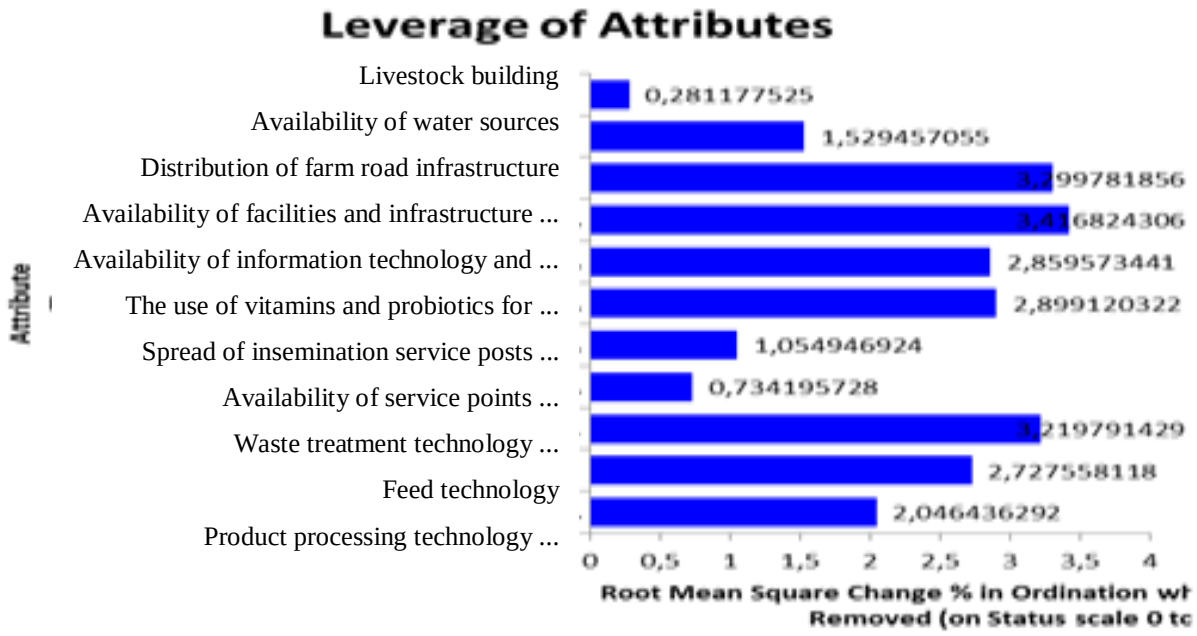


Figure 3:-Results of Leverage Analysis of Technology Dimensions

On the technology dimension, there are 3 lever attributes that are sensitive to the value of the technology dimension sustainability index, which named: **1). Condition of Farming Road Infrastructure**; The length of regency road in North Bolang Mongondow Regency is 394.59 km. The regency road here is a road that connects sub-districts, between villages, within sub-districts and within villages, generally in the form of asphalt *hotmix* roads. The farming road is a road that located in the farming area, which connects one farming area with another farming area and farming area with the village road. Observation of farming road researchers is still lacking, most of which are in the farming area are pioneering roads, can only be traversed by foot and two-wheeled vehicles that have been modified as mountain bikes. In general, the mountain motorcycle as a mode of transportation is rented or as a motorcycle taxi transporting agricultural products in the area of farming. The observation of the mountain bike researcher is not dangerous, because of the road factor that does not yet exist, while the area being traversed is hilly, where there are ravines on either side. **2) Availability of Agribusiness Facilities**; An area can become an agrologic area if the development of the area is not only related to on-farm farming activities but also its off-farm activities, namely starting the procurement of agricultural facilities and infrastructure (such as seeds / seeds, fertilizers, medicines, tools and machinery agriculture), processing of agricultural products to the marketing of agricultural products (such as bakulan, stalls, buying and selling of agricultural products, auction markets, agribusiness terminals / sub-terminals, etc.) and also supporting activities such as yield markets, agro-tourism, Ernalia et al. (2004), and the Ministry of Agriculture (2004). Having a variety of agribusiness facilities and infrastructure that is adequate to support the development of agribusiness systems and businesses, namely: 1) markets, both markets for agricultural products, agricultural facilities markets, agricultural equipment and machinery, and service markets including

