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The Potential Of Rice Straw As A Source Of Feed Ingredients For Beef Cattle In East Kalimantan

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ABSTRACT: The optimation of sustainably of local feed resource is a strategy to use rice straw as a beef cattle feed. This research was carried out in two steps: 1) potency of rice straw in North Penajam Paser, Kutai Kartanegara, Berau Regency. The research method used analitic survey with observation technique. The locations determined based on purposive sampling to the wide of rice straw harvested area. Populations of beef cattle as a based of determined carrying capacity to rice straw availability and, 2) rice straw potency can be known through labolatorium experiment with proximat analysis. The results showed that the average of rice straw productions in last five years ±16.584; ±13.239; ±13.767; ±24.347; and ±21.974 tons. Average populations rached 2.21 AU; 2.34 AU; 2.34 AU; 2.43 AU, and 2.51 AU. Average needs of beef cattle feed 17.327 tons/year; 18.580 tons/year; 18.521 tons/year; 19.948 tons/year and 19.963 tons/year. Average of each carrying capacity 1.97 AU/year; 1.57 AU/year; 1.63 AU/year; 2.82 AU/year; and 2.51 AU/year. The results proved that rice straw quantity and quality potentially to fulfill needs of beef cattle feed in North Penajam Paser, Kutai Kartanegara, and Berau Regency.

Key words: Nutrition, rice straw, beef cattle, animal unit , carrying capacity;

ABSTRAK

Optimasi sumberdaya pakan lokal secara berkelanjutan adalah strategi pemanfaatan jerami padi sebagai pakan sapi potong. Penelitian dilaksanakan dua tahap: 1) potensi jerami padi di Kabupaten Penajam Paser Utara, Kutai Kartanegara, dan Berau. Metode penelitian menggunakan survei analitik dengan teknik observasi. Lokasi ditentukan berdasarkan *purposive sampling* untuk luasan panen padi sawah, populasi sapi potong sebagai dasar penentuan kapasitas tampung terhadap ketersediaan jerami padi; dan 2) potensi nutrisi jerami padi diketahui melalui uji laboratorium dengan penelusuran bahan kering (BK), serta analisis proksimat. Hasil penelitian menunjukkan rata-rata produksi jerami padi lima tahun terakhir ±16,584; ±13,239; ±13,767; ±24,347; dan ±21,974 ton. Rata-rata populasi mencapai 2,21 ST; 2,34 ST; 2,34 ST; 2,43 ST, dan 2,51 ST. Rata-rata kebutuhan pakan sapi potong 17,327 ton/th; 18,580 ton/th; 18,521 ton/th; 19,948 ton/th dan 19,963 ton/th. Rata-rata kapasitas tampung masing-masing 1,97 ST/th; 1,57 ST/th; 1,63 ST/th; 2,82 ST/th; dan 2,51 ST/th. Hasil penelitian membuktikan jerami padi secara kuantitas dan kualitas berpotensi memenuhi kebutuhan pakan sapi potong di Kabupaten Penajam Paser Utara, Kutai Kartanegara, serta Berau.

Kata kunci: Nurisi, jerami padi, sapi potong, satuan ternak, daya dukung;

1. INTRODUCTION

Beef cattle-crop integration system is a mutual process developed by beef cattle and crop that can improve the fertility of soil and plants in turn it able to increases the availability of forage along the year and increase the production and productivity of cattle accordingly. The utilization of rice straw suited to a certain location is one effort to provide feed for beef cattle through optimum integration or diversification pattern (Sarnklong et al.,2010; Mayulu et al., 2010; Sunarso et al., 2011; Mahesh and Mohini, 2014). A sustainable cattle-crops integrated system in a big scale supported by optimum utilization of rice straw with low cost and zero waste is known as low external input sustainable agriculture (LEISA). This integration concept are widely implemented in plantation area by utilizing local biomass feed source which is considered as an intervention in agriculture based on environmental concept (Hobbs et al., 2008; Fischer et al., 2010; Rundengan, 2014; Rohaeni and Hartono, 2014).

