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Assessing Potency And Suitability Of Livestock Production Systems From Agricultural Crops; An Evidence From Island Agro-Ecology

Hans Mamboai[1*], Deny Anjelus Iyai[2*], Makarius Bajari[3], Johan Koibur[2], Meky Sagrim[1], Stepanus Pakage[2], Mulyadi[2], Siti Saadiyah[1], Johan Koibur[2], Siti Aisah Bauw[3], Frandz Pawere[2], Yubelince Runtuboi[4], Daniel Seseray[2], Obadja Fenetiruma[1]

[1]Faculty of Agriculture. Papua University. Jl. Gunung Salju, Amban. Manokwari Papua Barat
[2]Faculty of Animal Science. Papua University. Jl. Gunung Salju, Amban. Manokwari Papua Barat.
[3]Faculty of Economic and Business. Papua University. Jl. Gunung Salju, Amban. Manokwari Papua Barat.
[4]Faculty of Forestry. Papua University. Jl. Gunung Salju, Amban. Manokwari Papua Barat

*Corresponding author: h. mamboai@unipa.ac.id (HM), d..iyai@unipa.ac.id (DAI)

Abstract
The purpose of this study was to assess the potential for livestock production in the district area as a basis for developing livestock commodities and livestock sector, knowing the needs and potential for food crop wastes. The method is descriptive with desk-study and semi-survey techniques. The object of observation is the aspect of livestock production and food crop production as the primary source of animal feed and the projected suitability of livestock commodities. The findings of the study show that the portrait of livestock production is not optimal, marked by the low number of livestock production population structures per district, economic density, farming density, and regional density. Some areas that have the potential for the livestock base sector are Yendidori, North Biak, Samofa, West Biak, and East Biak. Although the suitability value for LQ livestock development is still dominant at < 1 in some districts, even 0, it needs serious attention for livestock development stakeholders in Biak Numfor. One thing that can be done is to strengthen the basic sector of food crop development.
Keywords: livestock population structure, livestock density, base sector, LQ, KPPTR, Biak
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INTRODUCTION

Various people's economic empowerment programs have been launched by the Indonesian government (Mayulu and Sutrisno, 2014; Harjanto et al. 2019; Tatipikalawan and Rajab, 2014; Asriati, 2015; Setianto et al., 2014; Sopamena and Ura, 2012; Widayati, 2012) since integration. with Papua. Through the development of the old order era known as the Repelita, followed by a period of reform, mutual cooperation, and a working cabinet. The livestock development program in Indonesia is implemented by the Ministry of Agriculture through the Director-General of Livestock. In Papua, livestock programs are implemented by a number of districts including the Biak district.

Biak Regency is one of the integrated economic development areas (KAPET) in Indonesia (Yai 2011; Biak-Numfor 2020). Located in the north of Papua, the island of Biak is the parent district of the two regencies on this island. This is done by the government because Papua and in particular Biak have potential natural resources that are potential to be used in the context of accelerating and improving the people's economy. One of the natural resources that can be used is the potential of agricultural and livestock resources.

Biak Regency has conventional livestock commodities which can be categorized into livestock commodities that are *high return livestock* and *slow return livestock* (Sugiarto et al. 2017; Devendra 2007; Erenstein and Thorpe 2010; Murgueitio 2017; Serey et al. 2014). The livestock commodities that are kept include chickens, pigs, and goats as well as cattle. The cattle mentioned above are introduced as conventional livestock which has not become a mainstay commodity because livestock cultivation is still extensive. This livestock for the population only serves as social savings or *life and social savings* (Phiri, 2012; Truebswasser et al., 2018; Iyai et al., 2018; Mekonnen et al., 2012; Vithanage et al., 2013; Mbaso and Kamwana, 2013; Nguthi, 2007; Widi, 2015). Economic value is created when there is an accidental need just to meet the daily food needs of the family. The non-optimal production and profit for farmers and the surrounding community is a short and medium-term impact experienced by smallholder farmers. In addition, the livestock that is kept still does not have a direct and significant impact on the farmer's economy and the regional economy (Soetrisno, 1999).

There are still production, economic, political, social, and cultural constraints that have an impact on the development and development of the livestock sub-sector (Soetrisno, 1999). Because Biak district is located in an urban and coastal area, the developing livestock farming systems have a trend of only utilizing the potential of coastal resources such as seawater, coconut plants, grasses of lowland plants, and adaptive coasts growing on the coast (Julendra et al. 2013; Madarisa et al. 2007; Saade and Nur 2017; Kutsiyah 2019; Abdullah et al. 2019; Warastuti 2001). The livestock system that is cultivated can also be ensured to be carried out extensively and even semi-intensively. Thus, the development of these livestock farming systems, it is relatively uncharted and well known.

It is known that among coastal areas, due to edaphic characteristics, available natural resources, and community culture, livestock farming patterns can vary. So far, the farming community in Biak has not become one of the suppliers of agricultural commodities in nearby regencies and cities, such as Supiori, Yapen, in Papua, and Manokwari and Wondama in West Papua. Not comparable to market demand for livestock commodities which increases every year (Diskominfo 2018). By only relying on limited knowledge from farmers (Daulay, 2011), agricultural commodities belonging to the community can be produced using low and cheap inputs. So far, only plantation commodities, especially coconut, have become export commodities for this area. Whereas local resources are one of the main factors that determine the development of livestock commodities. Thus, it is undeniable that the resulting livestock production has not been optimally produced. Of course, constraints are still found in the upstream and downstream aspects of the livestock system as well as aspects of the facilities and infrastructure which are very urgent to study for solutions (Yai 2016; Homer et al. 2017).

