The Utilization of Sago Waste as Cattle Feed

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Abstract

This study aimed was to evaluate nutrition value of sago waste and its effect on cattle performance.The collected data were analyzed using analysis of variance. The results of the study showed that of the utilization of sago waste had a positive effect on average daily gain (ADG), where with 2% sago waste of body weight (P2 treatment) gave the highest ADG 0.43 ± 0.02 kg/h/day and cattle which consumed only forage without sago waste (P0) gave the lowest ADG 0.26 ± 0.04 kg/h/day. Statistical analysis showed that the addition of sago waste significantly affected the ADG ($P<0.05$). The consumption of dry matter (DM) and crude protein (CP) also increased with the supplementation of the sago waste, where the highest consumption of DM was on the treatment P2 (5.09 ± 1.27 kg/day), and the lowest on the treatment P0 (4.25 ± 1.69 kg/day), while consumption of CP was highest at treatment P2 (0.37 ± 0.09 kg/day), and the lowest on the treatment P3 (0.34 ± 0.06 kg/day), while the feed conversionshowed the lowest level on the treatment P2 (12.01 ± 3.35) and highest on the treatment P0 (18.10 ± 7.39). However, supplementation of sago waste were not affect CP consumption ($P>0.05$), but significant affect($P<0.05$) DM consumption and feed conversion. Based on the results of this study it can be concluded that the sago waste as local resources have the potential to be used as a source of energy of feed supplement to beef cattle.

1. Introduction

Cattle productions in Papua are promising since it supported by ample land and diversity of local feed resources. Besides beef cattle has contribute both as a source of income for farmers and as a source of protein to meet the nutritional needs and educate the community. Beef cattle population in Papua Province during the last five years (2011-2015) has increased despite relatively small i.e. 5.82%/year. By the 2015 population of beef cattle was 100.542 and scattered in various counties and cities. This population has not been able to meet the demand for meat is increasing so it still must be supplied from outside Papua. Beef production in Papua on 2015 was reaching 3,068,235 kg compared to the previous year increased namely 2,711,011 kg (13.18%). However this meat production is still not meet demand for beef so that it still has to be supplied from outside. Yet to satisfy the needs of beef is possible because even though the population increased but increased beef cattle livestock has not been offset by the rate of reproduction and production of beef. In General, the system of maintenance of cattle in Papua is still traditional in nature, where only removed and feed still depends on the availability of nature certainly will affect the productivity of cattle produced. In addition breeders have not mastered the technology of feed appropriately so that the feed source of untapped optimally to support the growth of cattle. Utilization of local resources optimally is one of the strategic steps in an attempt to achieve the efficiency effort ruminant cattle production. Sago (*Metroxylon sp.*) many scattered in Eastern Indonesia, and about 90% of the area of sago in Indonesia occur in New Guinea [1]. Jayapura Regency is one of the areas that are quite widely spread plant Sago. Sago is a staple food communities who forever are still more consumed in the form of a papeda, but some are in the form of dry sago and sago cake. As the biggest sago producers in Indonesia of course waste sago is quite abundant in Papua.

Lees sago is waste that comes from the Sago flour processing, where in the process the obtained flour sago and sago dregs with 1:6, where comparisons of 1 sago can produce 220 kg flour Sago. This means that the potential of the dregs of sago generated considerable i.e. 1,320 kg/tree that consists of a mix of fiber and starch that does not extracted [2]. During this time, waste of untapped and sago are left piled up in the place of processing sago so that potentially cause environmental pollution.

In Papua, the sago waste utilization to feed cattle, pigs and beef cattle is still limited in certain location that near to site where farmers maintain to process sago flour. Ways of utilization of sago waste for cattle were took it from the place of processing and give it directly to livestock without controlling the amount of his deed and let cattle consume directly on site processing of Sago. However, according to the observations of farmers, cattle that consume it in processing site showed better performance. Nutrient content of sago waste, in this case protein low roughness ranges from 2.30 - 3.36%, yet starch dregs in sago is high i.e. 52.98% [3]. This allows the sago waste to be utilized as one of the alternative sources of energy to feed beef cattle. Several studies report that the utilization of sago waste as animal food to chickens and pigs can reduce uses of some other feed ingredients such as corn and rice bran. However it is not known yet the extent to which the grant of the waste sago is able to repair or improve the productivity of the cattle, so that needs to be examined his deed as cow feed. This study aims to find out the influence of utilization of waste of sago added body weight against the beef cattle.