The potency of rice straw as feedstuffs is to deal with the scarcity of forage which commonly faced by livestock farmers during dry season. As seen on the field, rice farmers have habit to stack their rice straw at the rice field after harvest and burned them when it dry rice straw is one alternative that can be used to replace forage as feedstuffs source for beef cattleand provide additional income to farmers (Yansari, 2017). The potency of rice straw is indicated by the abundant availability and affordable for livestock farmers due to cheap price and relatively considered as waste during harvesting. The limitation on the utilization of rice straw is due to the nutrient contents haven't met beef cattle requirements and bulky (Mayulu and Suhardi, 2015). However, the advantages of rice straw as feedstuffs are: availability, continuity of supply, nutrient content, possibility of limiting factors such as toxin or anti nutrients material and pre-treatment (Devendra and Leng, 2011; Mayulu et al., 2013; Gunun et al., 2013).

The utilization of rice straw by ruminants is possiblybe the most efficient means of conversion of this residue to overcome (Mayulu and Suhardi, 2015). More sustainable rice straw management methods are urgently needed to maximize adding value to the rice straw (Gummert et al., 2020). This situation indicated that the potency of rice straw is still less utilized. Rice straw has good palatability therefore the abundant amount of rice straw should be optimally used. However, some limitations also exist such as low digestibility due to high crude fiber and silica content (Sheikh et al., 2018; Thakur et al., 2020). Crude fiber plays a fundamentally important role in ruminant health, production, and welfare (Adesongan et al., 2019). Rice straw also contains high crude protein which associates with low productivity of beef cattle if the intake is uncontrolled.

The needs of beef cattle on forage can be supplied from agricultural and industrial by-product or waste which processed through certain feed processing technology (Mayulu et al, 2013). Technology inovation is needed to achieve efficiency on production cost in order to manage and improve the nutrient content of potential feedstuffs (Mayulu and Suhardi, 2015). New technology innovation provides wide range alternatives of feedstuffs which does not interfere human or animal needs such as by utilizing agriculture and plantation by-products (Mayulu, 2008; Lisson et al., 2010; Lumy et al., 2013; Syamsu et al., 2014). The wet paddy field harvest area in North Penajam Paser, Kutai Kartanegara, Berau 2018-2019 reached up to 13.138.93 ha; 30.801 ha; and12. 595.4 ha (BPS Kutai Kartanegara, 2018; BPS North Penajam Paser, 2020; BPS Berau, 2020). Large harvest area from those regions represents the potential production of rice straw that can be utilized as feed for beef cattle. The objective of it's research was to investigate the nutrient content of rice straw, evaluate the nutrient and carrying capacity of rice straw as feed for beef cattle.

2. MATERIAL AND METHOD

This research was carried out in two steps: 1) potency of rice straw in North Penajam Paser, Kutai Kartanegara, Berau Regency. The research method used analitic survey with observation technique. Populations of beef cattle as a based of determined carrying capacity to rice straw availability and; 2) rice straw potency can be known through labolatorium experiment with proximat analysis. The research locations were decided based on purposive sampling technique. The locations were three regencies with five districts at each regencies which selected based on wet paddy field harvest area and still carrying out rice production activities. The survey locations were North Penajam Paser Regency (Sepaku, Penajam, Waru and Babulu District); Kutai Kartanegara Regency (Tenggarong, Tenggarong Seberang, Sebulu and Muara Kaman District); and Kabupaten Berau (Sembaliung, Teluk Bayur, Gunung Tabur and Tabalar District).

Data collection related with beef cattle population was carried out together with survey activity. This population figure were used to calculate rice straw potency and carrying capacity of rice straw to provide dry matter forage for beef cattle. As the first procedure in laboratory experiment, rice straw was chopped, dried and milled. At this experiment, drying was carried out in shadow place free from direct sunlight. To determine dry matter weight, rice straw samples were put into oven at 105^{o}C for three or four hours until reached constant weight (Karimi et al., 2006; Eun et al., 2006). The next stage was to carry out proximate analysis.

3. RESULT AND DISCUSSION

General Condition of Research Locations

North Penajam Paser Regency has flat topography and locates at 0-150 m above sea level with a slope level of 15-40% in western side and 0-15% in eastern side. North PenajamPaser Regency lies between 00^{o}48’29”-01^{o}36’37”of South Latitude and 116^{o}19’30”-116^{o}56’35” East Longitude.

