Buletin Peternakan 45 (3): 195-204, August 2021

ISSTAP
Indonesian Society for Sustainable Tropical Animal Production

Bulletin of Animal Science

ISSN-0126-4400/E-ISSN-2407-876X Accredited: 36a/E/KPT/2016

http://buletinpeternakan.fapet.ugm.ac.id/

Doi: 10.21059/buletinpeternak.v45i3.64119

The Analysis of Capacity Increase in Beef Cattle Population in The South Konawe Regency

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Article history
Submitted: 16 February 2021
Accepted: 29 August 2021

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ABSTRACT

This research aimed to determine the maximum potential for increasing the population of beef cattle in the South Konawe Regency Southeast Sulawesi Province based on natural resources and the ability of the head of the farmer family to raise cattle. This research was conducted 5th October to 28th December 2019. Determination of research location was carried out purposely (purposive sampling), with the consideration that South Konawe Regency was a central area for Bali cattle breeding. The data analysis was carried out by analyzing the supporting capacity of forage from pasture land and non-pasture land (rice fields, plantations, forests and moor) as well as the production of agricultural food crop waste (rice, corn, peanuts, green beans, cassava, sweet potatoes and soybeans), using tabular data in the form of data on food crop production and land area. Potential analysis of beef cattle business development in South Konawe Regency using the calculation of the Capacity Increase of Ruminant Population/Kapasitas Peningkatan Populasi Ternak Ruminansia (KPPTR). Based on the results of research in South Konawe Regency, the number can still be increased by 7,478 Animal Units. If the value is converted to adult female-male cows with an age of >2 years, the population addition can be done as many as 7,478 cows. Meanwhile, if converted to female-male heifers with an age of 1-2 years, the population increase can be increased by 14,956 and if converted to female-male calves with an age of >1 year, the population increase can be done up to 28,912.

Keywords: Capacity increase, Cows, Feed, Population

Introduction

The development of the livestock sector is part of agricultural development in a broad sense. The development of livestock as an integral part of the development of the agricultural sector in the provision of animal protein, develops the potential of people's economy, especially in rural areas, employment and development the potential of an area (Zahara *et al.,* 2016).

South Konawe Regency is the second largest beef cattle producing regency in Southeast Sulawesi Province. Based on data from the Central Statistics Agency in 2018, the number of cattle population in South Konawe Regency was 72.004 (BPS, 2019). To obtain good quality livestock, adequate feed availability is required. The quality and availability of feed in the form of adequate and sustainable forage and concentrate is very important in development of beef cattle (Wantasen, 2016). The availability of forage is a top priority to fulfill livestock needs. Production costs in fulfillment of the availability of feed are 60-70% of all production costs. Given the high costs, it is necessary to pay deep attention to the provision of good feed in terms of quantity and quality (Infitria and Khalil, 2014).

The development of beef cattle farms needs to be supported by the availability of forage for both quality and quantity (Abadi *et al.,* 2019a). The low availability of feed in an area is a trigger factor for failure to increase productivity and livestock population in an area, this is due to the low feed supporting capacity that is not suitable for the available livestock population (Abadi *et al.*, 2019b). The carrying capacity of beef cattle development is one of the important factors to support the increase in beef cattle productivity, to achieve optimal results, it is necessary to develop a livestock development strategy that has good carrying capacity, such as feed given to livestock must contain good nutritional value, large land, processing, waste, utilization of forage fodder (Saputra *et al*., 2016).

To determine the maximum potential of the population increase development of beef cattle in an area, it can be done by analyzing the supporting capacity of agricultural land (rice fields, plantations, forests and moor) and supporting capacity of food crop waste. This research aims to

determine the maximum potential of population increase of beef cattle in South Konawe Regency based on natural resources and ability of the head of farmer family to raise cattle. The results of this research are expected to provide important information to Animal Husbandry Service, community and breeders in the context of developing ruminants based on the potential supporting capacity of forage and the maximum ability of the head of farmer family in raising cattle.

Materials and Methods

This research was conducted in South Konawe Regency from 5th October to 28th December 2019. The location determination in this study was carried out purposely (purposive sampling), with the consideration that South Konawe Regency is the center of Bali cattle breeding area.

The data used in this study are primary (main) data and secondary (supporting) data. Primary data is collected through surveys and observation of the general condition of research location and conducting interviews with respondents (farmers and beef cattle breeders) to determine the conditions at research location. Supporting data is the general condition of location, population and type of livestock, total population, land use and others. Secondary data is needed to obtain a broader and more comprehensive picture related to the focus/object of research in the field.