2. Materials and Methods

The study was carried out in the village Kwadeware, District Waibu, Jayapura Regency is one of the area of the development of beef cattle and also the distribution of sago large enough. The study was carried out on farm research, in the land of farmers by involving farmer groups, related institutions, extension officers, and researchers began planning to implementation.

Use as many as 16 head of Bali cattle (aged 18-24 months) belong to the breeder. The equipment used is the scales, livestock scales feed, feed the elephant grass forage/field grass/corn straw, etc., sago and salt. The enclosure used is individual models equipped dining and drinking spot. The feed materials used will be analyzed proximate[4]. The study used a randomized block design (RBD) consisting of 4 treatments and each treatment was repeated 4 times. The treatments were: P0: 100% forage, P1: P0 + 1% sago waste of body weight, P2: P0 + 2% sago waste of body weight and P3: P0 + 3% sago waste of body weight. Variable observed include: feed consumption, body weight increase of cattle, and feed conversion. The data obtained were analyzed using Analysis of Variance, to see the difference between the treatments continued with the Duncan Multiple Range Test (DMRT).

3. Results and Discussion

3.1. An Overview of The Study

At the beginning of the implementation of the study all the cattle body weights were originally weighed and given a vitamin B complex and anthelmintic (Mectyson), then the cattle were randomized based on body weight to enter into treatment. Before the data retrieval, preceded with a period of preliminary for two weeks. This is intended so that cattle can adjust with the condition system maintenance (enclosure) and feed to be used, given the cattle used for these removable in the Pastorate and unfamiliar with the feed to be used (sago waste). The content of the dry matter (DM), Crude Protein (CP) and Crude Fiber (CF) feed sees on Table 1.

In terms of quantity, the sago waste enough available for use as animal feed primarily on flour producers areas sago, but in terms of quality, the sago waste has low nutritional value particularly low protein levels, although the core rate pretty high. The chemical composition of sago waste can be seen in Table 1.

Table 1. Chemical Composition of Material Feed (Sago Waste and Forage)

Material Feed	Dry Matter (%)	The levels of (% DM Basis)			
		Crude Protein	Crude Fiber	BETN	TDN
Sago waste	43,32	2,1	9,99	71,3	50,1
Forage	26,57	8,25	20,00	1,23	59,18

Source : Beef Cattle Research Station Laboratory, 2016.

The data in Table 1 show that the nutrient content of sago waste in this CP is very low, only 2.1%, so that the sago waste is used more as a feed source of energy. CP levels low cause suboptimal utilization of sago waste as animal feed. Further processing with a touch of technology is needed to improve the nutritional value of sago waste especially protein content of which through the process of fermentation. In the process of fermentation of carbohydrate availability can be used as an energy source for mold to grow. Fermentation is in principle able to enable the growth and metabolism of microorganisms that can enhance cerna and resulting aromas and flavors preferred cattle. Some research results reported, fermented sago waste can increase the content of research results at [5], retrieved content CP fermentation increased to sago waste 12.29 – 13.99%, [6] using Aspergillus niger fermentation processes in the womb at sago waste increased to 7.04%; [7] reporting the content of CP fermented after the sago waste increased to 4.3% while through the process of amoniasi increased to 4.1%. Obstetrician by-product CF sago obtained relatively low (9.9%), is lower than any other analysis results.

3.2. Feed Consumption

Observation of the feed consumption, average daily gain (ADG) and feed conversion is seen on Table 2. At the beginning of the activities, cattle fed on the sago waste not everything can directly consume the sago waste, first they just kissed sago waste given but there is also a livestock directly consume sago waste awarded. But on the second day of all animal can already consume sago waste awarded. The data in Table 2 show that the consumption of DM feed also looks likely to rise with the addition of sago waste. Total consumption of DM on the control treatment (P0) of 4.25 ± 1.69 kg/head/day; P1 of 4.86 ± 2.64 kg/head/day, P2 of 5.09 ± 1.27 kg/head/day and P3 amounted to 4.97 ± 0.91 kg/head/day. The relults of statistical analysis showed that there was an effect of treatment on feed consumption, were DM consumption between P0 there was a significant difference ($P<0.05$) with treatment of P1, P2 and P3. While between the treatment of P1,P2 and P3 are not significant. Supplementation with a visible sago waste, decline in forage consumption DM treatment P1, P2 and P3 (Table 2). This is due to the cattle have first consumes the waste sago then provided forage for animal, so that will reduce the consumption of forage.

