The Nutrients Potential of Agricultural Waste as Feed of Ruminants in Southeast Sulawesi

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ABSTRACT

The developments of ruminants' production have to support by feed availability either in quantity or in quality. Problems of providing feeds in Southeast Sulawesi were limited land for forage cultivation and season fluctuation. Agricultural and plantation waste have great potential to use as alternative ruminant's feed. This research was aimed to analyze the nutrients potential of agricultural waste in Southeast Sulawesi as ruminant feed. The data obtained can be used as a reference for the formulation of rations of ruminants' maintenance, production, and reproduction nutrition based on its genetic potential. The observed variables were water content, crude protein, crude fat, crude fiber, and total digestible nutrient (TDN). The results showed that the higher protein content were obtained from kapok seeds (27,71%), followed by tofu waste (21.73%), groundnut shell (19.53%). Meanwhile high crude fiber were obtain from groundnut shell, cacao pods, and rice straw, respectively 35,63, 32.23 and 31.64%.

Key words: ruminant, agricultural waste, nutrients, crude protein, crude fat, and TDN

INTRODUCTION

Ruminant livestock production especially beef cattle still low. It is characterized by the number of beef cattle production cannot fulfill the domestic consumption. Indonesia has high number of beef cattle import over the years. The main reason caused low production of ruminants was feed availability. Therefore, to increase ruminant production should be followed by a production of forage both in quantity as well as quality. Fluctuation forage production was determined by season. High forage production in the rainy season, but sufficient during the dry season. Forage production decreased and cannot fulfill ruminant nutritional needs to express its genetic potential to the maximum. In addition, the production of forage is also determined by the availability of sufficient land for pasture grazing and cut and carry forage cultivation system.

The low land availability as forage source of cattle due to housing purpose and farmers choice to grow crops that can be beneficial to human needs (Samadi et al, 2010). Strategies that can be done to overcome various limitations ruminants feed are to develop integrated livestock – food crops – plantations. Integration between food crops with livestock is an alternative to increasing the population of cattle. The application of this system is a system that cattle can get an alternative feed from agriculture and plantations waste (Zainuddin et al., 1983). Agricultural wastes are cheap feed source that it can be used as substitution feed for ruminant livestock (Prasetyo et al. (2006).

The source of the agricultural waste obtained from food crops commodity, which is the availability affected by planting patterns and its extensive acreage area (Syamsu et al. 2003). Types of agricultural waste that can be utilized as feed source is corn straw, rice straw, soybean straw, peanuts, cassava, and sweet potatoes waste.

Some types of agricultural waste as potential feed ingredients with great number of availability and easily obtainable in Southeast Sulawesi were rice straw, sago waste, rice bran, cocoa pod, ground nuts shell, corn cobs, and kapok seed.. However, to be able to utilize agricultural waste

as a source of alternative livestock ruminant feed is need to knowing the potential of nutrition of each kind of waste. There has been no clear information about nutrient potential of agricultural and plantation waste in Southeast Sulawesi. Therefore the analysis needs to be done to explore the potential of agricultural waste by taking samples in several districts.

MATERIAL AND METHODS

This research uses descriptive method continued by simple statistical analysis. Data collection and documentation were obtained form of secondary data. The sampling locations were four regency in Southeast Sulawesi, they were Kendari, Muna Regency, Southern Konawe Regency, and Konawe Regency. Agriculture and plantations waste that used as sample were fine rice bran, tofu waste, cocoa pods, sago waste, corn cobs, groundnut shell, and kapok seed. Sampling method of each areas were taken two samples for each type of waste, so that the retrieved 8 samples for each type of waste. Each sample was analyzed nutritional potential value using proximate methods. The observed variables are; (1) moisture content, (2) Crude protein, (3) Crude fat content, (4) Crude fibers, (5) and Total Digestible Nutrient (TDN). Compositional analyses standard methods according to AOAC (2000) were used in this research.