Data analysis was carried out by analyzing the supporting capacity of forage from pasture land and non-pasture land (rice fields, plantations, forests and moor) as well as the production of agricultural food crop waste (rice, corn, peanuts, green beans, cassava, sweet potatoes and soybeans), using tabular data in the form of data on food crop production and land area, sourced from Central Statistics Agency, Regency and Provincial Animal Husbandry Service and Agriculture Service.

To analyze the potential of the development of beef cattle business in South Konawe Regency, using the calculation of the Increase Capacity of Ruminant Livestock Population/ Kapasitas Peningkatan Populasi Ternak Ruminansia (KPPTR). This method refers to Fariani (2008) with the following steps:

a. Maximum Potential based on Natural Resources/PSML (Regional Supporting Capacity) is formulated:
   PSML = Supporting capacity of Agricultural Land + Supporting capacity of Food Crops
   Notes:
   - Supporting capacity of Agricultural Land = Contribution of Agricultural Land x 3.75.
     The supporting capacity of agricultural land is obtained from the contribution of pasture land and non-pasture land (rice fields, plantations, forests and moor).
   - Contribution of Agricultural Land = Land Area x Land contribution coefficient.
   - 3.75 is the coefficient calculated as the supporting capacity of agricultural land in livestock units.
   - Supporting capacity of Food Crops = Agricultural Waste Production/2.3.
     Supporting capacity of food crops is obtained from the contribution of food crop agricultural waste (rice, corn, peanuts, green beans, cassava, sweet potatoes and soybeans).
   - Agricultural Waste Production = Harvested Area x Contribution Coefficient of Harvested Area.
   - 2.3 is the coefficient calculated as dry weight requirement (ton/year) for one livestock unit.
b. Maximum Potential based on Farmer Family (PMKK) is formulated:
   PMKK = c x KK
   Notes:
   - c : The coefficient calculated based on the number of livestock units (ST) that can be cared for by a family is 2.33 ST/KK.
   - KK : Head of Farmer Family
c. KPPTR value is formulated:
   1. KPPTR (SL) = PSML – Popril
   2. KPPTR (KK) = PMKK – Popril
   Notes:
   - KPPTR (SL): the Increased Capacity of Ruminant Livestock Population (ST) based on natural resources. KPPTR
   - (KK): The Increased Capacity of Ruminant Livestock Population (KPPTR) based on the head of farmer family.
   - Popril: Real population (livestock population of research location)
d. Effective KPPTR: KPPTR (SL), if KPPTR (SL) < KPPTR (KK)
   Effective KPPTR:
e. Effective KPPTR: KPPTR (KK), if KPPTR (KK) < KPPTR (SL)
   Effective KPPTR:
   Effectiveness is determined as the capacity of population increase of ruminants in the research area, namely KPPTR (SL) or KPPTR (KK) which has smaller value. KPPTR calculations, Nell and Rollinson (1974) provide conditions as shown in Table 1 and Table 2 below:

   The number of livestock calculation uses livestock units (Soekardono, 2009), namely:
   - 1 adult cow, age> 2 years = 1 ST
   - 1 heifer, age 1-2 years = s 0.5 ST
     1 calf, age <1 year = 0.25 ST.

Results and Discussion

Beef cattle population

Livestock population is a general indicator that can be used as a measurement for the conditions of livestock development, because it can describe the suitability of livestock to the agroecological environment, the level of

community acceptance of livestock, technical mastery of livestock, population dynamics and the success of reproductive system (Arifin and Riszqina, 2016). The population rate of ruminants such as beef cattle is influenced by several supporting factors such as the number of births, availability of feed and disease attacks. Beef Cattle Population by South Konawe Regency can be seen in Table 3.

Based on Table 3, showed that the cattle population continues to increase, and it can be seen as a good progress of livestock. South Konawe Regency was determined as the center area for Balinese cattle breeding through Decree of the Ministry of Agriculture number 803/Kpts/PK.030/12/2016. Since its establishment, in the last 4 (four) years, the livestock sector in South Konawe Regency has received serious attention. Beef cattle development efforts have been carried out by the government through procurement and quality improvement of seedlings, improvement of maintenance systems, management of reproductive systems, artificial insemination (IB), supervision of slaughtering excellent males and productive females, periodic livestock health checks as prevention and control of disease, increasing the quality and quantity of feed, business counseling and coaching, improving the facilities and infrastructure for business development, so that the cattle growth rate continues to increase. The policy of developing livestock production centers in the form of establishing and expanding pastures and forage areas for animal feed, management, improving livestock cultivation (Abadi *et al.*, 2018) must receive serious attention so that the increase in livestock population can be carried out optimally.