Dry matter needs feed recommendations according to [8], in which the bull with the weight of the body of 135 kg and 180 kg with the added weight of 0.2 – 0.4 kg, consumption DM minimum range 3.5 – 4.6 kg/day, then consume the feed on this study DM already are above the recommended minimum DM needs. Compared with the results of previous research, consumption DM feed obtained in this study were lower than the results of the research [9] who reported consumption of DM Bali cattle Wallaby that consume feed basal supplements (energy sources: protein, 30:70 ratio) is 6.79 ± 0.53 kg/day. So are the results of the study [10], which reported that the consumption of a Bali cows DM consume additional forage and feed the tofu waste and liquid waste made from cassava is ranged 6.12 – 6.92 kg/day. However, the consumption of feed on the results of the study the DM is higher than the results of the research of [11] who reported consumption of a Bali cows DM consume grass fields with palm waste supplements range 2.93 – 4.35 kg/day. Likewise research results [12], where

consumption of cow feed DM Aceh cows who consume feed forage and concentrates ranging 2.72 – 4.45 kg/day.

Table2. Average of Body Weight, Final Weight, ADG, Consumption of Feed DM, CP, TDN andFeed Conversion.

Description	P0	P1	P2	P3
Avarage of initial weight (kg)	138.83	139.07	131.03	126.40
Average of final weight (kg)	162.23	173.60	169.53	163.80
ADG (kg/head/day)	0.26 ± 0.04a	0.38 ± 0.01b	0.43 ± 0.02b	0.37 ± 0.02b
Consumption of DM (kg/head/day)	4.25 ± 1.69a	4.86 ± 2.64b	5.09 ± 1.27b	4.97 ± 0.91b
- Forage	4.25	4.16	4.16	3.81
- Sago waste	-	0.70	0.93	1.16
Consumption of CP(kg/head/day)	0.35 ± 0.14a	0.36 ± 0.19a	0.37 ± 0.09a	0.34 ± 0.06a
- Forage	0.35	0.34	0.34	0.31
- Sago waste	-	0.02	0.03	0.03
Consumption of TDN(kg/head/day)	2.21 ± 0.08a	2.51 ± 1.36a	2.63 ± 0.65a	2.56 ± 0.47a
- Forage	2.21	2.16	2.16	1.98
- Sago waste	-	0.35	0.47	0.58
Feed Convertion	18.10 ± 7.39a	12.53 ± 6.28b	12.01 ± 3.35b	13.51 ± 1.93b

Description: different Superscript on the same line showed a significant difference ($P < 0.05$). P0: forage (100%); P1: (P0 + 1% sago waste of body weight); P2: (P0 + 2% sago waste of body weight) P3: (P0 + 3%sago waste of body weight)

The existence of these feed consumption difference DM allegedly caused by the feed material is consumed, the level of palatability and age or body weight cattle. Beef cattle ration consumption affected the size of the body, the environment as well as the condition of the feed and forage consumption is correlated with in vivo digestibility of dry ingredients and organic materials [13]. Further described [14] that is usually a high digestibility gives a high consumption. DM feed consumption is determined by body size, range of rations, age, and condition. The dried material consumption ration usually decreases with increasing content of feed substances that can digest.

The factors that affect the rate of consumption of feed are 1). Factors include power feed, digestibility and palatability, and 2). Factors for livestock, which includes age, nation, gender and health conditions of livestock[15]. Further [8], explained that the palatability of the feed is one of the factors that affect the amount of consumption of livestock feed and the ability to consume DM contained in feed and relates to the physical capacity of the stomach as well as the condition of the gastrointestinal tract. High low feed consumption in ruminant livestock are strongly influenced by environmental factors as well as the feed material. Fast feed rate of motion is the latest in the rumen will have an effect on consumption of feed. The limitation of the capacity of the digestive tract almost

always pressing the feed consumption, so that the incoming feed is always lower than the supposed [16]. Low feed kecernaannya will longer be in the digestive tract so that it will slow down the rate of feed in rumen and will cause a decrease in the consumption of feed.