North Penajam Paser Regency administration is regulated in Law No. 7 Year 2002 which covers area 3.333.06 km^2 and consists of 3.060.82 km^2 of land and 272.24 km^2 of water. North Penajam Paser Regency (Figure 1) consists of four districts i.e. Penajam, Babulu,Waru and Sepaku. Their covering area are 1.207.37 km^2, 399.45 km^2, 553.88 km^2 and 1.172.36 km^2, respectively (BPS North Penajam Paser, 2019).

This regency share boundaries with Kutai Kartanegara Regency at northern side, Balikpapan City and Makasar strait ateastern side, West Kutai and Paser Regency atsouthern part.

The average wet days in North Penajam Paser Regency is 11 days with rainfall rate reaches up to 171.15 mm. In December, rainfall rate reaches up to 300 mm; January to June and September to November ranges from 100 to 300 mm (BPS North Penajam Paser Regency, 2019).

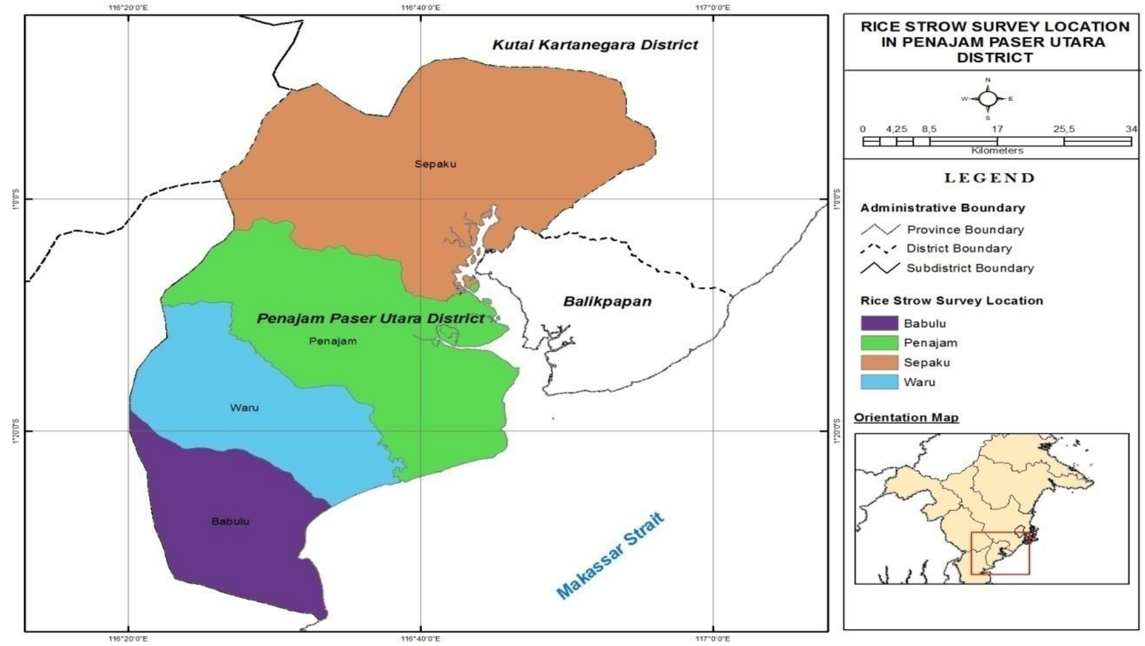

Figure 1. Map of North Penajam Paser Regency

Kutai Kartanegera Regency (Figure 2) covers land area 27.263.10 km^2 and water area $\pm$4.907 km^2. Kutai Kartanegara Regency lies between 115^{o}26'28"-117^{o}36'43" of East Longitude, 1^{o}28'21" of North Altitude and 1^{o}08'06" of South Latitude. The regency sharebordersarea with Bulungan, East Kutai and Bontang City at the eastern side; North Penajam Paser Regency and Balikpapan City at the southern part; West Kutai and Regency at the western part and Makasar Strait at the eastern part. Kutai Kartanegara Regency consists of 18 districts and 237 villages. The topography is mostly wavy and hilly with slightly and steepy slope. Flat to slight slope can be found in several parts especially coastal and Mahakam River watershed area(BPS Kutai Kartanegara, 2020).