auction markets, warehouse storage and processing of agricultural products before they are marketed, 2) Financial Institutions (banking and non-banking) as sources of capital for agribusiness activities, 3) having farmer institutions (groups, cooperatives, associations) which must also function as Agribusiness Learning and Development Centers (SPPA), 4) Agricultural Counseling Center (BPP), which functions as an Agribusiness Consultation Clinic (KKA), which is a source of agribusiness information, a model for agribusiness enterprises, and a center for community empowerment in developing more efficient and profitable agri-business ventures. In the development of the *Sangbintang* area, the BPP should be directed to become the Integrated Development Counseling Center where the BPP is a counseling base for extension agents and officers related to area development and self-help extension agents such as rented / advanced farmers, leaders, communities, etc. 5) technological trials / studies agribusiness, to develop appropriate technology suitable for the *Sangbintang* region, 6) adequate road network and accessibility with other regions and irrigation facilities, all of which are to support more efficient agricultural businesses (agribusiness) which having adequate public facilities and infrastructure, such as transportation, electricity, telecommunications, clean water, and others and Having adequate social / community welfare facilities and infrastructure such as health, education, arts, recreation, library, self-service and others. **3). Animal Husbandry / Agro-Forest Treatment technology**; Beef cattle which are aggraded intensively produce waste in the form of livestock manure, namely feces and urine. Cow dung is usually used as manure. In Indonesia, the use of cattle waste in general for solid organic fertilizer and liquid organic fertilizer as well as a source of bio-gas raw materials. In the *Sangbintang* region it is still far from the above expectations, although there are already those who utilize cattle waste for solid and liquid organic fertilizer and biogas, but the amount is still small. So that in the future there will need serious attention in increasing the utilization of beef cattle waste in the *Sangbintang* area to increase farmers' income.

Economic Dimension:-

Sustainability Score Calculation Results Based on Economic Dimensions:-

Non-metric MDS shows the sustainability of the *Sangbintang* Region of North Bolaang Mongondow District in the form of a two-dimensional graph called a stimulus configuration where the competitiveness score is viewed through the X-axis coordinates of the stimulus configuration. The results of the MDS non-metric analysis on the economic dimension are explained in Figure 1.

Figure 1 shows the potential sustainability score of the *Sangbintang* Region in North Bolaang Mongondow Regency based on the economic dimension of 49,061%. The non-metric MDS results on the economic dimension show values that are between 25.0% - 50.0% which means that the sustainability of the potential area owned by North Bolaang Mongondow Regency based on the economic dimension is less sustainable.

Leverage Analysis Results Using the Jacknife Method in the Economic Dimension:-

Leverage analysis using the Jacknife method is used to find out the sensitive attributes to improve the potential sustainability status of the *Sangbintang* region of North Bolaang Mongondow Regency. The results of leverage analysis are changes in the value of Root Mean Square (RMS) which shows the estimated change in the non-metric MDS result score if one attribute is removed from the model. The greater the change in the value of the Root Mean Square (RMS) given by an attribute shows the increasingly important role that attribute plays in determining the sustainability status of the area's potential based on the dimensions formed. The results of the leverage analysis using the Jacknife method on the economic dimension attribute are explained in Figure 4

