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Base Analysis and Land Carrying Capacity For the Development of Buffalo in Sijunjung Regency

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Abstract—This study aims to determine the sub-district base area and land carrying capacity index for buffalo development in Sijunjung Regency. It was conducted in Sijunjung in June-August 2019 and used a literature study method to collect the data and also to collect data from Livestock and Fisheries Office, Central Bureau of Statistics of Sijunjung Regency, and others related Offices. The result showed that the sub-district bases for buffalo developing are Kecamatan Koto VII and Kecamatan Sijunjung with LQ 1.55 and 1.29. The land carrying capacity index is 4.4, which means Sijunjung Regency is a safe area for buffalo development.

Keywords: Base, Land Carrying Capacity, Buffalo

INTRODUCTION

Increasing population and public awareness of the fulfillment of nutritional needs, making the demand for meat products always increase every year. In 2015, the Indonesian people's meat consumption per capita per year was 6.413 kg, an increase of 5.69% in 2016 to 6.778 kg (Dirjen PKH, 2017). But the rise in consumption is not supported by the rise in domestic production so that the number of imports remains high each year. According to the Directorate General of Animal Husbandry and Animal Health (2018), Indonesia still imports 403,668 tons of beef or about 30.1% of the national meat needs and 80,000 tons of buffalo meat.

This condition becomes an irony, considering that Indonesia is famous as an agrarian country that has a vast area, a lot of labor, and a climate suitable for livestock development. Various efforts and programs have been carried out by the government to meet the needs of the meat, such as the self-sufficiency program for beef and buffalo, Upsus Siwab (special effort for mandatory breeding cattle), regional-based development, but to date, it has not been successful.

In every program implementation, West Sumatra Province has always been the main supporting area. This province is one of the areas of animal husbandry development in western Indonesia, especially cattle and buffaloes. In supporting and discussing this study, several regions have been designed as areas for animal husbandry development centers, so that the development process can be focused and continuous. One such area is Sijunjung Regency as a center for buffalo breeding development area.

The population of buffalo cattle in Sijunjung Regency in 2017 was 14,813 individuals. If seen in the last ten years (2008-2017), as is the case with the national

population, the buffalo population in this district has also decreased. But the decline was relatively small, at an average of 1.49 per year (BPS, Sijunjung Regency).

In this district, there is also the largest cattle market in West Sumatra, the Palangki Livestock Market in district IV Nagari. In this market, they are gathering and transacting cattle traders and buyers across cities in West Sumatra and across provinces, such as: from Riau, Jambi, Bengkulu, and Lampung.

As a development center area, of course, the budget and activities will be more allocated to this district. The potential of the region must be known in more detail so that the development and development process carried out on target and the targeted development stages can be actualized according to plan. Moreover, this district is vast, reaching 3,130.8 km^2, hilly, and partly still forested. Therefore, the authors are interested in studying to determine the base and non-base areas of buffalo cattle development and to know the regional carrying capacity in terms of feed availability in the development of buffalo cattle.

Research Objectives

a. To find out the buffalo livestock development sub-district in Sijunjung Regency.
b. To find out the land carrying capacity index in Sijunjung Regency for the development of buffalo.

RESEARCH METHODOLOGY

Place and Time of the Research The

The Research was conducted in Sijunjung Regency, from June to October 2019.

Research Methods

This research uses library research methods. A literature study is the collection of data and reports from the Department of Animal Husbandry and Fisheries of Sijunjung Regency, Central Statistics Agency of Sijunjung, other relevant agencies.

Research Variables

a. Determining the subdistrict base used for buffalo breeding development, the variables are buffalo population in each district, RTP in each area, buffalo population in Sijunjung Regency, and RTP in Sijunjung Regency.
b. Finding out the value of the carrying capacity index of Sijunjung Regency in the development of buffalo farms, the variables are the total potential of feed and the whole need for feed.

Data Analysis

a) The first variable will be analyzed using the following formula:

$$LQ_{IJ} = \frac{X_{IJ} / X_{I.}}{X_{.J} / X_{..}}$$

Where :

X_{ij} : the degree of j-activity in the i-th region
$X_{i.}$: total activity in the Xth region
$X_{.j}$: total jth activity in all regions
$X_{..}$: the degree of total area activity

b) The second variable uses the following formulas:

To calculate the Regional Bearing Capacity Index the formula, the researcher used the following formula:

$$IDD = \frac{Total\ Potensi\ \ Pakan\ yang\ Tersedia\ (BKC)}{Total\ Kebutuhan\ Pakan\ (BKC)}$$

The total potential of feed (BKC) = Number of Feeds from Agricultural Waste + Total Natural Forage Production by Land Use

The total need for feed = Livestock population (ST) x K
where:

K = 2.5% x 50% x 365 x 25 kg = 1.14 tons BKC / year / ST

Description:

K = Minimum feed requirements for 1 ST (in tons of materialor also called DDM (*digestible dry matterdigestible dry matter*) for 1 year

2.5% = The minimum requirement for the amount of feed forage (dry matter) to body weight

50% = Average value of digestibility of various types of plants

365 = Number of days in one year

250kg = Amount of biomass for 1 unit of livestock (ST)

RESULTS AND DISCUSSION

General Condition of Research Area

Sijunjung Regency is one of 19 (nineteen) districts/cities in the Southern part of West Sumatra Province, located between 0 ° 18'43 "LS - 1 ° 41'46" LS and 100 ° 46'50 "East - 101 ° 53'50 "east longitude with an altitude of sea level between 100 - 1,250 meters [(1)]. Sijunjung Regency is in the eastern part of West Sumatra Province, on the main route that connects Riau Province and Jambi Province. Considering its location at the intersection of these lanes, Sijunjung is an economic and tourism route. Administratively, the area of Sijunjung Regency is 313,080 Ha includes eight districts, sixty-one Nagari and one village with 263 Jorong, whose territory is bordered by:

North Side: Tanah Datar regency
South side: Dharmasraya regency
West Side: Solok Regency and Sawahlunto City
East side: Regency Kuantan Singingi, Riau Province

Topographically, Sijunjung Regency is a series of hills extend from the northwest-southeast direction. The regional morphology is divided into 3 (three) parts, the steep area in the west and east, the flat area in the middle, and the sloping hills located in between. In terms of height, the dominance of the Sijunjung Regency is at the lowest altitude between 120 - 130 m above sea level and the highest between 550-930 m. Sijunjung Regency as a whole is at the lowest and highest altitude around 100 meters to 1,500 meters above sea level.

Climatic conditions in Sijunjung Regency classified as wet tropical types with rainy and dry seasons that change throughout the year. Climatic conditions are temperatures with a minimum temperature of 21 ° C and a maximum temperature of 37 ° C. Average rainfall based on six monitoring points 13.61 mm / day for each month.

In this district, there are almost all types of livestock raised in West Sumatra, except for dairy cattle and pigs. There are no dairy cattle developed here because it is not popular in the community, and some areas are not suitable agro-climatology. The distribution of the population of each livestock described in the following table:

Table 3: Population of Livestock in Sijunjung Regency 2015-2017 (head)

Type of Livestock	Jumlah			Growth Rate (%)
	2015	2016	2017	
Beef Cattle	17.701	18.033	16.961	-2,03
Dairy Cattle	0	0	0	0
Buffaloes	14.977	15.307	14.813	-0,51
Swine	0	0	0	0
Goat	12.885	11.639	13.847	4,65
Lamb	1.982	1.907	1.870	-2,86
Native Chicken	237.074	280.524	197.668	-5,60
Broiler	1.096.050	995.660	1.000.000	-4,36
Laying	45.250	54.000	63.445	18,41
Ducks	27.887	25.254	23.895	-7,41

Source: BPS Kab. Sijunjung 2018

The table above explains that generally, the livestock population in Sijunjung Regency has decreased in the last three years. Only goats and laying hens increased. However, for buffalo cattle, the decline is relatively small at an average of 0.51% per year, lower than the national decrease in buffalo population, which is 0.58% per year (BPS, 2012).

Development Base of Buffalo Farm in Sijunjung Regency

In this study, the determination of the establishment of buffalo cattle husbandry‘s development base areas conducted through LQ analysis. LQ analysis is

an index to compare the share of sub-regions in certain activities with the total amount of those activities in the overall operations of the region. In this case, certain activities in the sub-region are classified as the buffalo population. The population in the sub-district and the total activity in the overall area activity is buffalo population and population in the district. The LQ analysis results can be seen in the following table:

Table 4: LQ Analysis of Buffaloes Development in Each District in Sijunjung

No	Districts	Buffalo Population	Number of Population	LQ
1	Kamang Baru	1.810	49.359	0,57
2	Tanjung Gadang	1.066	24.977	0,66
3	Sijunjung	3.805	45.951	**1,29**
4	Lubuk Tarok	762	15.205	0,78
5	IV Nagari	1.369	16.932	1,26
6	Kupitan	1.155	13.977	1,28
7	Koto VII	3.771	37.902	**1,55**
8	Sumpur Kudus	1.075	25.801	0,65
Total		**14.813**	**230.104**	

Source: Data Processing, 2019

Results of the analysis of buffalo breeding LQ in Sijunjung Regency, as shown in the table above, explains that four subdistricts have a value of LQ > 1. If LQ > 1. Then the area is called the base sector. The sector whose specialization level is higher than the status of the reference area. Of the four sub-districts, there are two sub-districts with the highest LQ values, namely Koto VII and Sijunjung Districts, with LQ values of 1.55 and 1.29.