Border area is a mountainous area with around 5000-2000 m above sea level. Kutai Kartanegara is in wet tropical climate with high rainfall rate throughout the year thus the season change is not very clear. This climate condition is highly influenced by geographical location of Kutai Kartanegara. The lowest temperature reaches up to 25^{o}C and the highest reaches up to 27^{o}C with average temperature is 26^{o}C. The annual rainfall rate is 2.000-4.000 mm/year and the number of wet days is 130-150 days/year (BPS Kutai Kartanegara, 2020).

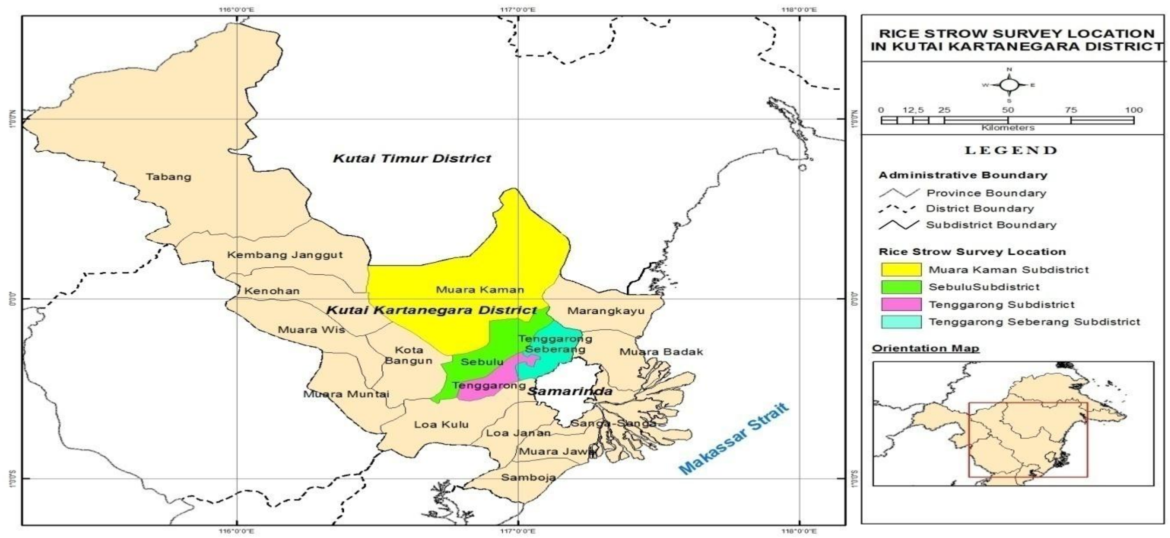

Figure 2. Map of Kutai Kartanegara Regency

Berau Regency has an area of 36.962.37km^2 and lies between 1^o-2^{o}33" of North Altitude and 166^o-119^{o}of East Longitude. The regency share borders area with Bulungan Regency at the northern part, Sulawesi Ocean at eastern part, East Kutai at the southern part, West Kutai, Kutai Kartanegara and Malinau at the western part (BPS Berau, 2020).Survey put more concern on rice straw sample collection. The main data targets were rice producer villages with 30% number of villages at each district and total sample of rice straw was 90 kg. The first procedure was to determine dry weight of the sample by drying the sample free from sunlight. The sample reached constant weight in 15 days and reducing weight from 90 kg to 30 kg due to reducing water content.