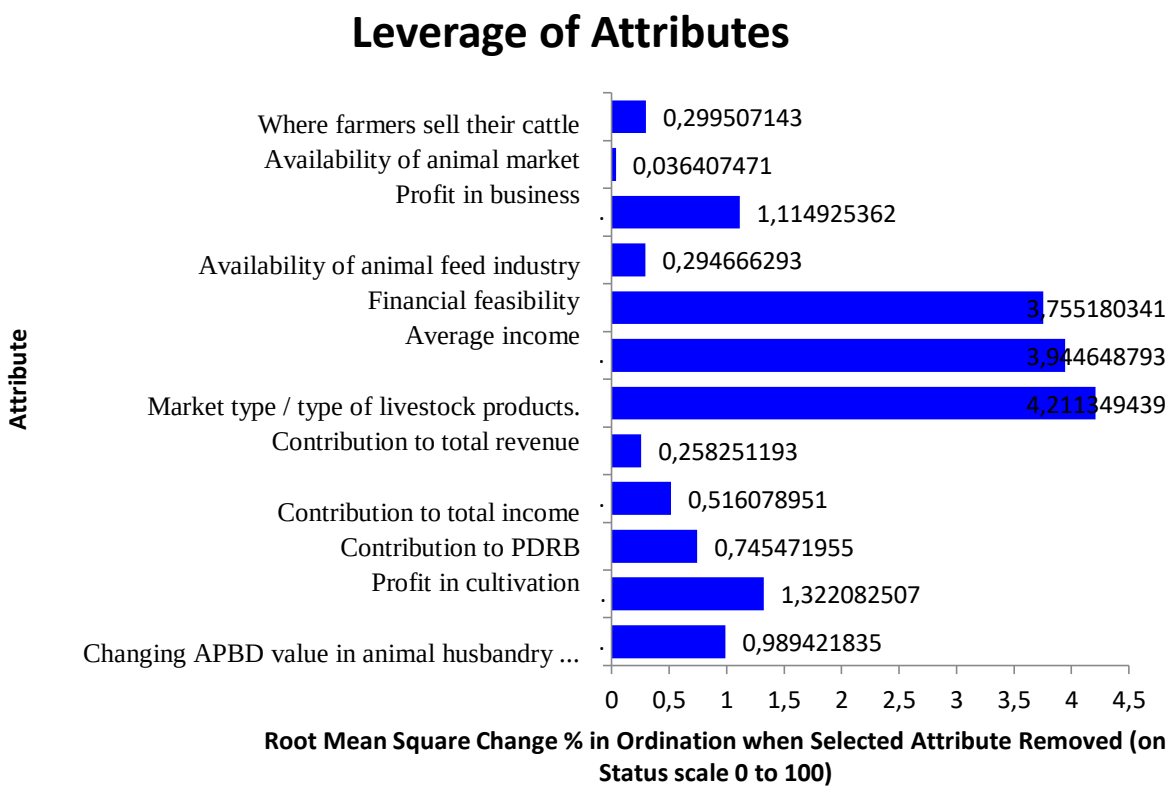


Figure 4:-Results of Leverage Analysis of Economic Dimensions

On the economic dimension, there are 3 lever attributes that are sensitive to the value of the technological dimension of the sustainability index, namely: 1) **Type of livestock product market**; Market in the sense of infrastructure is a place of business selling goods, services, and labor to people in exchange for money. In the concept of a market economy, each structure allows buyers and sellers to exchange types of goods, services and information. The exchange of goods or services for money is called a transaction. The type of livestock product market referred to is the type of market seen from the products traded, namely livestock products, in this case beef cattle commodities. Ideally in an area or somewhere where producers of beef cattle products have their own market for beef products, so farmers have no difficulty in selling their products. 2) **Average farmer income relative to the North Sulawesi provincial minimum wage**. The regional minimum wage (UMR) in an area is the minimum standard used by employers and industry players in remuneration for workers / laborers. The purpose of establishing the minimum wage is to ensure that workers receive a living wage. In general, the regional minimum wage is determined by the relevant regional government, and each region varies in terms of its minimum wage, which is influenced by the standard of living needs and different levels of productivity. Whereas a reasonable standard of income is the amount of worker's income or income from the results of his work so that he is able to meet the living needs of workers and their families fairly (PP no.78 year 2015 article 4). The magnitude of UMR in North Sulawesi province is in accordance with PERGUB. No 48 of 2018 amounted to Rp. 3,051.76 for 2019, while in 2018 Rp. 2,824,286, -, 2017 Rp. 2,598,000, -, in 2016 Rp.2,400,000. UMR in North Sulawesi Province is the third highest in all of Indonesia after Papua Province and DKI Jakarta. While the income of beef cattle breeders with the number of 30 heads is managed intensively with the type of ongole crossbred cattle and mixed Bali (bacan) income per month Rp. 1,790,729. Thus the ratio with the 2019 UMR was 58.69%. For this reason, the beef cattle breeding system needs to be considered to be improved. 3) **Financial feasibility**: In this case whether raising beef cattle is profitable, in the aspect of financial feasibility analysis. Analysis of the profitability of intensive maintenance beef cattle business in the *Sangbintang* area with 30 mixed ongol (PO) and bali mixed (*bacan*) cows resulting from a RC ratio of 1.32, means profitable because the RC ratio is > 1. However, the conditions in the field that the beef cattle breeding system is dominated by extensive and traditional systems, which financially have not provided significant benefits.

For this reason in the future, in order to obtain optimal benefits, it is necessary to seriously pay attention to the beef cattle breeding system by shifting the maintenance system to an intensive system.

Social and Cultural Dimensions:-

Sustainability Score Calculation Results Based on Social and Cultural Dimensions:-

Non-metric MDS shows the sustainability of the region's potential in North Bolaang Mongondow Regency in the form of a two-dimensional graph called a stimulus configuration where the competitiveness score is viewed through the X-axis coordinates of the stimulus configuration. The results of the MDS non-metric analysis on social and cultural dimensions are explained in Figure 1.

In figure 1 shows the potential sustainability score of the *Sangbintang* region of North Bolaang Mongondow Regency based on social and cultural dimensions is 50.414%. MDS non-metric results on social and cultural dimensions show values that are between 50.0% - 75.0% which means that the sustainability of the potential area owned by North Bolaang Mongondow Regency based on social and cultural dimensions is quite sustainable.