Isolation from factors of transportation facilities, factors of upstream livestock information about knowledge of production and fodder, livestock health factors, business capital factors, and forms of guidance. Thus, it becomes very urgent to know what things start from the pre-production, production, post-production, and trade/agribusiness aspects (Nasrul 2012; Sagrim et al. 2017), which need attention so that a common thread can be drawn. to be used as the basis for designing the master plan for agricultural development in Biak. The purpose of this study was to determine the portrait of livestock production in a village environment (*eco-farm*) as the basis for developing livestock commodities and developing livestock, knowing the needs and potential for livestock development in Biak Regency.

MATERIALS AND METHODS

Research Location Conditions. Biak Numfor is located at 2°.49' to 3°.05" South Latitude and 132°20" to 132°.33" East Longitude, just below the equator with an altitude of 100 meters above sea level. The area of Biak reaches 705 Km^2 (based on the regulation of the Minister of Home Affairs Number 06 of 2008) and is divided into 19 districts (BPS Biak, 2020).

Table 1. Livestock population in Biak Numfor.

No.	District	Population (head)							
		Cattle	Goat	Pigs	Chicken	Laying hend	Broiler	Alabio duck	Entog
1	Numfor Barat	5	19	725	3654	0	0	0	0
2	Orkeri	0	0	471	3119	0	0	0	0
3	Numfor Timur	7	11	912	3765	0	0	0	563
4	Bruyadori	7	18	615	1781	0	0	0	0
5	Poiru	0	29	661	2798	0	0	0	0
6	Padaido	0	0	365	1991	0	0	0	0
7	Aimando Padaido	0	0	365	2188	0	0	0	0
8	Biak Timur	137	135	881	10312	0	0	0	0
9	Oridek	21	23	346	1939	0	0	0	0
10	Biak Kota	162	609	3181	6359	6232	45650	3994	928
11	Samofa	173	631	4147	5495	16060	42250	4163	471
12	Yendidori	624	578	753	11693	25200	180270	247	0
13	Biak Utara	741	609	617	15584	1300	0	0	0
14	Andey	78	69	405	2192	0	0	31	0
15	Warsa	31	131	335	1894	0	0	181	0
16	Yawosi	43	32	263	1821	0	0	75	0
17	Bondifuar	21	53	242	1698	0	0	0	0
18	Biak barat	159	121	571	6957	0	0	144	0
19	Swandiwe	27	31	559	1974	0	0	0	0
	Jumlah	**2236**	**3099**	**16414**	**87214**	**48792**	**268170**	**8835**	**1962**

The method used in this research is descriptive with *desk and* semi-survey techniques (Yin, 2000). Data collection was obtained through data published online on the website of the Biak Numfor Regency BPS office.

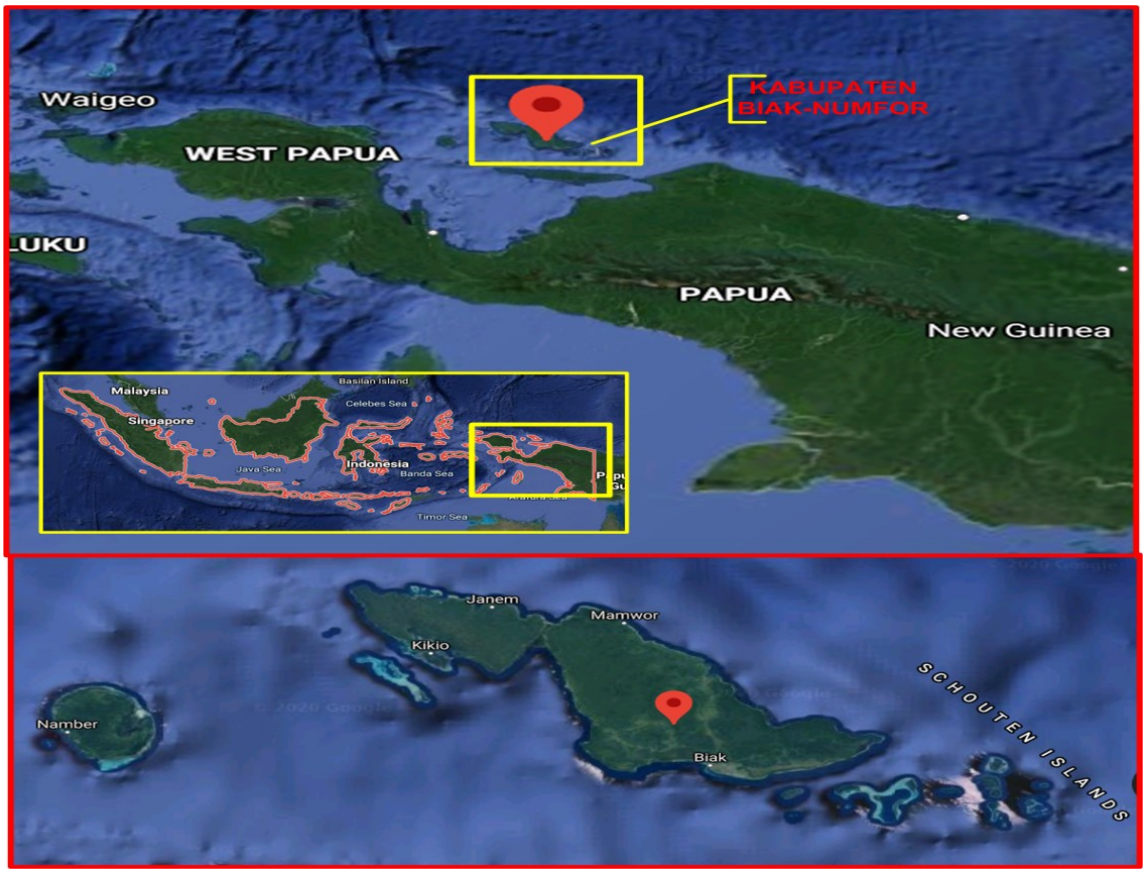

Figure 1. Indication of study location in Biak Numfor Regency, Papua. Source: BPS Biak-Numfor 2020 and Google Maps.