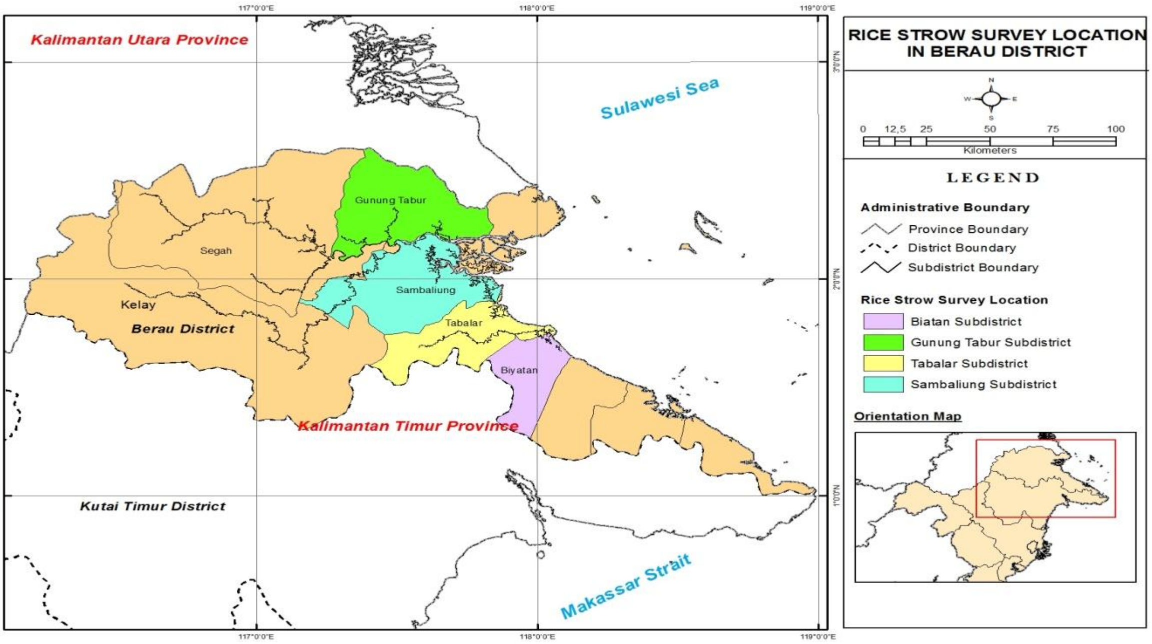

Figure 3. Map of Berau Regency

Nutrient Potency of Rice Straw

The nutrient contents of rice straw were determined by carrying out proximate analysis (AOAC, 1990). Based on proximate analysis, the rice straw samples collected from North Penajam Paser, Kutai Kartanegara and Berau Regency were potential to be used as feed for beef cattle (Table 1). Rice straw has a higher proportion of leaves at 60% compared with other cereal straw, such as barley (35%) and oats (43%) (Aquino et al., 2020).

Table 1. Rice Straw Nutrient in Three Regency

No	District	DM	EE	CP	CF	NFE	TDN[1]	TDN[2]
		------------------------%-------------------- ----						
1	North PenajamPaser	87.73	1.27	4.47	37.60	41.78	49.63	42.84
2	KutaiKartanegara	86.82	0.80	6.23	46.69	30.07	42.57	38.52
3	Berau	88.99	0.67	3.89	38.93	39.10	47.74	39.77
Remark:DM= Dry Matter; EE= Ether Extract; CP= Crude Protein; CF= Crude Fiber; NFE= Nitrogen Free Extract; TDN= Total Digestible Nutrient. [1]TDN is based on Sutardi 2001; [2]TDN is based on Hartadi, 1997.								

Based on proximate analysis, it can be seen that each samples collected from North Penajam Paser, Kutai Kartanegara and Berau contained a potential nutrient content to be used for beef cattle feed. It was considered potential as the CP contained in samples, at each survey locations were 4.47%, 6.23% and 3.89%, respectively. Balance amount between protein content and NFE indicates that the rice straw samples contain organic nutrients that is easily digested by beef cattle. Other potential source from rice straw is indicated by energy content which calculated based on TDN equation through Sutardi (2001) approach. Based on those two approaches, the energy content found in samples at each locations were 9.63; 42.57 and 47.74, respectively and 42.84; 38.52; and 39.77, respectively. The energy content which calculated based on TDN provides information on the potency of rice straw that can be used as one of ingredient material in beef cattle feed. Rice straw has a very high silica content 8 to 14%. Silica is indigestible and decreases digestibility of the feed (Hung et al.,2020), this is particularly true in the rice leaves, which contain the highest levels of silica. This high silica level combined with other mineral compounds produce an average ash content of 17% (Drake et al., 2001).