Results of Leverage Analysis Using the Jacknife Method on Social and Cultural Dimensions:-

Leverage analysis using the Jacknife method is used to find out the sensitive attributes to improve the potential sustainability status of the *Sangbintang* region of North Bolaang Mongondow Regency. The results of leverage analysis are changes in the value of Root Mean Square (RMS) which shows the estimated change in the non-metric MDS result score if one attributes is removed from the model. The greater the change in the value of the Root Mean Square (RMS) given by an attribute shows the increasingly important role that attribute plays in determining the sustainability status of the area's potential based on the dimensions formed. The results of the leverage analysis using the Jacknife method on the attributes of social and cultural dimensions are explained in Figure 5

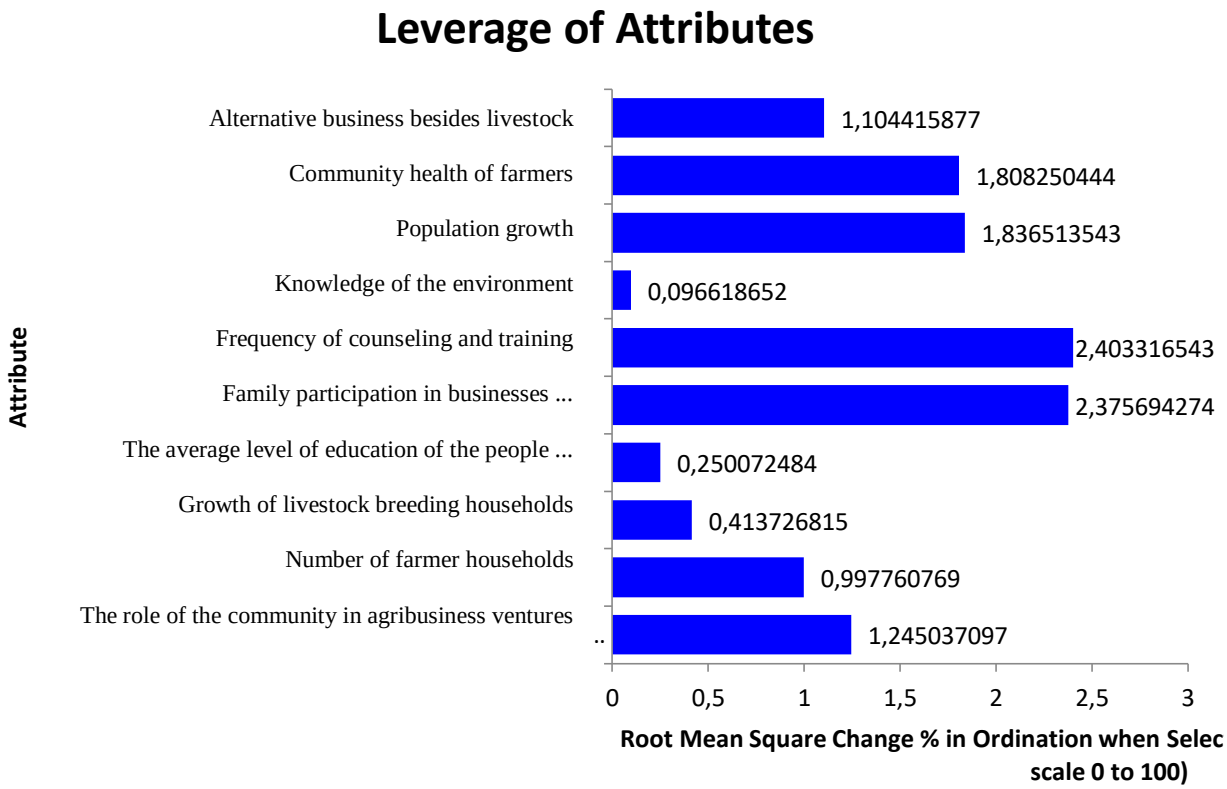


Figure 5:-Results of Leverage Analysis of Social and Cultural Dimensions

In the socio-cultural dimension, there are 2 lever attributes that are sensitive to the value of the social and cultural dimension of the sustainability index, namely: 1) **Frequency of Counseling and training**; to empower breeder farmers (farmer development) the role of counseling has a very strategic position. Empowerment of farmers can

mean increasing the ability / capacity of themselves or independence of farmers by creating an atmosphere or climate that allows farmers to be able to develop. Besides increasing the ability of farmers to build breeders 'institutions (farmers' groups) and protect through partiality to the weak by preventing unbalanced competition, creating mutually beneficial partnerships and establishing relationships or cooperation by establishing business partnerships with related institutions and as a media in the process of transfer or adoption of innovation in animal husbandry. In reality, counseling and training activities. 2) **Family participation in livestock business**; Based on observations at the research location in the *Sangbintang* area, the community's role in livestock agribusiness has been relatively low, so that in the future it needs to be improved so that the growth and development of animal husbandry agribusiness in this area is even more advanced. The low role of the community in the agribusiness business of beef cattle production results in the availability of commodity products for beef cattle farms being very poor.