Source land of forage for livestock

Livestock development is closely related to the development of an area and the carrying

Table 1. Land capability in producing grass

Type of land	Land contribution (ha)
Pasture	100% of land area
Similar Forest	5% of land area
Secondary forest	3% of land area
Plantation	5% of land area
Rice fields	2% of land area
Galengan rice fields	2,5% of land area
Moor	1% of land area

Source: Nell and Rollinson (1974)

Table 2. Forage production that could be produced from the harvested area

Waste products	Straw production
Rice straw	0.23 Tons BK/ha/Year
Corn straw	10.9 Tons BK/ha/Year
Peanut straw	1.44 Tons BK/ha/Year
Soybean straw	1.07 Tons BK/ha/Year
Cassava straw	5.05 Tons BK/ha/Year
Sweet potato straw	1.2 Tons BK/ha/Year

Source : Nell and Rollinson (1974)

Table 3. Beef cattle population according to the district in South Konawe Regency

Number	District	Beef cattle population		
		2016	2017	2018
1	Andolo	1,919	2,035	2,107
2	Andolo Barat	2,487	2,614	2,817
3	Angata	2,202	2,478	2,566
4	Baito	3,375	3,516	3,650
5	Basala	928	995	1,050
6	Benua	378	459	572
7	Buke	3,593	3,821	3,924
8	Kolono	1,534	1,532	1,586
9	East Kolono	847	913	985
10	Konda	5,272	5,387	5,915
11	Laeya	3,671	3,783	4,373
12	Lainea	2,592	2,739	2,826
13	Lalembu	1,670	1,750	1,812
14	Landono	3,116	2,843	3,173
15	Laonti	616	689	716
16	Moramo	4,027	4,129	4,227
17	North Moramo	980	1070	1.108
18	Mowila	3311	3412	3.629
19	Palangga	5765	5937	6.257
20	South Palangga	3098	3164	3.276
21	West Ranomeeto	2598	2719	3.189
22	Ranomeeto	2025	2114	2.193
23	Sabulakoa	1071	1469	1.490
24	Tinanggea	4273	4498	5.011
25	Wolasi	1277	1377	1.455
	Total	**62,625**	**65,443**	**69,907**

Source: Department of Animal Husbandry and Animal Health (2019).

capacity of forage both in quality and quantity (Abadi *et al.*, 2019b). The availability of forage is the main priority in fulfilling the needs of livestock and it is influenced by the availability of land. Land has an important role in providing forage such as grass and agricultural waste. Forage for livestock can be obtained on agricultural land, plantations, forests, moor and food crops by-products such as rice straw, corn, peanuts, cassava, sweet potatoes and soybeans. The land area for forage sources in South Konawe Regency can be seen in Table 4.

Based on Table 4, showed that the land area for forage sources from rice fields, moor, plantations, pasture and forests in South Konawe Regency is 349,482 ha. The largest land area is plantation, which is 194,555 ha, then forest is 70,835 ha, wetland is 41,442 ha, moor is 35,710 ha, the smallest land area is pasture, which is 6,941 ha. The largest source of forage land is Lalembu District with an area of 91,967 ha, while the smallest is Ranomeeto District, 826 ha.

Table 4 also showed that the harvested area for food crops consists of various types of commodities (rice, maize, peanuts, cassava, sweet potatoes and soybeans) reaching 50,687 ha, where the largest harvest area is rice, which is 39,030 ha, followed by maize of 7,267 ha, cassava 2,479 ha, soybean 1.357 ha, peanuts 164 ha, and sweet potatoes 393 ha. The largest

Table 4a. Land area of forage sources area of food crops in South Konawe Regency

District	Land area (ha)					Total
	Rice Field	Moord	Plantation	Pasture	Forest	
Andolo	3,774	2,510	5,792	86	0	12,162
West Andolo	2,524.8	2,270	8	1,105	0	5,908
Angata	1,970	0	0	0	0	1,970
Baito	2,029.6	840	853	75	0	3,798
Basala	2,421.5	295	6,236	0	70	9,023
Benua	190	0	35,350	0	0	35,540
Buke	2,209.2	0	1,578	0	0	3,787
Kolono	348	7,517.5	2,276	0	11,628	21,770
East Kolono	0	1,249	67	0	134.9	1,451
Konda	2,344	790	986	320	863	5,303
Laeya	2,345.25	0	18,345	0	0	20,690
Lainea	536	2,642	2,720	700	4,430	11,028
Lalembu	9,033.6	0	82,932	0	0	91,966
Landono	461	3,222	642	154	783	5,262
Laonti	13	3,490	5,669	1,408	450	11,030
Moramo	1,020	2,495	13,424	200	17,472	34,611
North Moramo	120	2,039.55	1,409	679.58	0	4,248
Mowila	2,526	0	1,932	0	0	4,458
Palangga	2,498.5	457	2,231	524	683	6,394
South Palangga	196.92	158.83	1,365.84	26.03	9,492.72	11,240
West Ranomeeto	708	381	1,381	215	349	3,034
Ranomeeto	289	0	537	0	0	826
Sabulakoa	30	330.4	1,851.75	0	0	2,212
Tinanggea	3,623.6	3,373	5,669	1,408	8,450	22,524
Wolasi	230	1,650	1,300	40	16,029	19,249
Total	41,442	35,710	194,555	6,941	70,835	349,482