The disadvantage of rice straw is high content of crude fiber which higher than the threshold 18%. Crude fiber plays a fundamentally important role in ruminant health, production, welfare (Adesoganet al., 2019), and specialy energy source. Rice straw is considered a lignocellulosic that contains 38% cellulose, 25% hemicellulose, and 12% lignin. The high silica and lignin contents of straw also contribute to low nutrient (dry matter and protein) digestibility (<50%) (Aquino et al.,2020). Crude fiber content found in rice straw samples at North Penajam Paser, Kutai Kartanegara and Berau were37.60%; 46.69%; and 38.93%, respectively. High content of CF indicates high fraction of carbohydrate structure. Crude fiber content in rice straw can be digested by beef cattle but needs other component such as energy during metabolism process. Rice straw contains higher quantities of potassium (1.58%), calcium (0.53%), magnesium (0.24%), phosphorus (0.12%), sodium (0.13%), iron (0.07%), and manganese (0.07%) (Aquino et al., 2020).

Survey on rice harvested area was taken place in Sepaku, Penajam, Waru, Babulu, Tenggarong, Tenggarong Seberang, Muara Kaman, Sembaliung, Teluk Bayur, Gunung Tabur, and Tabalar. It was found that this area had potency to produce rice straw as by-product to be used for beef cattle feed (Table 2). In this last five years (2015-2019), those harvested area can produce forage resource but not optimally utilized. Based on Mayulu (2008), every one hectare of wet paddy field can produce 4 tons of milled rice and 3-3.75 tons of rice straw and supports 2 to 3 animal unit (Sullivan and Diwyanto, 2007).

Table 2. Harvested Areaof Paddy* at the Research Location

No	District	Year/Ha				
		2015	2016	2017	2018	2019
1	Sepaku	2298	1293.5	1834.5	2855.8	1846
	Penajam	3632	869.9	2212.7	3140.6	2490
	Waru	1398	648.2	1031.9	1893.7	1185
	Babulu	8188	7996.1	11601.1	14766.9	12880
2	Tenggarong	3253	1935	2490	2490	2490
	Tenggarong Se berang	7874	7848	7848	29214	29214
	Sebulu	3062	4307	3235	2670	2670
	Muara Kaman	3410	3738	4057	4001	4001
3	Sembaliung	1873	2132.4	1855.9	1845.5	1664
	Teluk Bayur	666	706.5	529.7	668	653
	Gunung Tabur	4348	4030.7	4127.1	5337.2	2979.7
	Tabalar	1488	1304.5	1004	1864.4	1612.3

Total	41.490	36.810	41.827	70.747	63.685
Average	3.458	3.067	3.486	5.896	5.307

[*] Wetland Paddy and Dryland Paddy

The utilization of rice straw to feed beef cattle is still necessary as rice straw contains some advantages for beef cattle. The three main potential parameters of rice straw are: 1) huge production of rice straw (high quantity), 2) good nutrient content (good quality), and 3) sustainable, the availability is throughout the year. The average of Paddy Harvest area wide in these last five years has increased until 2018 and started to decreased in 2019 (Figure 4).

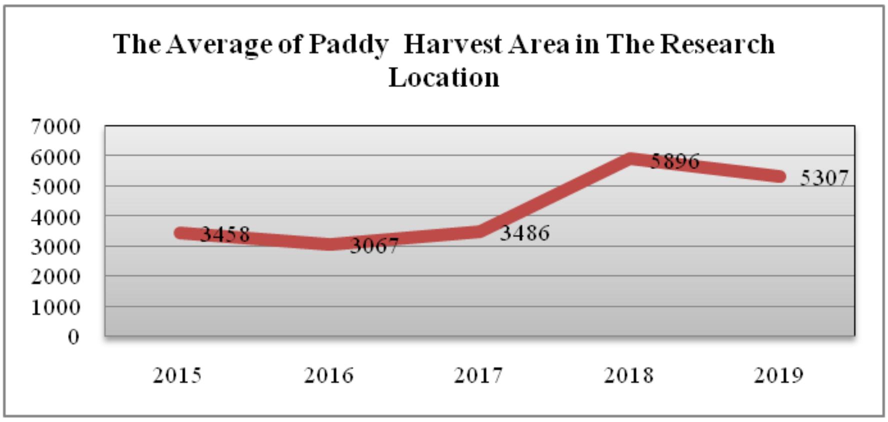

Figure4. Average of Paddy Harvest Area in The Research Location

Based on the harvested area at each location (Table 2) and assumed that rice straw production capacity is 3.5 tons/ha (Sarnklong et al., 2010), then the total production of rice straw at each location in last five years could be calculated (Table 3). According to those figures, it could be said that each survey location produced abundant resource of feedstuffs. Rice straw is potential to replace the uses of green forage and becomes one of cheap feed resource material. However, rice straw is still less utilized.