Legal and Institutional Dimensions:-

Sustainability Score Calculation Results Based on Legal Dimensions and Institutional:-

Non-metric MDS shows the potential sustainability of the *Sangbintang* region of North Bolaang Mongondow Regency in the form of a two-dimensional graph called a stimulus configuration where the competitiveness score is viewed through the X-axis coordinates of the stimulus configuration. The results of the MDS non-metric analysis on the legal and institutional dimensions are explained in Figure 1

Figure 1 shows the potential sustainability score of the *Sangbintang* area of North Bolaang Mongondow Regency based on legal and institutional dimensions of 50.450%. MDS non-metric results on the legal and institutional dimensions show a value that is between 50.0% - 75.0% which means that the sustainability of the potential of the *Sangbintang* area in North Bolaang Mongondow Regency based on the legal and institutional dimensions is quite good.

Results of Leverage Analysis Using the Jacknife Method in Dimensions:-

Legal and Institutional:-

Leverage analysis using the Jacknife method is used to determine the sensitive attributes to improve the sustainability status of the potential of the *Sangbintang* area of North Bolaang Mongondow Regency. The results of leverage analysis are changes in the value of Root Mean Square (RMS) which shows the estimated change in the non-metric MDS result score if one attribute is removed from the model. The greater the change in the value of the Root Mean Square (RMS) given by an attribute indicates the increasingly important role of the attribute in determining the potential sustainability status of the *Sangbintang* region based on the dimensions formed. The results of the leverage analysis using the Jacknife method on the attributes of the legal and institutional dimensions are explained in Figure 6