Table 4b. Land area of harvested area of food crops in South Konawe Regency

District	Harvested area of food crops (ha)						Total
	Rice	Corn	Peanuts	Ubi kayu	Sweet potato	Soybeans	
Andolo	3,744	612	2	990	0	322	5,670
West Andolo	2,524.8	450	0	3	0	15	2,993
Angata	1,970	0	0	20	0	0	1,990
Baito	1,746.3	394	2	0	0	0	2,142
Basala	0	0	0	0	0	0	0
Benua	190	350	0	0	0	0	540
Buke	2,209.2	416	46	157	38	0	2,866
Kolono	348	337	0	131	0	229	1,045
East Kolono	0	48	0	15	0	0	63
Konda	2,235	607	6	258	23	1	3,130
Laeya	2,345.25	97	29	76	23	142.5	2,713
Lainea	503.9	346.6	2	42	0	1	896
Lalembu	8,989.2	1,365	0	5	0	0	10,359
Landono	370	145	6	51	89	0	661
Laonti	26	0	0	6	0	0	32
Moramo	870	22	8	6	8	19	933
North Moramo	120	1	1.05	7.6	0	0	130
Mowila	2,522	915	15	16	20	36	3,524
Palangga	2,408.4	370	0	5.5	0	0	2,784
South Palangga	1,300		30	340	0	0	1,670
West Ranomeeto	516	25	0	85	55	27	708
Ranomeeto	276	85	9	6.25		289	665
Sabulakoa	30	111	3	241	125	239	749
Tinanggea	3,555.6	418	5	18	12	36	4,045
Wolasi	230	150	0	0	0	0	380
Total	39,030	7,265	164.05	2,479	393	1,357	50,687

harvested area for food crops is Lalembu District with an area of 10,359 ha and the smallest is Laonti District, which is 32 ha.

Forage is the most basic requirement for the survival of ruminants, both large and small livestock. Every day, livestock need quite a lot of forage, because more than 60% of all the feed needs consumed are forage, both fresh and dry and Forage fodder is one of the ingredients for animal feed that is indispensable and has great benefits for the life and survival of the livestock population (Abadi, *et al.*, 2019a; Abadi, *et al.*, 2021b;). Regarding the supply of forage to increase population, the availability of suitable land for forage growth is very important. If the aspect of land availability is not taken into account properly, increasing the livestock population will be very difficult to achieve (Delima *et al.*, 2015). The potential of the supporting area and the availability of feed raw materials and human resources allow the development of beef cattle based on local resources in the region. This is because the development of beef cattle is positively correlated with the availability of forage as a source of animal feed. Forage is the main feed ingredient that needs to be provided for ruminants (Sangadji and Rajab, 2018).

Supporting capacity of land

In developing beef cattle, one thing to pay attention to is supporting capacity of land. It is the ability of land to provide forage for livestock, which was estimated from the land area in the land use utilized. The calculated supporting capacity of land is all the land that has potential to produce forage. Land resources that can be used for ruminants are rice fields, grazing/pasture lands, plantations, forests and so on.

In addition to relying on grass that was intentionally planted on forage land, the farmers in South Konawe Regency also used natural grass that grows around staple crops or forage that grows in other lands such as forests and moor. Each type of land has a different ability to produce forage for livestock. The supporting capacity of land for forage sources in South Konawe Regency can be seen in Table 5.

Based on Table 5, it showed that the land that has the largest contribution in providing feed for livestocks was plantations, 9,728 ha, while the smallest was moor of 357 ha. The area that had the largest contribution of land was Lalembu District, which was 4,327 ha and the smallest was East Kolono District of 23 ha. Table 5 also showed that the supporting capacity of agricultural land in South Konawe Regency reached 80,235 ST. The area that had the largest supporting capacity was Lalembu District at 16,227 ST and the smallest was Laonti District at 85 ST.

Land use must be carried out by applying the level of land suitability through in-depth and unpatterned studies of temporary interests (Sangadji and Rajab, 2018). To increase soil fertility, it is necessary to add soil organic matter with a higher nutrient content. Land preparation needs to be done to renovate existing vegetation (Jarmani and Haryanto, 2015).