In this study, the objects of observation are aspects of the distribution and structure of livestock population, livestock density, carrying capacity of food crop waste (BK), and the suitability of the area for developing commodities, both livestock and food crops. The data obtained were then analyzed by tabulation and descriptive to obtain a portrait of the production and potential of livestock as well as the need for livestock development in Biak Regency.

Data analysis

1. Waste Carrying Capacity

The carrying capacity of food crop waste as a source of animal feed is calculated using the results of a study from Syamsu (2018). The calculation used is assumed to be 1 livestock unit (ST) of beef cattle requiring an average dry matter of 6.25 kg/day (NRC, 1984). The following table presents the harvested area of food crops in Biak district.

Table 2. Harvested area of food crops in Biak-Numfor.

District	Land	Harvested land (Ha)						
		Rice	Corn	Cassava	Potatoes	Peanut	Soya bean	Mung beans
Numfor Barat	414	0	4	12	9	0	0	10
Orkeri	284	0	0	21	16	0	0	10
Numfor Timur	226	0	4	11	9	0	0	2
Bruyadori	464	0	2	20	14	0	0	20
Poiru	364	0	0	19	13	0	0	4
Padaido	140	0	0	0	0	0	0	0
Aimando Padaido	232	0	0	0	0	0	0	0
Biak Timur	572	0	7	11	20	0	0	0
Oridek	828	0	8	7	9	2	6	2
Biak Kota	196	0	3	13	24	0	0	0
Samofa	1050	0	12	30	33	0	0	0
Yendidori	1254	0	12	27	34	3	0	0
Biak Utara	196	0	19	5	28	0	0	6
Andey	1231	0	3	10	9	0	2	0
Warsa	312	0	6	10	13	0	0	0
Yawosi	181	0	8	16	11	0	0	0
Bondifuar	588	0	11	12	17	0	0	0
Biak barat	1150	0	8	12	30	0	2	0
Swandiwe	1106	0	9	9	13	0	0	0
Jumlah	10788	0	116	245	302	5	10	54

2. **Capacity to Increase Cattle Population (KPPTR)**

The value of the capacity to increase the population of ruminants in a district is calculated based on the difference between the feed capacity of food crop waste and the number of existing ruminants. The percentage value of KPPTR is the KPPTR (ST) of each district divided by the Province's KPPTR (ST) (Syamsu et al., 2006).

3. **Livestock density indicator**

The economic density of livestock is measured by the total population (ST) in 1000 inhabitants. The criteria used were for ruminants in livestock units, namely very dense (>300), dense (>100-300), moderate (50-100), and rare (<50). Farming density is measured by the total population (ST) per hectare of farming land (paddy fields and gardens). The criteria used are ruminants for very dense (>2), dense (>1-2), moderate (0.25-1.0) and rare (<0.25) categories. The density of the area is the total population (ST) per km^2. The criteria used are very dense (> 50), dense (> 20-50), moderate (10-20), rarely (< 10) categories.

4. **Potential of Leading Livestock Sector**

The leading potential of the base and non-base sectors is analyzed using the LQ (*location quotient*) method. The LQ formula is written as, where: X_{ij}= the i-th degree of activity in the*j-th region,* $X_{i.}$= total activity in the*j* , X_j= total*j* in all areas, X..= degree of total activity in the area. The results of calculations using the LQ method produce three (3) categories of LQ values as follows: LQ > 1; meaning that commodity *i* is the basis or source of growth. This commodity has a comparative advantage, the results can not only meet the needs of the region concerned but can also be exported outside the region, LQ = 1; commodities classified as non-basic, do not have a comparative advantage. Its production is only sufficient to meet the needs within its own region and cannot be exported outside the region. The LQ value < 1 means that this commodity is also non-basic, cannot meet the needs within the region, and must be imported from outside the region. Commodities that have an LQ value > 1 are normative standards to be designated as superior commodities (Faijah and Wahbi, 2014; Khairiyakh and Mulyo, 2015).

RESULTS AND DISCUSSION

Portrait of Livestock Production

In the portrait of livestock production, the attributes discussed are the composition of livestock ownership, livestock system, population and age of livestock, feeding of livestock, breeding, reproduction, and

veterinary, and sources of livestock breeds. The livestock kept in Biak come from their own efforts/self-employment. Goats are obtained by farmers from family donations and buy them at the market/other breeders. Pigs are obtained by residents by hunting in the forest. Meanwhile, native chickens are obtained on the basis of independent business (Sudaryani and Santosa, 2000). The ducks were obtained by the farm with the assistance of the Biak Livestock Service.

The number types of livestock kept by farmers in Biak consists of ruminants, non-ruminants, and poultry. The following table presents the types of livestock. The dominant types of livestock kept by breeders are native chicken (poultry) (Sujionohadi and Setiawan, 2016; Ustomo, 2015) followed by goats, entog, and a small number of beef cattle businesses (Murtidjo, 2012), pigs, and ducks (Murtidjo, 2009 ; Bharoto, 2001). Free-range chicken (free-range chicken) is still the prima donna for the population in Biak and the same goes for breeders throughout Indonesia (Sarwono 2000). By only keeping a few tails, the need for eggs and meat for a family-scale has been fulfilled.