RESULTS AND DISCUSSION

Rice straw is the rest of harvesting rice consisting of stems and leaves. Quality of rice straw showed in table 1. The average crude protein content of was 5.44%, crude fat, 1.35%, crude fiber 31.64% and TDN 53.56%.

Table 1. Average Nutritional Content of Agricultural Waste

Material	Moisture content (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	TDN
Rice straw	5.44	3.98	1.35	31.64	53.56
Fine Rice Bran	8.56	7.34	4.43	14.86	62.23
Coarse Rice Bran	7.36	7.30	3.88	16.88	58.76
Tofu Waste	6.89	21.73	3.65	20.70	71.90
Cocoa Pod Husk	7.33	6.93	2.99	32.23	55.36
Corn Cob	4.80	3.07	0.20	29.05	56.01
Ground Nut Shell	7.85	19.53	0.78	35.63	51.99
Kapok Seed	7.58	27.71	8.39	28.75	63.39

Similar observations were made by Herawati, et al. (1988) and Murni et al, (2008) that states protein content of rice straw was range from 4 - 7% with ADF, 41-56%, TDN 43 - 54%, and 80.8% dry matter. The cellulose and hemicelluloses content were 47.54%, and 10,67% respectively. Rice straw digestibility was relatively low due high silica content (8-14%). The results of the analysis by Prasetyo, et al (2006) showed that rice straw dry matter , crude fat, crude fiber, crude protein, BETN and metabolism energy were 86.00; 18.20; 1.50; 30.90; 3.44; 32.20% and 1.180 Mkal/kg respectively. These result were also supported by Wahyono and Ruly Hardianto, (2004) who reported that dry rice straw contains crude protein, crude fat, crude fiber, TDN were 31.867; 5.211; 26.779 and 51.496% respectively. Rice straw benefits in beef cattle rations is source of feed fiber, so it can serve as basal feed. Crude fiber that is consumed will be fermented by rumen microbes to produce volatile fatty acids as energy source and to supply-chain carbon (Arora, 1989). Feeding only rice straw does not provide enough nutrients to the ruminants to maintain high production levels, it is due to the low nutritive value of this highly lignified material (Sarnklong, et al, 2010).

Fine rice bran is a by-product of rice milling which is usually consist layer of cotyledon bran, small husk and broken rice. Rice bran is a source of energy for livestock, besides as good B vitamin source. The use of rice bran in rations was as filler material that makes feed more bulky and does not have high density, source of crude fiber which needed by poultry digestive systems to improve efficiency and contributes energy given its high fat content. The results of the analysis in table 1 shows fine rice bran have average 8.56% water content, 14.68% ash, 7.34% crude protein, 4.43% crude fat, crude fiber 14,86%, Ca 0.33%, and PO_4 1.05% (Hartadi, Reksohadiprodjo, and Tillman, 1993). Rice bran crude protein content ranges from 7.6%, crude fat has an extensive range of approximately 7-19%, 27.8%, of crude fiber, BETN 44.7% and ash 16% . Meanwhile analysis results showed coarse rice bran have 7.30% crude protein, 3.75% crude fat, 16.88% crude fibre, 0.24% Ca, 1.09% PO4, 15.58% ash and 7,36% moisture content. Wahyono and Ruly Hardianto, (2004) also reported that coarse rice bran contains dry matter 91.267%, crude protein 9.960 %, crude fat 2.320 %, crude fiber 18.513% and TDN 55.521%.

Tofu waste is solid waste from tofu factories. Tofu waste the result of the follow-up process of making tofu, obtained from boiling residue soybean slurry which has durability no more than 24 hours in open space (team Fatemata, 1981). The results of the analysis of table 1 shows crude protein content or other nutritional substances from dried tofu waste were 21.73% crude protein, 3.65% crude fat, 20.70% crude fiber, 2.29% ash, 0.77% Ca, 0.77% PO4 and 6.89% water content. In other research, according to Wahyono and Ruly Hardianto, (2004) dried tofu waste contains 10.788% dry matter, 25.651% crude protein, 5.317% crude fat, 14.527% crude fiber, and 76.0% TDN.