Supporting capacity of food crops

The supporting capacity of food crop waste is the ability of an area to produce feed for livestocks in the form of food crop waste that can fulfill the needs of a number of ruminant livestock populations in fresh or dry form. Utilization of food crops by-products as feed for ruminants is widely known, this is due to the ability of beef cattle to convert feed ingredients containing crude fiber into products that are useful for their growth and reproduction.

Table 5a. Land contribution of forage sources in South Konawe Regency

District	Land contribution coefficient (ha)					Total
	Rice field	Moor	Plantation	Pasture	Forest	
Andolo	75.48	25.10	289.60	86.00	0	476
West Andolo	50.50	22.70	0.40	1105.00	0	1,179
Angata	39.40	0	0	0	0	39
Baito	40.59	8.40	42.65	75.00	0	167
Basala	48.43	2.95	311.80	0	3.50	367
Benua	3.80	0	1,767.50	0	0	1,771
Buke	44.18	0	78.90	0	0	123
Kolono	6.96	75.18	113.80	0	581.40	777
East Kolono	0	12.49	3.35	0	6.75	23
Konda	46.88	7.90	49.30	320	43.15	467
Laeya	46.91	0	917.25	0	0	964
Lainea	10.72	26.42	136.00	700	221.50	1,095
Lalembu	180.67	0	4,146.60	0	0	4,327
Landono	9.22	32.22	32.10	154.00	39.15	267
Laonti	0.26	34.90	283.45	1408.00	22.50	1,749
Moramo	20.40	24.95	671.20	200	873.60	1,790
North Moramo	2.40	20.40	70.45	679.58	0	773
Mowila	50.52	0	96.60	0	0	147
Palangga	49.97	4.57	111.55	524.00	34.15	724
South Palangga	3.94	1.59	68.29	26.03	474.64	574
West Ranomeeto	14.16	3.81	69.05	215.00	17.45	319
Ranomeeto	5.78	0	26.85	0	0	33
Sabulakoa	0.60	3.30	92.59	0	0	96
Tinanggea	72.47	33.73	283.45	1,408.00	422.50	2,220
Wolasi	4.60	16.50	65.00	40	801.45	928
Total	829	357	9,728	6,941	3,542	21,396

Table 5b. Land supporting capacity of forage sources in South Konawe Regency

District	Land supporting capacity (ST)					Total
	Rice field	Moord	Plantation	Pasture	Forest	
Andolo	283.05	94.13	1,086.00	322.50	0	1,786
West Andolo	189.36	85.13	1.50	4,143.75	0	4,420
Angata	147.75	0	0	0	0	148
Baito	152.22	31.50	159.94	281.25	0	625
Basala	181.61	11.06	1,169.25	0	13.13	1,375
Benua	14.25	0	6,628.13	0	0	6,642
Buke	165.69	0	295.88	0	0	462
Kolono	26.10	281.91	426.75	0	2,180.25	2,915
East Kolono	0	46.84	12.56	0	25.29	85
Konda	175.80	29.63	184.88	1,200	161.81	1,752
Laeya	175.89	0	3,439.69	0	0	3,616
Lainea	40.20	99.08	510	2,625.00	830.63	4,105
Lalembu	677.52	0	1,5549.75	0	0	16,227
Landono	34.58	120.83	120.38	577.50	146.81	1,000
Laonti	0.98	130.88	1,062.94	5,280	84.38	6,559
Moramo	76.50	93.56	2,517.00	750	3,276.00	6,713
North Moramo	9.00	76.48	264.19	2,548.43	0	2,898
Mowila	189.45	0	362.25	0	0	552
Palangga	187.39	17.14	418.31	1,965.00	128.06	2,716
South Palangga	14.77	5.96	256.10	97.61	1,779.89	2,154
West Ranomeeto	53.10	14.29	258.94	806.25	65.44	1,198
Ranomeeto	21.68	0	100.69	0	0	122
Sabulakoa	2.25	12.39	347.20	0	0	362
Tinanggea	271.77	126.49	1,062.94	5,280	1,584.38	8,326
Wolasi	17.25	61.88	243.75	150	3,005.44	3,478
Total	3,108	1,339	36,479	26.027	13,281	80,235

The development of beef cattle cannot be separated from the development of agricultural businesses, because agricultural businesses have the potential for the availability of agricultural waste which can be used as feed for the development of beef cattle. Potential sources of feed from food crop waste are rice straw, peanut straw, corn straw, cassava leaves, soybean straw, sweet potato leaves, and other agricultural waste. The production of food crops by-products in South Konawe Regency can be seen in Table 6.