As part of the implementation of the arrival of domesticated animals by the local government, it is necessary to pay attention to aspects of welfare and health needs. Poultry such as native chickens, ducks, and squid are also kept by farmers in an intensive, semi-intensive, and slinging manner (Yuwanta, 2008; Homer et al., 2017). The existence of lumbar cultivation is because the breeders themselves have not been able to provide cages for their livestock. The livestock that is displayed and the lack of supervision by the farmers is a *trigger* for the emergence of social problems such as theft of livestock and the destruction of farmers' gardens. Thus, actually by making cages for livestock, the economic benefits that can be obtained will be more optimal, such as the sale of organic fertilizers and the availability of biogas raw materials (Wahyuni, 2015) as household energy reserves.

Distribution of Livestock Population Structure

The population of Biak's ruminants, non-ruminants, and poultry is still dominated by poultry commodities which include native chickens (non-breed chickens), ducks, and mutton. Next followed by goats, beef cattle, and pigs.

Table 3. Cattle population structure in Biak Numfor (tail/ST).

District	Cattle							Total
	Sum	Structure Population (head)			Structure Population (AU)			
	(head)	Young	Growers	Parents	Young	Growers	Parents	
Numfor Barat	5	0.85	1.33	2.82	0.21	0.80	2.82	3.83
Orkeri	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Numfor Timur	7	1.19	1.87	3.94	0.30	1.12	3.94	5.36
Bruyadori	7	1.19	1.87	3.94	0.30	1.12	3.94	5.36
Poiru	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Padaido	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aimando Padaido	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biak Timur	137	23.28	36.55	77.17	5.82	21.93	77.17	104.92
Oridek	21	3.57	5.60	11.83	0.89	3.36	11.83	16.08
Biak Kota	162	27.52	43.22	91.25	6.88	25.93	91	124.07
Samofa	173	29.39	46.16	97.45	7.35	27.69	97	132.49
Yendidori	624	106.02	166.48	351.50	26.50	99.89	351	477.89
Biak Utara	741	125.90	197.70	417.41	31.47	118.62	417	567.50
Andey	78	13.25	20.81	43.94	3.31	12.49	44	59.74
Warsa	31	5.27	8.27	17.46	1.32	4.96	17	23.74
Yawosi	43	7.31	11.47	24.22	1.83	6.88	24	32.93
Bondifuar	21	3.57	5.60	11.83	0.89	3.36	12	16.08
Biak barat	159	27.01	42.42	89.56	6.75	25.45	90	121.77
Swandiwe	27	4.59	7.20	15.21	1.15	4.32	15	20.68
Sum	2236	379.90	596.56	1259.54	94.97	357.94	1259.54	1712.45

The composition of the cattle population structure in Biak is dominated by adult cattle, followed by young cattle and children. From this composition, it can be seen that the age pyramid of cattle is less healthy because the population of calves is less than that of young and adult cattle. From the demographic composition of the livestock population above, it can be conveyed that livestock in the population of children and young livestock for all commodities have not shown a good composition for the sustainability of the maintenance business. It is suspected that the low composition of the calf population is thought to be due to accidental deaths, as well as the release of livestock breeds in other areas due to the buying or selling of livestock between regions from outside the Biak district.

Table 4. Population and population structure of goats in Biak Numfor (tail/ST)

District	Sum (Head)	Goat						Total (AU)
		Structure Population (head)			Structure Population (AU)			
		Young	Grower	Parent	Young	Grower	Parent	
Numfor Barat	19	2.07	2.70	14.22	0.08	0.22	2.28	2.57
Orkeri	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Numfor Timur	11	1.20	1.57	8.23	0.05	0.13	1.32	1.49
Bruyadori	18	1.97	2.56	13.47	0.08	0.20	2.16	2.44
Poiru	29	3.17	4.13	21.71	0.13	0.33	3.47	3.93
Padaido	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aimando Padaido	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biak Timur	135	14.74	19.21	101.05	0.59	1.54	16.17	18.29
Oridek	23	2.51	3.27	17.22	0.10	0.26	2.75	3.12
Biak Kota	609	66.50	86.66	455.84	2.66	6.93	72.93	82.53
Samofa	631	68.91	89.79	472.30	2.76	7.18	75.57	85.51
Yendidori	578	63.12	82.25	432.63	2.52	6.58	69.22	78.33
Biak Utara	609	66.50	86.66	455.84	2.66	6.93	72.93	82.53
Andey	69	7.53	9.82	51.65	0.30	0.79	8.26	9.35
Warsa	131	14.31	18.64	98.05	0.57	1.49	15.69	17.75
Yawosi	32	3.49	4.55	23.95	0.14	0.36	3.83	4.34
Bondifuar	53	5.79	7.54	39.67	0.23	0.60	6.35	7.18
Biak barat	121	13.21	17.22	90.57	0.53	1.38	14.49	16.40
Swandiwe	31	3.39	4.41	23.20	0.14	0.35	3.71	4.20
Sum	3099	338.41	440.99	2319.60	13.54	35.28	371.14	419.95

The composition of goat livestock is also dominated by adult livestock, followed by young livestock and children. From the demographic composition of the livestock population above, it can be conveyed that livestock in the population of children and young livestock for all commodities have not shown a good composition for the sustainability of the maintenance business. The alleged low population composition of the young goats is thought to be caused by accidental death cases, a high number of majir broods, rejected brooders, and also the release of livestock breeds in other areas due to the purchase or sale of livestock between regions from outside Biak Regency.