3.3. Land Carrying Capacity for the Development of Buffalo in Sijunjung Regency

Bearing to find out the carrying capacity index of buffalo cattle can be measured by calculating the total available feed potential divided by the full feed requirements. The possible feed potential and animal feed requirements are calculated not only for buffaloes but for ruminants (buffalo, cattle, goats, and sheep). Rumunansia is a plant-eating animal that digests its food in two steps: first, by swallowing raw materials, then removing the half-digested food from its stomach and chewing it again or better known for ruminating.

A. The Total Potential of Feed

Livestock feed can be produced from agricultural waste and natural forages available on existing land. Agricultural wastes that used as animal feed are rice, corn, peanuts, green beans, soybeans, sweet potatoes, and cassava. For Sijunjung Regency, agricultural residues that can be utilized as ruminant animal feed are as follows:

Table 5: Number of Feeds from Agricultural Waste

No	Type of Waste Food	Crop Production Plant (Ton / Yr)	Waste Production (Ton / Yr)	Digestibility	Production Waste (BKC / Ton / Yr)
(a)	(b)	(c)	(d)	(e)	(f)
1	Rice Paddy	88.468	88.468	0,2	17.694
2	Corn	1.880	3.760	0,2	752
3	Green Beans	5	10	0,25	3
4	Peanuts	27	54	0,25	14
5	Cassava	443	28	0,3	8
	Total				18.470

Source: Results of Data Processing, 2019

From the table above, it can be seen that agricultural waste in Sijunjung Regency can produce the animal feed of 18,470 tons of BKC / Year.

While the forage that can be produced by existing land can be seen from the use of paddy fields, dry land, plantations (rubber, oil palm), land, dry fields, fields, community forests, pasture fields, and others. More in the table below:

Table 6: Total Natural Forage Production by Land Use in Sijunjung Regency

No	Land Use	Area (Ha)	Forage Feeding Productivity (Ton / Ha / Yr)	Conversion Factor	Production(Ton / BKC / Yr)
(a)	(b)	(c)	(d)	(e)	(f)
1	Rice fields	10.220	1,25	1	3.194
2	Dry Land	7.872	2,975	2	11.710
3	Plantation	47.758	3	2	71.637
4	Yard	5.228	0,53	2	1.385
5	Fields / Gardens	15.586	2,875	1	11.202
6	Community Forests	19.953	0,6	1	2.993
7	Other	17.905	0,75	1	3.357
	Total				105.478

Source: Results of Data Processing, 2016

From the table above illustrates that the production of natural forages that can be produced by land in Sijunjung Regency is 105,478 tons of BKC / year. This amount is a potential forage that can be produced by land use, as illustrated in the table above.

After knowing the potential of feed originating from agricultural waste and natural forage production, the total feed availability in Sijunjung Regency is obtained by adding up the results of both. From the sum, the overall availability of animal feed obtained in Sijunjung Regency is 123,948 tons of BKC / year. Learn more in the following table:

Table 7. Total Potential Forage in Sijunjung (Ton / BKC / year)

Number of Feeds from Agricultural Waste	Total Natural Forage Production by Land Use	Potential Total Feed
18 470	105 478	123 948

Source: Data Processing, 2019

B. Ruminant Animal Feed Needs

Based on the formula contained in the research methodology, the ruminant animal feed needs in Sijunjung District are as shown in the following table:

Table 8. Ruminant Animal Feed Needs in Sijunjung District (BKC tons/year)

No	Type of Livestock	Population	Factors	Amount (ST)	Needs Feed (ST)	Total
(a)	(b)	(c)	(d)	(e) = (c)* (d)	(f)	(g) = (e)*(f)
1	Beef Cattle	16.961	0,7	11.872,70	1,14	13.534,88
2	Dairy Perah	0	0,7	0,00	1,14	0,00
3	Buffalo	14.813	0,8	11.850,40	1,14	13.509,46
4	Goat	13.844	0,06	830,64	1,14	946,93
5	Sheep	1.870	0,05	93,50	1,14	106,59
	Total			24.647,24		28.097,85

Source: Results of Data Processing, 2019

From the above table, it can be explained that the current need for ruminant animal feed in one year in Sijunjung Regency is 28,097.85 tons of BKC / year.

C. Land Carrying Capacity Index

Land carrying capacity index in developing ruminants farms is obtained by dividing the total available feed potential by the current total feed requirements. The value obtained is IDD 4.4. It means that Sijunjung Regency is in the safe region in the development of ruminant farms because it has an IDD> 2. One of the ruminants is buffalo cattle.

CONCLUSIONS

a. The base districts for buffalo breeding development in Sijunjung Regency are Koto VII District and Sijunjung District with LQ index values of 1.55 and 1.29.
b. The carrying capacity index of the Sijunjung Regency in buffalo cattle development is 4.4, which depicts that Sijunjung Regency is in the safe region in the development of buffalo ranches (ruminants).

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