Seeing the potential and supporting capacity of food crop waste as a source of feed, it seems that it can fulfill the needs in providing feed for a number of beef cattle populations. Based on Table 6, it showed that the largest production of food crop by-products (straw) was obtained from corn plants at 79,184 BK tons/year and the smallest was peanuts plants at 236 BK tons/year. The area with the largest production of food crop by-products (straw) was Lalembu District with 16,971 BK tons/year and the smallest was Laonti District with 36 BK tons/year. Table 6 also showed that the supporting capacity of food crops in South Konawe Regency reached 50,687 ST. The area that had the largest supporting capacity was Lalembu District at 16,227 ST and the smallest was Laonti District at 16 ST.

Table 6a. Production of food crops by-products

District	Production of food crop by-products (tons/year)						Total
	Rice	Corn	Peanuts	Cassava	Sweet Pottato	Soybean	
Andolo	861.12	6,670.80	2.88	4,999.50	0	344.54	12,879
West Andolo	580.70	4,905.00	0	15.15	0	16.05	5,517
Angata	453.10	0	0	101.00	0	0	554
Baito	401.65	4,294.60	2.88	0	0	0	4,699
Basala	0	0	0	0	0	0	0
Benua	43.70	3,815.00	0	0	0	0	3,859
Buke	508.12	4,534.40	66.24	792.85	45.60	0	5,947
Kolono	80.04	3,673.30	0	661.55	0	245.03	4,660
East Kolono	0	523.20	0	75.75	0	0	599
Konda	514.05	6,616.30	8.64	1,302.90	27.60	1.07	8,471
Laeya	539.41	1,057.30	41.76	383.80	27.60	152.48	2,202
Lainea	115.90	3,777.94	2.88	212.10	0	1.07	4,110
Lalembu	2,067.52	1,4878.50	0	25.25	0	0	16,971
Landono	85.10	1,580.50	8.64	257.55	106.80	0	2,039
Laonti	5.98	0	0	30.30	0	0	36
Moramo	200.10	239.80	11.52	30.30	9.60	20.33	512
North Moramo	27.60	10.90	1.51	38.38	0	0	78
Mowila	580.06	9,973.50	21.60	80.80	24.00	38.52	10,718
Palangga	553.93	4,033.00	0	27.78	0	0	4,615
South Palangga	299.00	0	43.20	1,717.00	0	0	2,059
West Ranomeeto	118.68	272.50	0	429.25	66.00	28.89	915
Ranomeeto	63.48	926.50	12.96	31.56	0	309.23	1,344
Sabulakoa	6.90	1,209.90	4.32	1,217.05	150	255.73	2,844
Tinanggea	817.79	4,556.20	7.20	90.90	14.40	38.52	5,525
Wolasi	52.90	1,635.00	0	0	0	0	1,688
Total	8,977	79,184	236	12,521	472	1,451	102,841

Table 6b. Food crop supporting capacity

	Daya dukung tanaman pangan (ST)						Total
District	Rice	Corn	Peanuts	Cassava	Sweet Potato	Soybean	
Andolo	374.40	2,900.35	1.25	2,173.70	0	149.80	5,599
West Andolo	252.48	2,132.61	0	6.59	0	6.98	2,399
Angata	197.00	0	0	43.91	0	0	241
Baito	174.63	1,867.22	1.25	0	0	0	2,043
Basala	0	0	0	0	0	0	0
Benua	19.00	1,658.70	0	0	0	0	1,678
Buke	220.92	1,971.48	28.80	344.72	19.83	0	2,586
Kolono	34.80	1,597.09	0	287.63	0	106.53	2,026
East Kolono	0	227.48	0	32.93	0	0	260
Konda	223.50	2,876.65	3.76	566.48	12.00	0.47	3,683
Laeya	234.53	459.70	18.16	166.87	12.00	66.29	958
Lainea	50.39	1,642.58	1.25	92.22	0	0.47	1,787
Lalembu	898.92	6,468.91	0	10.98	0	0	7,379
Landono	37.00	687.17	3.76	111.98	46.43	0	886
Laonti	2.60	0	0	13.17	0	0	16
Moramo	87.00	104.26	5.01	13.17	4.17	8.84	222
North Moramo	12.00	4.74	0.66	16.69	0	0	34
Mowila	252.20	4336.30	9.39	35.13	10.43	16.75	4,660
Palangga	240.84	1,753.48	0	12.08	0	0	2,006
South Palangga	130	0	18.78	746.52	0	0	895
West Ranomeeto	51.60	118.48	0	186.63	28.70	12.56	398
Ranomeeto	27.60	402.83	5.63	13.72	0	134.45	584
Sabulakoa	3.00	526.04	1.88	529.15	65.22	111.19	1,236
Tinanggea	355.56	1,980.96	3.13	39.52	6.26	16.75	2,402
Wolasi	23.00	710.87	0	0	0	0	734
Total	3,903	34,428	103	5,444	205	631	44,713

Livestock development needs to be supported by the availability of forage and feed ingredients sourced from adequate agricultural by-products throughout the year both in terms of quality and quantity, so that sources of forage feed ingredients and agricultural by-products need to know their potential in order to maximize their utilization (Abadi *et al.*, 2021a). The production of food crop waste depends on the harvested area of food crops by increasing agricultural land for food crops, the production of waste by-products of food crops also increases (Zahara *et al.*, 2016). However, the use of various types of agricultural by-product waste in the form of straw must first be treated physically, chemically, and biologically. The high content of crude fiber and the low nutritional content of straw feed are limiting factors for its use. One of the approaches which can be used is through fermentation technology (Darmawansya *et al.*, 2021).