The composition of pigs also shows the same value, where the age of adult cattle dominates the composition of age in tail and livestock units.

Table 5. Pig population and population structure in Biak Numfor (head/AU)

District	Sum (head)	Pigs						Total (AU)
		Structure Population (head)			Structure Population (AU)			
		Young	Grower	Parent	Young	Grower	Parent	
Numfor Barat	725	79.17	103.17	542.66	3.17	8.25	86.83	98.25
Orkeri	471	51.43	67.02	352.54	2.06	5.36	56.41	63.83
Numfor Timur	912	99.59	129.78	682.63	3.98	10.38	109.22	123.59
Bruyadori	615	67.16	87.51	460.33	2.69	7.00	73.65	83.34
Poiru	661	72.18	94.06	494.76	2.89	7.52	79.16	89.57
Padaido	365	39.86	51.94	273.20	1.59	4.16	43.71	49.46
Aimando Padaido	365	39.86	51.94	273.20	1.59	4.16	43.71	49.46
Biak Timur	881	96.21	125.37	659.43	3.85	10.03	105.51	119.39
Oridek	346	37.78	49.24	258.98	1.51	3.94	41.44	46.89
Biak Kota	3181	347.37	452.66	2380.98	13.89	36.21	380.96	431.06
Samofa	4147	452.85	590.12	3104.03	18.11	47.21	496.64	561.97
Yendidori	753	82.23	107.15	563.62	3.29	8.57	90.18	102.04
Biak Utara	617	67.38	87.80	461.82	2.70	7.02	73.89	83.61
Andey	405	44.23	57.63	303.14	1.77	4.61	48.50	54.88
Warsa	335	36.58	47.67	250.75	1.46	3.81	40.12	45.40
Yawosi	263	28.72	37.42	196.86	1.15	2.99	31.50	35.64
Bondifuar	242	26.43	34.44	181.14	1.06	2.75	28.98	32.79
Biak barat	571	62.35	81.25	427.39	2.49	6.50	68.38	77.38
Swandiwe	559	61.04	79.55	418.41	2.44	6.36	66.95	75.75
Total	16414	1792.41	2335.71	12285.88	71.70	186.86	1965.74	2224.29

The composition of pigs is also dominated by adult livestock, followed by young livestock and children. From the demographic composition of the livestock population above, it can be conveyed that livestock in the population of children and young livestock for all commodities have not shown a good composition for the sustainability of the maintenance business. The alleged low population composition of piglets is also caused by accidental deaths, high numbers of majir broods, rejected brooders and also the release of livestock breeds in other areas due to the purchase or sale of livestock between regions from outside Biak Regency.

Livestock

Density The highest economic density of goats is in the district of Biak city, followed by Samofa and Yendidori, and North Biak. The lowest density is in Bondifuar district (1.77). The highest pig density was in Kota Biak and Samofa, followed by Yendidori and East Biak. The lowest economic density is in the Bondifuar district. For cattle, the highest density is also in the Biak Kota district, followed by Yendidori and North Biak. The lowest economic density for this commodity is Bondifuar (3.96). Several districts were allegedly not densely packed, namely Poiru, Padaido, and Aimando Padaido (0.00). The density of livestock farming in Biak Numfor for goat commodities was found to have an average of 15 heads. Meanwhile, the highest district value of farming density on goat livestock commodity is Yendidori district and the lowest is East Numfor district.

Table 6. Livestock density in Biak Numfor district.

Parameters	Economic abundance				Agribusiness abundance				Regional abundance			
District	Population (head)	Goat	Pigs	Cattle	Land (Ha)	Goat	Pigs	Cattle	Width areas (km ^{2})	Goat	Pigs	cattle
Numfor Barat	2704	6.96	265.66	10.35	414.00	1.07	40.67	1.59	90.83	0.03	1.08	0.04
Orkeri	1915	0.00	122.23	0.00	284.00	0.00	18.13	0.00	62.42	0.00	1.02	0.00
Numfor Timur	1370	2.04	169.31	7.34	226.00	0.34	27.93	1.21	49.54	0.03	2.49	0.11
Bruyadori	2024	4.94	168.68	10.85	464.00	1.13	38.67	2.49	101.73	0.02	0.82	0.05
Poiru	1964	7.72	175.92	0.00	364.00	1.43	32.60	0.00	79.93	0.05	1.12	0.00
Padaido	1880	0.00	92.99	0.00	140.00	0.00	6.92	0.00	30.72	0.00	1.61	0.00
Aimando Padaido	2336	0.00	115.54	0.00	232.00	0.00	11.48	0.00	50.86	0.00	0.97	0.00
Biak Timur	7182	131.39	857.43	753.55	572.00	10.46	68.29	60.02	125.51	0.15	0.95	0.84
Oridek	5056	15.76	237.06	81.32	828.00	2.58	38.82	13.32	181.66	0.02	0.26	0.09
Biak Kota	44624	3682.68	19235.79	5536.43	196.00	16.18	84.49	24.32	42.94	1.92	10.04	2.89
Samofa	29610	2531.89	16639.88	3923.12	1050.00	89.78	590.07	139.12	230.54	0.37	2.44	0.57
Yendidori	8414	659.03	858.57	4021.00	1254.00	98.22	127.96	599.28	275.13	0.28	0.37	1.74
Biak Utara	8018	661.70	670.39	4550.20	196.00	16.18	16.39	111.23	277.77	0.30	0.30	2.04
Andey	2512	23.49	137.86	150.06	1231.00	11.51	67.56	73.54	270.17	0.03	0.20	0.22
Warsa	5236	92.95	237.70	124.31	312	5.54	14.16	7.41	68.37	0.26	0.66	0.35
Yawosi	2305	10.00	82.15	75.91	181	0.78	6.45	5.96	39.63	0.11	0.90	0.83
Bondifuar	246	1.77	8.07	3.96	588	4.22	19.28	9.46	129.14	0.06	0.25	0.12
Biak barat	6372	104.48	493.05	775.92	1150	18.86	88.98	140.04	252.34	0.06	0.31	0.48
Swandiwe	4696	19.73	355.73	97.10	1106	4.65	83.78	22.87	242.76	0.02	0.31	0.09
Total	138464	7956.52	40924.00	20121.43	10788.00	282.92	1382.64	1211.83	2601.99	3.71	26.12	10.46
Average	7288	419	2154	1059	568	15	73	64	137	0	1	1