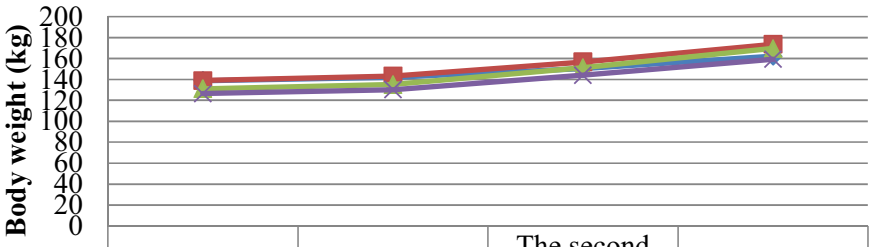
Average consumption CP on P0 treatment amounting to 0.35 ± 0.14 kg/head/day; P1 of 0.36 ± 0.19 kg/head/day, P2 of 0.37 ± 0.09 kg/head/day and P3 of 0.34 ± 0.06 kg/head/day. The results of the statistical analysis, showed the presence of sago waste supplementation as influential feed not significant effect on CP consumption (P>0.05). Nevertheless empirically the average of CP consumption on treatment of P2 (2% sago waste of body weight) is higher and the lowest at the treatment of P3 (3% sago waste of body weight). This suggests that the higher the addition of sago waste as beef cattle feed will reduce consumption caused by nutrient content of CP in this case CP sago waste low so even though the DM consumption is higher than P0 (forage treatment 100%) CP consumption is lower. When compared with the recommendations of CP[8], consumption at cattle beef 135 kg and 180 kg have to add with 0.2 – 0.4 kg consumption CP range0.34 – 0.48 kg/day, then consumption CP study on feed is in compliance with the needs of CP are recommended.

Therefore consumption of CP can be said already suffice the needs of a Bali cows is currently growing. Increased consumption of CP along with increased consumption of feed, where DM consumption increases with the presence of suplmentasi sago waste, raising also the consumption of CP are contained within the feed. However granting excessive sago waste (3% of body weight) turns out to lower the consumption of CP because the low content of waste at sago. Consumption of CP feed affected by the increase of the weight of cattle, the amount of feed consumed as well as the quality of the feed they are given [8].

AverageTDN consumption for the treatment of P0 was 2.21 ± 0.88 kg/head/day, P1 was 2.51 ± 1.36 kg/head/day, P2 was 2.63 ± 0.65 kg/head/day and P3 was 2.56 ± 0.47 kg/head/day. The results of the statistical analysis, showed that the use of sago waste showed not significant influence on the consumption of TDN (P >0.05). Empirically, there is an increase in the consumption of waste supplementation with the TDN Sago. Increased consumption of TDN in line with consumption of its DM, because the consumption of nutrients is affected by the consumption of the nutrient content of feed and DM. The increasing consumption of BK then it will result in a rise in consumption of other nutrients.

3.3. Average Daily Weight Gain (ADG)

The data in Table 2 shows that, the highest ADG average was in treatment P2 (2% added of sago waste) and the lowest was on treatment P0 (without sago waste). Although in the first month ADGbeef cattle is very low (<0.2 kg/head/day), but in the next month there is a significant increase in body weight. While the treatment of P3 (3%of sago waste) gave ADG lower than P1 (1% of sago waste) and P2 (2% of sago waste). The low ADG in the treatment of P3 although the total consumption of high DM but low consumption of CP due to low content of CP sago waste. This shows that the provision of sago dregs for beef cattle ranges from 1 - 2% of body weight. The result of statistical analysis showed that the mean of ADG of cow was influenced by treatment, where between treatment P0 there was a significant difference (P<0,05) to treatment of P1, P2 and P3. While between treatments P1, P2 and P3 differ not significant. Body weight description and ADG of male Balinese cattle during observation are shown in Figures 1 and 2.

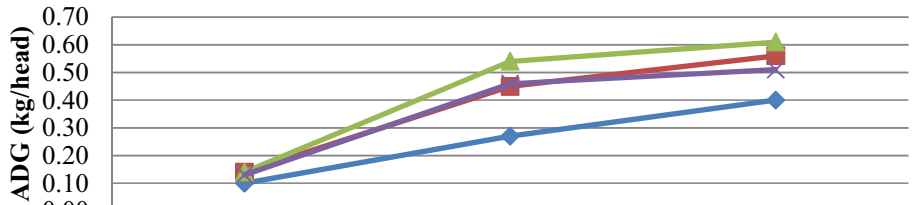


	Initial weight	First month	The second month	Third month
P0	138.83	141.97	150.20	162.23
P1	139.07	143.33	156.77	173.60
P2	131.03	135.10	151.20	169.53
P3	126.40	130.17	144.10	159.33

Figure 1. Graph of Male Balinese Cow Body Weight for 3 Months

In Figure 1, it can be seen that the mean body weight at treatment P1 is higher than other treatment because the initial weight average is also higher. While on treatment P2, mean body weight was higher than P0 treatment even though the mean body weight at treatment P0 was higher. This is thought to be caused by higher consumed feed and also with the addition of sago dregs in the feed can improve the weight of livestock than those who only consume forage.