Increase capacity of ruminant livestock population

The development of beef cattle population is an increase in the population of beef cattle both in terms of the increase of body weight and number of livestock, namely the calves of the cow. Increasing the population of beef cattle needs to be supported by the ability of area to produce forage, both from various types of grass and legumes as well as food crop straw/waste products. The potential of forage and food crop waste is an alternative to fulfill the needs of beef cattle feed while creating a ruminant livestock business in the development of environmental-based agribusiness (Febrina and Liana, 2008).

The increase capacity calculation of the ruminants population was useful to see how much an area has potential to increase ruminants population based on the capability of the land supporting capacity and ruminants population that can be cared for by the head of family in South Konawe Regency. The coefficient value of increasing ruminant livestock population in South Konawe Regency can be seen in Table 7.

The KPPTR SL score in each district varies greatly. Based on the result of data and the calculation of increase capacity score of livestock populations from 25 (twenty-five) districts, there are 17 (seventeen) districts that are positive, namely Andolo District of 5,451.22 ST, West Andolo District of 4,485.89 ST, Basala District of 493.55 ST, Benua District of 7,849.07 ST, Kolono District of 3,645.56 ST, Konda District of 509.46 ST, Laeya District of 968.12 ST, Lainea District of 3,536.53 ST, Lalembu District of 22,128.08 ST, Laonti District of 5,976.44 ST, Moramo District of 3,413.52 ST, North Moramo District of 1,988.68 ST, Mowila District of 2,175.91 ST, South Palangga District of 403.62 ST, Sabulakoa District of 297,32 ST, Tinanggea District of 6,641.25 ST and Wolasi District of 2,983.81 ST. Then, 8 (eight) districts are negative, namely Angata District of -1,760.84 ST, Baito District of -458.79 ST, Buke District -242.69, East Kolono District of -465.39 ST, Landono District of -753.57 ST, Palangga District at -456.71 ST, West Ranomeeto District at -940.82 ST and Ranomeeto District at -1,103.41 ST. KPPTR SL which had a negative score because the livestock population exceeded the capability of the bearing capacity of land. Table 7 also showed that KPPTR KK score are positive in all districts. The positive score of KPPTR KK in all districts of South Konawe Regency indicated that the ruminant livestock population was smaller than the maximum potential that can be take cared by each head of farmer family. The varying KPPTR score were influenced by the agricultural land area, harvested area, real proportion of livestock population and the number of farmer households (Darsono *et al.*, 2016).

Table 7. Increase capacity of cattle population

District	Real Population (ST)	PMSL (ST)	PMKK (ST)	KPPTR SL (ST)	KPPTR KK (ST)	KPPTR Efektif (ST)
Andolo	1,710	7,385	2,898.52	5,675.17	1,189*	1.189
West Andolo	2,333	6,818	3,443.74	4,485.89	1,111*	1.111
Angata	2,150	389	3,774.6	-1,760.84	1,625*	-1,760.84
Baito	3,065	2,668	4,669.32	-396.49*	1,605	-396.49
Basala	882	1,375	1,519.16	493.55*	638	493.55
Benua	471	8,320	638.42	7,849.07	167*	167
Buke	3,290	3,047	4,869.7	-242.69*	1,580	-242.69
Kolono	1,296	4,941	1,719.54	3,645.56	424*	424
East Kolono	811	345	945.98	-465.39	135*	-465.39
Konda	4,926	5,435	6,393.52	509.46*	1,468	509.46
Laeya	3,605	4,573	4,566.8	968.12	962*	962
Lainea	2,356	5,892	3,686.06	3,536.53	1,331*	1,331
Lalembu	1,478	23,606	2,614.26	22,128.08	1,136*	1,136
Landono	2,640	1,886	4,422.34	-753.57*	1,782	-753.57
Laonti	599	6,575	1,020.54	5,976.44	422*	422
Moramo	3,522	6,936	4,445.64	3,413.52	924*	924
North Moramo	944	2,932	1,425.96	1,988.68	482*	482
Mowila	3,036	5,212	5,727.14	2,175.91*	2,691	2,175.91
Palangga	5,179	4,722	5,783.06	-456.71*	604	-456.71
South Palangga	2,646	3,050	3,397.14	403.62*	751	403.62
West Ranomeeto	2,556	1,596	3,676.74	-960.02*	1,121	-960.02
Ranomeeto	1,810	707	2,395.24	-1,103.41	585	-1,103.41
Sabulakoa	1,301	1,598	2,316.02	297.32*	1,015	297.32
Tinanggea	4,087	10,728	5,540.74	6,641.25	1,454*	1,454
Wolasi	1,258	4,212	1,393.34	2,983.81	135*	135
Total	57,946	124,949	83,283.52	68,754.12	25,338.02	7,478

Notes: * = Selected score as effective KPPR.