The average density of pig farming is 73 heads. The highest value of this farming density is in Samofa district (590.07) and the lowest is Yawosi district (6.45). However, pig farming in Biak Numfor still shows good performance to be developed. Meanwhile, for cattle, the average is 64 heads. The highest density is in the Yendidori district and the lowest is in the East Numfor district.

For regional density, the density of goats is still relatively low, less than 2 heads per square km, namely in the Biak Kota district (1.92 heads/km2). The density of pigs in Biak is the highest in the Biak district of the city, which is 10 heads/km^2. Meanwhile, for cattle, the density of the area is in the Biak Kota district, which is 2 heads/km^2. This can be indicated that the central areas or those which are the basis for agriculture and animal husbandry have not optimally become the *leading sector* for livestock development in Biak district.

Composition of Dry Matter Production

Agricultural and plantation crops and their crop residues can be used as a cheap and available source of feed throughout the year. In Indonesia, garden produce is an asset that is very helpful or helps small farmers, especially in villages that have paddy fields or plantations.

Table 7. Dry matter production of agricultural crops in Biak Numfor.

District	Dried matter (Ton)							Sum
	Rice	Corn	Cassava	Potatoes	Peanut	Soya Beans	Mung Beans	
Numfor Barat	0	24	20.76	44.37	0	0	54.5	143.63
Orkeri	0	0	36.33	78.88	0	0	54.5	169.71
Numfor Timur	0	24	19.03	44.37	0	0	10.9	98.3
Bruyadori	0	12	34.6	69.02	0	0	109	224.62
Poiru	0	0	32.87	64.09	0	0	21.8	118.76
Padaido	0	0	0	0	0	0	0	0
Aimando Padaido	0	0	0	0	0	0	0	0
Biak Timur	0	42	19.03	98.6	0	0	0	159.63
Oridek	0	48	12.11	44.37	9.88	16.74	10.9	142
Biak Kota	0	18	22.49	118.32	0	0	0	158.81
Samofa	0	72	51.9	162.69	0	0	0	286.59
Yendidori	0	72	46.71	167.62	14.82	0	0	301.15
Biak Utara	0	114	8.65	138.04	0	0	32.7	293.39
Andey	0	18	17.3	44.37	0	5.58	0	85.25
Warsa	0	36	17.3	64.09	0	0	0	117.39
Yawosi	0	48	27.68	54.23	0	0	0	129.91
Bondifuar	0	66	20.76	83.81	0	0	0	170.57
Biak barat	0	48	20.76	147.9	0	5.58	0	222.24
Swandiwe	0	54	15.57	64.09	0	0	0	133.66
Total	0	696	423.85	1488.86	24.7	27.9	294.3	2955.61
Proportion (%)	0	23.55	14.34	50.37	0.84	0.94	9.96	

Land carrying capacity

A Garden is a resource that provides agricultural products and crop residues.are known as *crop residues* (Devendra and Sevilla, 2002; Vithanage et al., 2013; Devendra 2004; Tanner et al., 2001; Eliakunda et al., 2015; Sraïri and Kiade, 2005; Devendra, 2007; Ocaido et al., 2009; Tolera and Abebe, 2007; Yuwono and Sodiq, 2006; Ginting, 2019; Rahardjo, 2013).

Table 8. Bearing capacity of agricultural crop straw in Biak Numfor Regency.

District	Land carrying capacity							Total
	Rice	Corn	Cassava	Potatoes	Peanut	Soya	Mung	
Numfor Barat	0.00	10.53	9.11	19.46	0.00	0.00	23.90	63.00
Orkeri	0.00	0.00	15.93	34.60	0.00	0.00	23.90	74.43
Numfor Timur	0.00	10.53	8.35	19.46	0.00	0.00	4.78	43.11
Bruyadori	0.00	5.26	15.18	30.27	0.00	0.00	47.81	98.52
Poiru	0.00	0.00	14.42	28.11	0.00	0.00	9.56	52.09
Padaido	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aimando Padaido	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biak Timur	0.00	18.42	8.35	43.25	0.00	0.00	0.00	70.01
Oridek	0.00	21.05	5.31	19.46	4.33	7.34	4.78	62.28
Biak Kota	0.00	7.89	9.86	51.89	0.00	0.00	0.00	69.65
Samofa	0.00	31.58	22.76	71.36	0.00	0.00	0.00	125.70
Yendidori	0.00	31.58	20.49	73.52	6.50	0.00	0.00	132.08
Biak Utara	0.00	50.00	3.79	60.54	0.00	0.00	14.34	128.68
Andey	0.00	7.89	7.59	19.46	0.00	2.45	0.00	37.39
Warsa	0.00	15.79	7.59	28.11	0.00	0.00	0.00	51.49
Yawosi	0.00	21.05	12.14	23.79	0.00	0.00	0.00	56.98
Bondifuar	0.00	28.95	9.11	36.76	0.00	0.00	0.00	74.81
Biak barat	0.00	21.05	9.11	64.87	0.00	2.45	0.00	97.47
Swandiwe	0.00	23.68	6.83	28.11	0.00	0.00	0.00	58.62
Total	0.00	305.26	185.90	653.01	10.83	12.24	129.08	1296.32