Rice straw production based on DM calculated from harvested area at each district survey location experienced fluctuation associates with the paddy yield. The production of rice straw as rice farming by-products correlates with the production or the yield of paddy grain. The average of rice straw production in this last five years was ±16.584; ±13.239; ±13.767; ± 24.347; and ± 21.974 tons. Rice straw 10 to 15 tons can support three or four animal units cattle) (Aquino et al., 2020).

Table 3. Rice Straw Production (% DM)

No	District	Tons/Year				
		2015	2016	2017	2018	2019
1	Sepaku	8.917	5.134	5.905	10.317	6.156
	Penajam	15. 655	3.452	7.122	11.346	8.304
	Waru	6.589	2.573	3.537	6.841	3.952
	Babulu	38.466	31.735	37.342	53.349	42.955
2	Tenggarong	17.798	9.504	12.653	12.653	12.653
	Tenggarong Seberang	49.423	43.615	43.615	142.936	142.936
	Sebulu	15.418	18.398	13.481	11.683	11.683
	Muara Kaman	17.540	16.059	15.847	13.176	13.176
3	Sembaliung	6.478	7.128	6.418	5.764	5.275
	TelukBayur	2.629	2.742	2.125	2.165	2.008

	GunungTabur	14.398	13.538	13.460	16.236	9.465
	Tabalar	5.693	4.995	3.698	5.697	5.119
Total		199.003	158.873	165.203	292.164	263.683
Average		16.584	13.239	13.767	24.347	21.974

Source: Primary Data Processing Result

Carrying Capacity

Feed resource is strongly correlated with carrying capacity. Calculation of carrying capacity have management dicisions and planning and help to achieve sustainable utilization of ecosystems (Wangchuk et al., 2015). Carrying capacity is defined as ability of agro-ecosystem or an area to produce feed material to maintain sustainability and supply the needs of ruminant population in a fresh or dry form and it is assumed that the utilization is to supply the needs of big ruminant (Meehan et al., 2016; Abadiet al., 2019; Meshesha et al 2019). Land carrying capacity is calculated based on land carrying threshold as an ecosystem to provide green forage or by-product in order to supply ruminant needs and expressed in the number of tails per unit area of land (Santoso and Prasetiyono, 2018; Meshesha et al 2019).

Table 4. Population of Beef Cattle Based (AU)

No	District	AU/Year				
		2015	2016	2017	2018	2019
1	Sepaku					
	Penajam					
	Waru					
	Babulu					
2	Tenggarong					
	Tenggarong Seberang					
	Sebulu					
	Muara Kaman					
3	Sembaliung					
	Teluk Bayur					
	Gunung Tabur					
	Tabalar					
Total						
Average						

Source: Primary Data Processing Result

Carrying capacity of livestock is more addressed to big ruminant such as cattle, buffalo, sheep and goat. The carrying capacity is derived from available digested green forage divided by total needs of a certain ruminant population in a certain location by considering other advantages in optimum way. Population that can sustain in a certain area depends on the availability of food to maintain their living needs and production. Beef cattle population in research location (Table 4) is the object who utilizes rice straw as their food.

Beef cattle population in 12 districts fluctuated through hout this last five years, which indicated that the availability of beef cattle was less sustain. This condition will occur every year considering that population of beef cattle in Indonesia as recorded in data base shows similar characteristic where population of male, female and calves is not segregated. The number of population is accumulated, different and changes along the year in every level. This condition creates problem on the difficulties to decide the policy on the development of beef cattle including on the provision of beef cattle feed and other policies. Based on survey, the highest population of beef cattle was in Sepaku and Penajam Regency, and other districts showed fluctuation. The average animal unit of beef cattlein these last five years were2.21 AU; 2.34 AU; 2.34 AU; 2.43 AU; and 2.51 AU at respective research locations (Table 4).