The KPPTR SL score in 18 (eighteen) districts was positive. This showed that the area based on capability of land supporting capacity was still possible to increase the number of cattle population because the level of land supporting capacity exceeds the population, so that caused under grazing (excess feed). Meanwhile, 7 (seven) other districts had negative scores. So it was not possible to increase the cattle population because the number of population had exceeded the capability of land supporting capacity. If the population continues to increase, there will be potential for excessive overgrazing (lack of feed) and can affect livestock productivity. This was in accordance with the statement of Ningsih *et al.*, (2011) which stated that the positive (+) calculation results indicated the level of excess feed availability while negative (-) indicated a lack of feed.

The bearing capacity of an area based on the feed potential was then compared with bearing capacity based on the farmer household. The addition of an effective ruminant livestock population (PPTR) was the smallest score of the comparison between KPPTR based on the potential of feed and KPPTR based on farmer households in South Konawe Regency. The results of analysis using the effective KPPTR calculation showed that the effective KPPTR score of each district in South Konawe Regency varied. In general, the total effective KPPTR score was 9.257 ST. This means that based on the maximum potential of natural resources and the head of farmer family in South Konawe Regency, it was still possible to increase the population. If the score was converted to adult female-male cows with an age of >2 years, the population addition can be done as much as 7,478. Meanwhile, if converted to female-male heifers with an age of 1-2 years, the population increase could be increased by 14,956 and if converted to female-male calves with an age of >1 year, the population increase could be done up to 28,912. However, there were 8 (eight) districts where it was not possible to increase the cattle population, namely Angata District, Baito District, Buke District, East Kolono District, Landono District, Palangga District, West Ranomeeto District and Ranomeeto District.

Based on the available resources, both land availability and labor availability, Konawe South Regency had considerable potential for livestock development. Factors that supported the increase of livestock population in South Konawe Regency were forage from pasture and non-pasture land (rice fields, plantations, forests and moor) as well as production of agricultural food crop waste (rice, corn, peanuts, green beans, cassava, sweet potato and soybean), which was balanced by the number of farmer families.

Referring to the availability of forage resources and food crops waste used as feed for livestocks as well as the real livestock population of South Konawe Regency, it could be seen that the capacity to increase the ruminants population (KPPTR). Abdullah (2014) stated that in the ruminants development in Indonesia, forage was a very important factor with the largest composition, namely 70-80 percent of the total maintenance costs. The level of forage availability in an area was one very important factor and also influenced population dynamics in the successful development of livestock, especially herbivorous livestock.

The availability of land area for forage, the potential of agricultural waste, and the availability

of labor in South Konawe Regency were opportunities that could be utilized for the development of beef cattle business. The steps that can be taken are to intensify the existing land and utilize agricultural waste as a source of feed for livestocks to increase the number of livestock that can be accommodated. As well as by increasing the ability of the head of farmer family as a labor to improve maintenance management so that the number of livestock being raised is more and is expected to be able to absorb optimal labor.

The development of livestock is aimed to increase the production of livestock products which at the same time to increase the income of breeders, to create jobs and to increase the population and genetic quality of livestock.

The role of government has a big influence in increasing the population of cattle, namely by optimizing supervision in the prohibition of slaughtering productive female cattle. This is important to maintain the continuity of population, because slaughtering productive females can reduce the number of beef cattle calves, thereby enlarging the possibilities that the population improvement program will not be realized.

Conclusions

Based on the availability of forage land resources and farmer labor, the increase in ruminant livestock population in the South Konawe Regency could still be increased by 7,478 ST. If the score is converted to adult female-male cows with an age of >2 years, the population addition can be done as much as 7,478. Meanwhile, if converted to female-male heifers with an age of 1-2 years, the population addition can be increased by 14,956 and if converted to female-male calves with an age of >1 year, the population addition can be done up to 28,912. However, there were 8 (eight) districts where it was not possible to increase the cattle population, namely Angata District, Baito District, Buke District, East Kolono District, Landono District, Palangga District, West Ranomeeto District and Ranomeeto District.

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