Umbaran land plants are available resources on overhangs/road bodies or vacant lands (sleeping land) in an area. Freely available around the clock and free (no cost, *zero cost*). If only planted or managed by certain farmers or communities, these resources have a price. Farmers can usually buy by contracting land and fodder crops for a certain period of time. In addition to the types and sources of feed above, there is currently a trend of natural animal feed sources (Prasetio, 2018). Sources of natural animal feed can be in the form of fermented feed

(Kaleka, 2019), the cultivation of insects, caterpillars, and moths. The current natural feed cultivation business has very promising economic prospects.

Table 9. Carrying capacity and capacity to increase livestock population in Biak Numfor Regency.

District	Carrying capacity (AU)	Livestock Population (ST)	KPPTR	%
Numfor Barat	63.00	3.83	59.17	-14.22
Orkeri	74.43	0.00	74.43	-17.89
Numfor Timur	43.11	5.36	37.75	-9.07
Bruyadori	98.52	5.36	93.16	-22.39
Poiru	52.09	0.00	52.09	-12.52
Padaido	0.00	0.00	0.00	0.00
Aimando Padaido	0.00	0.00	0.00	0.00
Biak Timur	70.01	104.92	-34.91	8.39
Oridek	62.28	16.08	46.20	-11.10
Biak Kota	69.65	124.07	-54.42	13.08
Samofa	125.70	132.49	-6.80	1.63
Yendidori	132.08	477.89	-345.81	83.10
Biak Utara	128.68	567.50	-438.82	105.45
Andey	37.39	59.74	-22.35	5.37
Warsa	51.49	23.74	27.75	-6.67
Yawosi	56.98	32.93	24.05	-5.78
Bondifuar	74.81	16.08	58.73	-14.11
Biak barat	97.47	121.77	-24.30	5.84
Swandiwe	58.62	20.68	37.94	-9.12
Sum	1296.32	1712.45	-416.13	100.00

Suitability of Livestock The Areas

Performance of the Location Quotient (LQ) value in Biak Numfor district for ruminants, the LQ value is in the range of 0.000-0.331 in cattle and is found in North Biak district. The LQ of goats is in the range of 0.000-0.204 and is in the Samofa district. Ruminants are also still in non-basic status with LQ<1. Meanwhile, non-ruminant livestock, namely pigs, were still in the range of 0.015-0.253 and the highest was in the Samofa district. The status of the pig livestock commodity can also be said to be still non-basic.

Table 10. LQ values for livestock commodities in Biak Numfor district.

District	**LQ**							
	Cattle	**Goat**	**Pigs**	**Chicken**	**Laying hens**	**Broilers**	**Alabio duck**	**Entog**
Numfor Barat	0.002	0.006	0.044	0.042	0.000	0.000	0.000	0.000
Orkeri	0.000	0.000	0.029	0.036	0.000	0.000	0.000	0.000
Numfor Timur	0.003	0.004	0.056	0.043	0.000	0.000	0.000	0.287
Bruyadori	0.003	0.006	0.037	0.020	0.000	0.000	0.000	0.000
Poiru	0.000	0.009	0.040	0.032	0.000	0.000	0.000	0.000
Padaido	0.000	0.000	0.022	0.023	0.000	0.000	0.000	0.000
Aimando Padaido	0.000	0.000	0.022	0.025	0.000	0.000	0.000	0.000
Biak Timur	0.061	0.044	0.054	0.118	0.000	0.000	0.000	0.000
Oridek	0.009	0.007	0.021	0.022	0.000	0.000	0.000	0.000
Biak Kota	0.072	0.197	0.194	0.073	0.128	0.170	0.452	0.473
Samofa	0.077	0.204	0.253	0.063	0.329	0.158	0.471	0.240
Yendidori	0.279	0.187	0.046	0.134	0.516	0.672	0.028	0.000
Biak Utara	0.331	0.197	0.038	0.179	0.027	0.000	0.000	0.000
Andey	0.035	0.022	0.025	0.025	0.000	0.000	0.004	0.000
Warsa	0.014	0.042	0.020	0.022	0.000	0.000	0.020	0.000
Yawosi	0.019	0.010	0.016	0.021	0.000	0.000	0.008	0.000
Bondifuar	0.009	0.017	0.015	0.019	0.000	0.000	0.000	0.000
Biak barat	0.071	0.039	0.035	0.080	0.000	0.000	0.016	0.000
Swandiwe	0.012	0.010	0.034	0.023	0.000	0.000	0.000	0.000

For poultry (village chickens, layer chickens, broilers and ducks), native chickens are in the LQ range of 0.019-0.179 and the highest is in North Biak district. Laying hens are also in the range of LQ 0.000-0.516 and the highest is in the Yendidori district. Meanwhile, broilers are in the LQ range of 0.000-0.672 and the highest is in the Yendidori district. For ducks, the LQ value is in the range of 0.000-0.471 and the highest is in the Samofa district. In manila ducks, the LQ value is in the district of 0.000-0.473 and the highest is in the district of Biak city. From this data and information, it can be indicated that poultry is still not a non-basic commodity (LQ<1). For this reason, quick tips and breakthroughs are needed in improving the performance of the livestock sector in general in the Biak Numfor district.