Figure 1 also shows that in the first month of observation, the average increase in animal body weight is still very low (3.14 - 4.26 kg), this is because in the first month the livestock is still in adaptation with new maintenance and feed system. Maintenance systems are usually removed, where the cattle are allowed to find their own feed is on this livestock cattle so that suspected cattle stress with a new maintenance and feed system. But in the second month, the average increase in body weight is quite high (8.23 - 16.0 kg) as well as in the third month the average increase in body weight reached 12.03 - 18.43 kg. The highest body weight increase in livestock treated with P2 (forage 100% + sago waste 2% of body weight) reached 18.43 kg, then treatment P1 (forage 100% + sago waste 2% of body weight) reached 16.83 kg; the treatment of P3 (forage 100% + sago waste 3% of body weight) reached 15.23 and the lowest in the treatment of P0 (forage 100%) ie 12.03 kg. This illustrates that the sago waste as one of the locally available resources has the potential to be used as beef cattle feed.



	First month	The second month	Third month
P0	0.10	0.27	0.40
P1	0.14	0.45	0.56
P2	0.14	0.54	0.61
P3	0.13	0.46	0.51

Figure2. Graph ofADG of BaliCows

In Figure 2, it is seen that the highest treatment ADG of P2 (forage 100% + sago waste 2% of body weight), then P1 and P3, while the lowest ADG at P0 (forage treatment 100%). Look also that ADG in the first month of observation is still low, then rise in second and third. This is because entering the second month cattle is familiar with system maintenance and new feed so that a positive effect against rising ADG. Views of the percentage increase in livestock that consume between ADG sago waste than just consume the forage, in treatment P1 occur an increase of 49.35% higher than P0, P2 treatment treatment increased by 67.53% compared to P0 and P3 treatment treatment increased by 42.86% compared to treatment of P0. Sago waste contain high starch so that it is used as a feed source of energy to a positive effect against beef cattle body weights of cattle, while protein needs would be sure of forage.

3.4. Feed Conversion

Feed conversion was one of the benchmarks for assessing the level of efficiency of the use of body weight added against rations of livestock. The data in Table 2 show that the feed conversion numbers on treatment of P0 of 18.10 ± 7.39, P1 of 12.53 ± 6.28, P2 of 12.01 ± 3.35, and P3 of 13.51 ± 1.93. The results of statistical analysis show supplementation sago waste as influential feed real ($P < 0.05$) against the feed conversion numbers. The lowest feed conversion figures are on treatment P2 and highest at treatment P0, this illustrates that livestock in treatment of P2 is more efficient in utilizing the feed. Low feed conversion treatment rataan P2 caused though the consumption of high pakannya but the resulting ADG also high so as to form a 1 kg ADG require less feed. High feed conversion on average P0 treatment due to the high consumption of feed is not offset by a high mean ADG to form ADG 1 kg need more feed so that it can be said that the feed consumed less efficient. The feed conversion figures obtained in this study are still lower than the results of the research [9],are reporting the number of conversion feed Balicows which consume fodder basal supplements (energy sources: protein, 30:70 ratio) was 39.9 ± 4.5; but higher than the results of the research of [17], where the male cow feed conversion of Aceh that consume feed forage and concentrates – 4.60 9.55. The difference of this feed conversion figures alleged to be caused by the feed materials consumed (quality and quantity), livestock conditions and environmental factors. However, the rate of conversion of feed obtained in this study (treatment of P1 and P2) is still appropriate, where according to [16],a good feed conversion figures for beef is 8.56 – 13.29. Feed conversion was influenced by the condition of livestock, power cerna, gender, nation, the quality and quantity of feed and also environmental factors. States that the use of the feed efficiency is influenced by several factors including the ability of cattle in the feed material, digesting the sufficiency substance staple feed for life, growth, body functions as well as the type of feed to be consumed [18].

4. Conclusion

The content of nutrient sago waste is very low especially CP, however, the core content is high enough so that it could potentially be utilized as energy sources in beef cattle feed. The addition of sago waste as the most efficient beef cattle feed on treatment of P2 (P0 + sago waste 2%of body weight), seen from the aspect of improved ADG 67.53% higher than P0 (forage treatment 100%), increased consumption of nutrients (DM, CP or TDN) and numbers the lowest feed conversion (12.01).

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