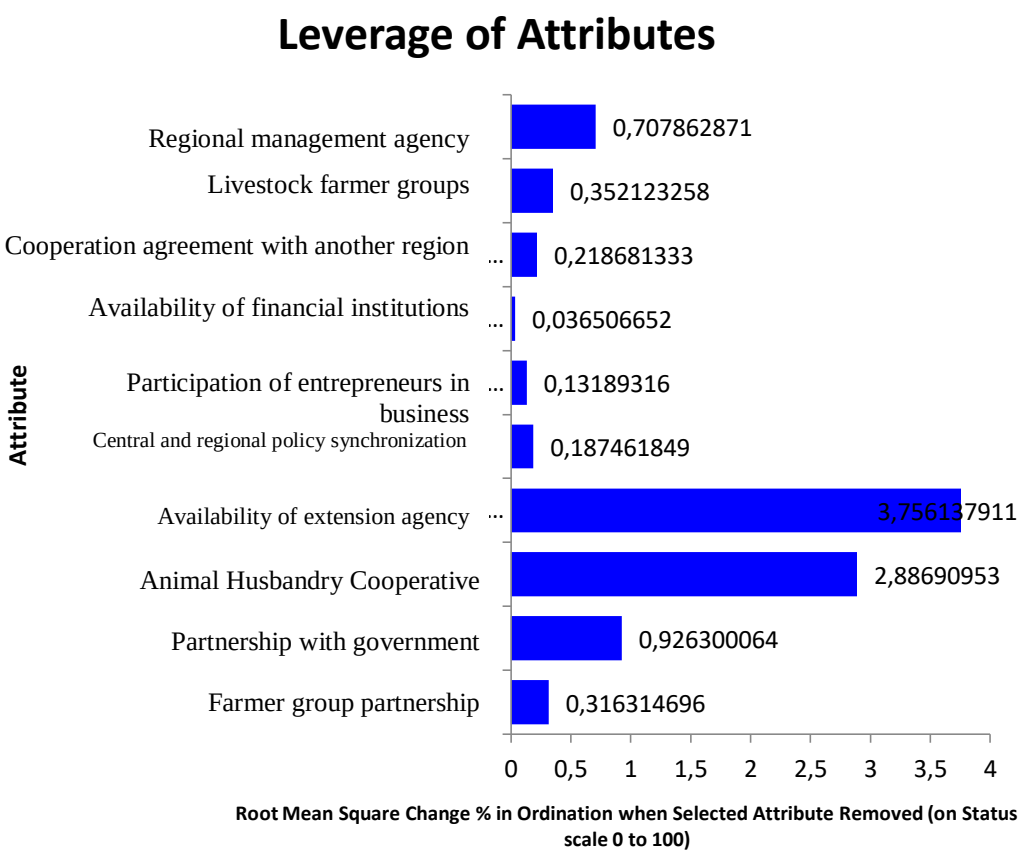


Figure 6:-Results of Leverage Analysis of Legal and Institutional Dimensions

In the legal and institutional dimensions, there are 2 lever attributes that are sensitive to the value of the technological dimension of the sustainability index, there are: **1) Availability of agricultural extension institutions**; To enhance the role of the agricultural sector as the cornerstone of national development, the Ministry of Agriculture in the period 2015 - 2019 has set a vision of agricultural development, namely "The realization of food sovereignty and farmers' welfare". In order to realize this vision the Ministry of Agriculture's mission is determined: 1) realizing food security, 2) Increasing the added value and competitiveness of agricultural commodities, 3) and 4) creating a transparent, accountable, professional and high integrity ministry. In order to realize this vision and mission, it is necessary to have professional, creative, innovative and global-minded agricultural human resources. For this reason, agricultural counseling, agricultural training, agricultural education, and standardization and certification of agricultural human resources need to be continuously developed and strengthened to prepare competent, visionary apparatuses, and understand their roles and functions in agricultural development. In addition, agricultural extension activities, agricultural training, agricultural education, as well as standardization and certification of agricultural human resources are also intended to: 1) strengthen farmers 'institutions, 2) empower farmers' businesses, and 3) realize the main actors in independent agricultural development, entrepreneurial spirit, competitive, and global outlook. This is intended so that the main actors in agricultural development are able to compete, both in regional markets and in global markets. In the *Sangbintang* area, agricultural extension centers have been built in each of the 1 BPP sub-districts, so that there are 3 BPP units in the *Sangbintang* area. It should be established in villages in the village agricultural extension posts, so that the process of adopting innovations from extension agents to farmers is more intensive with optimal frequency, so there will be an increase in the quality of human resources. 2) **Livestock cooperatives**; the cooperative is a symbol of hope for the economically weak, based on helping to help among its members born from self-confidence and brotherhood. The existence of livestock cooperatives can help in solving problems experienced by farmers today. With the incorporation of farmers into livestock cooperatives can bring a new atmosphere for the farmers to change their lives for the better and prosperous. The role of livestock cooperatives is as a forum for the aspirations of farmers in increasing social care, the welfare of their members, and obtaining a win-win situation that enables them

to control and maintain the products of farmers, while also generating additional income. In the *Sangbintang* Region there are no livestock cooperatives as expected. So that in the future it is necessary to pay attention to the development of livestock cooperatives in the context of the sustainable development of beef cattle-based *Sangbintang* area.

Analytical Hierarchy Process (AHP):-

In order to determine appropriate and relevant sustainable development policies in the development of beef cattle in the *Sangbintang* region, there are broadly five dimensions as described in the Rap-KAW*Sangbintang* analysis, namely: Ecological, Economic, technological, socio-cultural and institutional dimensions, which are sustainable and interconnected with each other.

In order to the *Sangbintang* beef cattle development area to be sustainable, the policy formulation refers to the six alternative policies resulting from the Rap-Kaw*Sangbintang* analysis as follows: 1) Improvement of facilities and infrastructure, 2) Increasing the quality of human resources, 3) Increasing the active role of farmers, 4) Application of cultivation technology, 5) Enhancing cooperation and partnerships, and 6) The role of supporting institutions. The results of the analysis between the determinants of the sustainability of the *Sangbintang*-based beef cattle breeding development in the North Bolaang Mongondow Regency are presented in Figure 7.