Laboratory of Nutrisi Ternak Ruminansia dan Kimia Makanan Ternak, Livestock Husbandry Faculty of Padjadjaran University (2006) nutritional of tofu waste contains 22.64% crude protein, 6.12% crude fat, 22.65% crude fiber, 2.62% ash, 0.04% Ca; 0.06%; P and 4010 kcal/kg gross energy. According the composition and nutritional content of tofu waste, it can used as protein source of feed. The tofu waste could be given to livestock in the wet form. Feeding tofu waste to Muscovy duck already practices by farmer (Tanwiriah, et al, 2006). Tofu waste fermentation through the ensilage process using the Bacillus amyloliquefaciens bacteria can improve its nutritional value. Tofu waste raw material has high moisture content (90.04 %) so that it is perishables and has short shelf life. However, the crude protein content in tofu waste is quite high (34,94%) and is potentially used as either ruminants or poultry feed through fermentation (Anggraeni, 2013).

Cocoa pods husk is agriculture industrial waste on cocoa (Theobroma cacao l.) processing. Cocoa fruit composed of 74% of the skin (pods) of the fruit, the placenta 2% and 24% was the seeds. Proximate analysis results in table 1 shows nutrition value of cocoa pods, that contain 0.93% crude protein, 2.99% crude fat, 32.23% crude fiber, 0.85% Ca, 0.05% PO4, 13.02% ash and 7.33% moisture content. Daud et al. (2013) reported that ash and moisture content of cocoa pod are 12% and 14% respectively. Nasrullah and Ella (1993), reported that cocoa pod contains 22% crude protein and 3 - 9% crude fat. Other experiment expressed the cocoa pod nutrition content consists 88% of dry matter, 8% crude protein, 40.1% crude fiber and 50.8% TDN and its application on ruminant livestock trough 30-40% (Wawo, 2008). Cocoa pod husk will enhance increase in the use of waste cocoa by-products, poultry farmers' income and reduction in feed production cost in Nigeria (Eghosa, et al, 2010). However, cocoa pod husk may be possible to feed fresh cocoa pod husk at a higher level. The problem with this will be the high cost of the concentrate to go with the higher level of fresh cocoa pod husk (Oddoye, 2010)

Proximate analysis results indicate that nutritional content of corn cob was 3.07% crude protein, 0.20% crude fat, 29.05% crud fiber, 1.69% Ca, 0.06% PO_4, 2.15% ash and 4.80% moisture content. Krishna, et al., (2006) reported dried corn cobs contain 72.42% dry matter, 3.85% crude protein, 27.53% crude fiber and 52.80% TDN. While according to Faesal (2013) that dried corn cobs contains cob 87% dry matter, 83% TDN, and 9.0% crude protein.

Ground nut shell proximate analysis results shown that the crude protein content was 19,53%, 0.78% crude fat, 35,63% crude fiber, 1.38% calcium, 0.32% PO4, 4.59% ash and 7,85% moisture content. Wahyono and Ruly Hardianto (2004) reported that ground nut shell contain

87.36% dry matter, 5.769% crude protein, 2.511% crude fat, 73.369 crude fiber, and 31.700% TDN. The last material was kapok seed, which based on the results of the analysis of table 1 have nutrition value as below; 27.71 crude protein, 8.39% crude fat, 28.75% crude fiber, 0.52% Ca, 0.42% PO4, 6.45% ash and 7.58% moisture content.

CONCLUSION

The agriculture and plantation waste in Southeast Sulawesi has potency of nutritional for ruminant feed. Tofu waste, kapok seeds and ground nut shell has the potential of nutrition as protein source. Utilization of agricultural waste such as rice bran, corn cobs, ground nut shell, kapok seed, etc should be formulated with other feed ingredients to meet the daily maintenance, production and reproduction of ruminant requirement.

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