Table 5 . Population of Beef Cattle in Three Regency (AU)

No	Regency	AU/Year				
		2015	2016	2017	2018	2019
1	PenajamPaser Utara	14.300	16.318	16.888	17.062	17.191
2	KutaiKartanegara	27.508	28.969	29.466	28.604	29.463
3	Berau	13.120	14.306	14.485	14.656	15.240
Total		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: Primary Data Processing Result

The average populations of beef cattlein North Penajam Paser, Kutai Kartanegara and Berau in these last five years continues to increase i.e 18.309 AU; 19.864 AU; 20.280 AU; 20.107 AU; and 20.631 AU, respectively.According to Nutrient Research Council (NRC) in 2000, beef cattle needs dry matter supply by 4% of the total weight. However, this number assumes that the feed provides good quality of nutrient content. This number is used to calculate the needs of cattle when consumes concentrate. In this research, the feed amount was estimated by using number of 10% considering that rice straw is identic to green forage. Thus, if the rice straw produced at each location will be used to feed beef cattle with ±200 kg of weight then the DM consumption of beef cattle (Table 6).

Table 6. Beef Cattle Dry Matter Consumption Needs

No	District	Tons/Year				
		2015	2016	2017	2018	2019
1	Sepaku	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Penajam	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Waru	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Babulu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Tenggarong	[illegible]				
	Tenggarong Seberang	[illegible]	[illegible]	[illegible]	[illegible]	
	Sebulu					
	Muara Kaman	[illegible]	[illegible]	[illegible]	[illegible]	
3	Sembaliung	[illegible]	[illegible]	[illegible]	[illegible]	
	Teluk Bayur	[illegible]	[illegible]	[illegible]	[illegible]	
	Gunung Tabur	[illegible]	[illegible]	[illegible]	[illegible]	
	Tabalar					
Total		[illegible]4	[illegible]5	[illegible]8	[illegible]7	[illegible]3
Average		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Soruce: Estimation result follows NRC (2000).

Carrying capacity defines the picture of rice straw potency which is still less utilized as a feed source for beef cattle. Undesired condition shows that most of rice straw is intentionally burned at the paddy field. Based on the estimation result, the average carrying capacity at each location was 1.97AU/year; 1.57 AU/ year; 1.63 AU/ year; 2.82 AU/ year; and 2.51 AU/ year (Table 7).

Table 7. Carrying Capacity of Rice Straw

No	District	AU/Year				
		2015	2016	2017	2018	2019
1	Sepaku	1.2	0.7	0.8	1.4	0.8
	Penajam	2.1	0.5	0.9	1.5	1.1
	Waru	0.9	0.3	0.5	0.9	0.5
	Babulu	5.1	4.2	4.9	7.1	5.7
2	Tenggarong	1.9	1.0	1.3	1.3	1.3
	TenggarongSeberang	5.2	4.6	4.6	15.1	15.1
	Sebulu	1.6	1.9	1.4	1.2	1.2
	Muara Kaman	1.9	1.9	1.7	1.4	1.4
3	Sembaliung	0.9	0.9	0.8	0.8	0.7
	TelukBayur	0.3	0.4	0.3	0.3	0.3
	GunungTabur	1.9	1.8	1.8	2.1	1.3
	Tabalar	0.8	0.7	0.5	0.8	0.7
Total		23.67	18.85	19.59	33.87	30.10
Average		1.97	1.57	1.63	2.82	2.51

Source: Primary Data Processing Result

Calculation on carrying capacity of rice straw as beef cattle feed source verifies that rice straw has potency to supply DM needed by beef cattle. Higher carrying capacity resulting in more livestock product (Starsburg et al., 2014). The existing situation shows that rice straw is still less utilized as most of potential rice straw is burned after harvesting activity complete. Optimation of rice straw utilization can be done through introduction of rice straw potency to farmers with dissemination or introducing zero-waste livestock farming business model and technology application such ammoniation fermentation (amofer) and complete feed compiler materials (Mayulu et al., 2013; Mayulu and Suhardi, 2015). Local government through animal husbandry and agricultural offices are suggested to issue policies regarding with the utilization of rice straw as beef cattle feed source. The policy should be followed by the development of livestock faming business at each rice production center and put more concern on the utilization of waste to protect the environment.

4. CONCLUSION

Research result shows that the quantity and quality of rice straw are able to supply the needs of beef cattle feed in North Penajam Paser, Kutai Kartanegara, and Berau Regency. Rice straw used in this research meets the requirement of feed source for beef cattle including the quantity, quality and sustainability. The nutrient content is very good and still able to be improved.

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