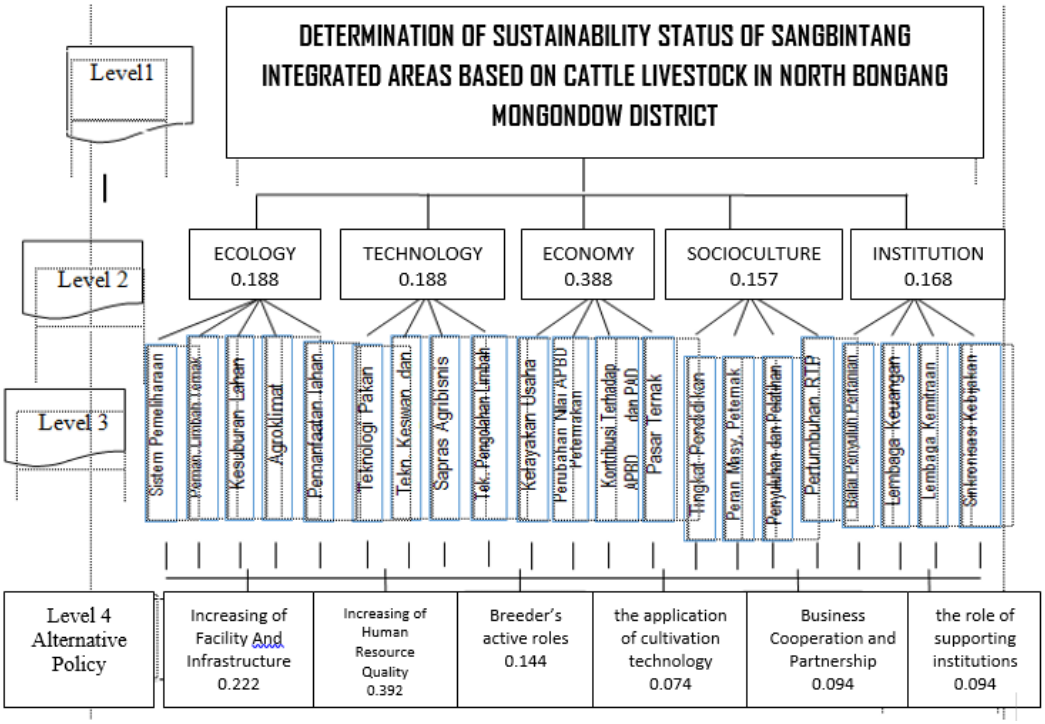


Figure 7:-Analysis Results of the Correlation between Components of the sustainability of the development of the Sangbintang area based on Beef Cattle Farming in Bolaang Regency, North MoNgondow.

Results of Analytical Hierarchy Process (AHP) of Stakeholders on Sustainability of the Development of Integrated *Sangbintang*-Based Beef Cattle Farming in Bolaang Regency, North Mongondow.:-

The analysis is carried out at each level of the policy determination hierarchy, while the weights and priorities analyzed are a combined combination of opinions and assessments of all stakeholders in each paired comparison matrix. The analysis results are presented in Figure 8.

Alternative Policy for Continuing Development of the *Sangbintang* Integrated Area:-

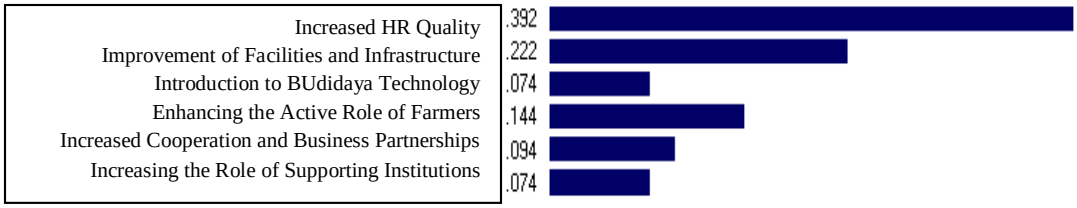


Figure 8:-Weight of each alternative development policy in the *Sangbintang* area, North Bolaang Mongondow Regency

Based on Figure 8 that the consistency index value is 0.04 (overall inconsistency), which means the weighting value of the pairwise comparison in each matrix is consistent. It also means that each respondent has given a consistent answer.

Based on the analysis of RAP-KAW*Sangbintang* and AHP analysis, an alternative model of sustainable development of beef cattle-based beef cattle can be made as follows:
Priority Policy Model 1: Human Resource Quality Improvement Model, especially farmers. It is known that the characteristics of breeders in the *Sangbintang* area, from the aspect of formal education are dominated by elementary school level. Typology of beef cattle breeding systems in general is still very traditional, namely cattle are bound and moved in grazing fields or gardens that are *bero*, both their own and those of others. This is because the knowledge of farmers on the cultivation of beef cattle is correct and good is very low. To improve the quality of human resources of farmers/breeders through formal education and training (vocational schools specifically for animal husbandry) and non-formal education through counseling by agricultural instructors who are reliable in the Agricultural Counseling Center container.

Priority of Policy Model 2:
Improvement of facilities and infrastructure model (weight 0.222). That the availability of infrastructure / facilities and infrastructure is very much needed in the development of an integrated area based on beef cattle breeding in North Bolaang Mongondow Regency. Infrastructure improvements here are; Technology facilities for building livestock pens, availability of animal health services (*poskeswan*), distribution of artificial insemination service posts, availability of water sources, both irrigation water and rivers and artificial wells, Facilities for using vitamin vitamins and probiotics to stimulate livestock growth, the availability of information and transportation technology related to the publication and modes of transportation, the availability of agribusiness facilities and infrastructure from upstream to downstream, improvement of infrastructure in farm roads and village roads. Improvement of irrigation / irrigation infrastructure, improvement of infrastructure facilities for agriculture and animal husbandry businesses are important because they can facilitate beef cattle business activities, such as housing facilities, cage construction, food and drink, medicine and vitamins, and others. It needs serious attention because it greatly influences the potential sustainability of the *Sangbintang* beef cattle development area in North Bolaang Mongondow Regency in the technological dimension.