The LQ analysis of food crops from agriculture and plantations is presented in Table 12. Rice in Biak has not yet become a basic commodity (LQ<1). Corn is the basic commodity in almost all districts with an LQ range of 0-17.38 and the highest LQ value is in the North Biak district. Cassava cultivation was in the 0-12.24 range, the highest in Samofa. Sweet potato plants have an LQ range of 0-11.26, the highest is in Yendidori, while peanuts are in the LQ range of 0-60, the highest is in Yendidori, soybeans with the highest LQ range of 0-60 are in Oridek, and green beans are 0-18.52 in West Numfor. and Orchery. Thus, the current LQ indicator shows that food crop agricultural activities still have open opportunities for further improvement.

Table 11. LQ of food crop commodities in Biak Numfor Regency.

District	LQ						
	Rice	Corn	Cassava	Potatoes	Peanut	Soya	Mung beans
Numfor Barat	0	3.45	4.90	2.98	0	0	18.52
Orkeri	0	0	8.57	5.30	0	0	18.52
Numfor Timur	0	3.45	4.49	2.98	0	0	3.70
Bruyadori	0	0	0	0	0	0	0
Poiru	0	0	7.76	4.30	0	0	7.41
Padaido	0	0	0	0	0	0	0
Aimando Padaido	0	0	0	0	0	0	0
Biak Timur	0	6.03	4.49	6.62	0	0	0
Oridek	0	6.90	2.86	2.98	40	60	3.70
Biak Kota	0	2.59	5.31	7.95	0	0	0
Samofa	0	10.34	12.24	10.93	0	0	0
Yendidori	0	10.34	11.02	11.26	60	0	0
Biak Utara	0	16.38	2.04	9.27	0	0	11.11
Andey	0	2.59	4.08	2.98	0	20	0
Warsa	0	5.17	4.08	4.30	0	0	0
Yawosi	0	6.90	6.53	3.64	0	0	0
Bondifuar	0	9.48	4.90	5.63	0	0	0
Biak barat	0	6.90	4.90	9.93	0	20	0
Swandiwe	0	7.76	3.67	4.30	0	0	0

The provision of animal feed is adjusted to the source of feed obtained by the population that is cheap, available and affordable. Gardens are land resources that provide agricultural products and crop residues are known as *crop residues* (Devendra and Sevilla, 2002; Vithanage et al., 2013; Devendra 2004; Tanner et al., 2001; Eliakunda et al., 2015; Sraïri and Kiade, 2005; Devendra, 2007; Ocaido et al., 2009; Tolera and Abebe, 2007; Yuwono and Sodiq, 2006; Ginting, 2019; Rahardjo, 2013) is a source of forage for animal feed other than field grass, cut grass, legumes and the rest of the harvest from rice fields and moor. Agricultural and plantation crops and their by-products are used as sources of cheap and available feed throughout the year. In Indonesia, garden produce is an asset that helps smallholder farmers, especially in villages that have paddy fields or plantations. Umbaran land plants are available resources on overhangs/road bodies or vacant lands (sleeping land) in an area. Freely available around the clock and free (no cost, *zero cost*). If only planted or managed by certain farmers or communities, these resources have a price. Farmers can usually buy by contracting land and fodder crops for a certain period of time. Commercial feed sources are feed resources that are not available for free by farmers (Pedersen, 2017; Montsho and Moreki, 2012; Mbaso and Kamwana, 2013). These feed resources are available at stores or outlets for livestock and agricultural infrastructure. The current price of feed in Indonesia is quite expensive so only large-scale farmers can afford it.

In addition to the types and sources of feed above, there is currently a trend of natural animal feed sources (Prasetio, 2018). Sources of natural animal feed can be in the form of fermented feed (Kaleka, 2019), the cultivation of insects, caterpillars, and moths. The current natural feed cultivation business has very promising economic prospects. Efforts to utilize natural animal feed waste need technological breakthroughs (Kaluku, 2019). Several approaches to improve the quality of agricultural and plantation waste as animal feed have been developed, including through pre treatment of agricultural waste, feed supplementation, and selection of agricultural and plantation waste.

CONCLUSION

It can be concluded that the portrait of livestock production in terms of population structure (tail/ST) is not optimal. Another indication is the density of livestock economically, farming and territory which is still not evenly distributed in almost all districts. Livestock density still follows ethnic preferences in raising livestock. Livestock growth in the area, the base livestock area has not been optimally driven. Some of the areas that become base farms are Yendidori, Samofa, North Biak, West Biak and East Biak. The KPPTR value is also still low. The carrying capacity of animal feed originating from food production is also still low and needs to be accelerated. Another aspect is the suitability value (LQ) for the development of agricultural commodities for food crops and livestock, which are still domains > 1. Thus, the availability of animal feed production from food crops per unit area needs to be intensified. The implication of the results of this study is that the area or district that is the center of the basis for livestock development needs to be *driven by livestock commodities based.* This is important because several areas in Biak Numfor can become breeding centers and buffer areas for livestock distribution in several areas that have the potential to develop livestock and food crop commodities for animal feed.

Conflict Of Interest

The Authors declared that there is no conflict of interest with any party related to the materials discussed in the paper.

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