Priority Policy Model 3;
Policy model to increase the active role of the community in livestock agribusiness (a value of 0.144). This policy basically enhances the active role of the community in beef cattle agribusiness. So far, breeders' communities still do not play a role and tend to be objects in livestock agribusiness activities. This policy is expected to increase the community's knowledge of the farming business environment, increase family participation in their farming, increase the average community education, In turn, the growth of farmer households increases which also increases the number of farmer households. The frequency of outreach activities is maintained to maintain the continuity of adoption of technological innovations, as well as population growth and public health need to be maintained. While cooperation and partnerships internally with fellow farmers and externally with institutions and individuals outside of the farm are increased, as well as microfinance institutions , banking, educational and training institutions, breeders association institutions and others need to improve their role and performance. So that the policy to increase the active role of the breeders' community in agribusiness is very important to be implemented seriously in

the framework of *Sangbintang* developing integrated based areas in beef cattle in North Bolaang Mongondow Regency.

Priority of Policy Model 4;

Policy model of increasing availability of extension institutions (weight value of 0.375). This policy basically enhances the function and role of extension institutions in their task of increasing knowledge, skills and attitudes of farmers in the transfer of new technologies in the field of animal husbandry, in this case beef cattle. The priority of this policy model needs to be supported by the availability of financial institutions at the field level, efforts to increase the participation of entrepreneurs in the beef cattle business, synchronization of central and regional policies, enter into cooperative agreements with other regions in the beef cattle breeding sector that are mutually beneficial, foster development livestock farmer groups and increase farmer group partnerships both internally with farmers and externally with institutions and individuals outside the livestock sub-sector, as well as improving livestock cooperatives. The importance of internal and external cooperation and partnerships in an effort to increase the bargaining value of farmers as well as the ease of accessing capital and investment in the framework of developing integrated areas of beef cattle-based cattle farming in North Bolaang Mongondow Regency.

Priority Policy Model 5;

Policy model to improve cultivation technology (weight value 0.074). This policy is closely related to seed technology (artificial insemination) with the aim of accelerating the increase in beef cattle population. In addition, appropriate technology policy in the field of feed, such as forage and concentrate processing so that it becomes effective and efficient beef cattle feed, as well as technology policy for processing beef cattle waste into organic fertilizer (liquid and solid fertilizer) through the making of bio gas in the group - herds in the area of the star.

Priority Policy Model 6;

Supporting institutional improvement policy model (weighting value 0.074). This policy is beyond the control of the farmer / rancher, but the essence is very influencing the rancher in conducting his farming. Such as agricultural extension centers (BPP), livestock cooperatives, banks, financial management bodies, need to increase their role and performance in the framework of developing integrated star-based beef cattle farms.

The results of the AHP analysis have been agreed by all stakeholders and become input in the formulation of a policy model for the development of *Sangbintang*-based cattle breeding areas in North BolaaangMongondow Regency. These results are in accordance with the wishes of all stakeholders. Thus, the implementation of this policy is expected to be carried out as well as possible.

Conclusions And Suggestions:-

Conclusion:-

1. Rap-KAW*Sangbintang* analysis results, that in the area of *Sangbintang* the status is not sustainable, because of the five dimensions analyzed the results are 3 dimensions that are less sustainable namely the ecological, technological and economic dimensions, 2 dimensions are quite sustainable, namely the socio-cultural and legal-institutional dimensions . To achieve sustainable development of *Sangbintang* beef cattle based area, the performance of the attributes that need to be optimally and integrated from these five dimensions are: improvement of beef cattle breeding systems, improvement of farm road infrastructure and facilities, Availability of agribusiness infrastructure facilities, technology availability livestock waste management, slaughterhouse availability (slaughterhouse), slaughter of productive females, utilization of livestock waste for organic fertilizer, availability of types / types of livestock product markets, increase the average farmer income relative to the North Sulawesi provincial minimum wage, financial feasibility, increase the frequency of counseling and training, increasing family participation in the beef cattle business, and the availability of extension institutions, as well as the existence of cooperative farms.
2. There are 6 policy models in the framework of developing *Sangbintang* area based on sustainable beef cattle breeding. In the context of developing sustainable *Sangbintang* beef cattle based area, the 6 policy models need to be implemented in a consistent, integrated and sustainable manner.

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