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Evaluation of potential and local forages nutrition as ruminant feed-in Payo Agro-Tourism Area, Solok City, West Sumatera, Indonesia

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Abstract. This study aims to evaluate local forage's potential and nutritional content in the Payo agro-tourism area of Solok, West Sumatra, Indonesia, to be used as a ruminant feed. This study used a survey method by taking a sample of the forage that grows a lot in the area and then analyzed its nutritional content. The nutritional content analyzed were dry matter, ash, crude protein, crude fiber, crude fat, calcium, and phosphorus minerals. At the same time, the TDN value and the extracted material without nitrogen were calculated based on the formula. The results showed that 12 types of forage have the potential as ruminant feed, namely *Panicum maximum, Tithonia diversifolia, Gliricidia sepium, Digitaria sp, Centrocema pubescens, Calliandra calothyrsus, Stachytarpheta jamaicensis, Bidens pilosa, Ipomea triloba, Micania Scandens, Asystasia gangetica,* and corn straw. This study shows that *Calliandra calothyrsus* has the highest crude protein content, and Corn straw contains the lowest crude protein. The highest and lowest TDN values were *Gliricidia sepium* and *Panicum maximum*, respectively. Through the linear programming program, these 12 plants can be formulated into 4 ration formulations with 58% TDN and 15-16% crude protein.
Keywords: Crude protein, Forage, Payo, Ruminants, Total digestible nutrients.

1. Introduction

The City Government of Solok, West Sumatera, Indonesia, seeks to exploit the potential of natural and human resources as much as possible to improve the welfare of its people. One of the efforts is through the development of agro-tourism. One of the potentials is for the development of agro-tourism in the Payo area in Tanah Garam Village, Lubuk Sikarah District [1].

A series of studies have been carried out to realize the development of agro-tourism in the Payo area. These studies include studies on livestock development. Based on this study, it has been recommended to use local feed ingredients found in Payo as animal feed. Based on these recommendations, to realize agro-tourism in stages, it is necessary to carry out studies that support it technically. In realizing livestock, it is necessary to study the feed source in-depth so that technically the farm does not experience a shortage of feed. This is done because the success of a farm is 70% influenced by the environment, including the availability of feed [2]. This research presents the identification of plants that have the potential as animal feed, the nutritional content of feed ingredients, and the preparation of an economical feed formula.

2. Materials and methods

2.1. Experimental site

Forage samples were taken around the Payo area, Solok City, West Sumatra Province. The proximate analysis was carried out in the laboratory of the feed testing and certification center, Bekasi. The sampling area is presented in figure 1.

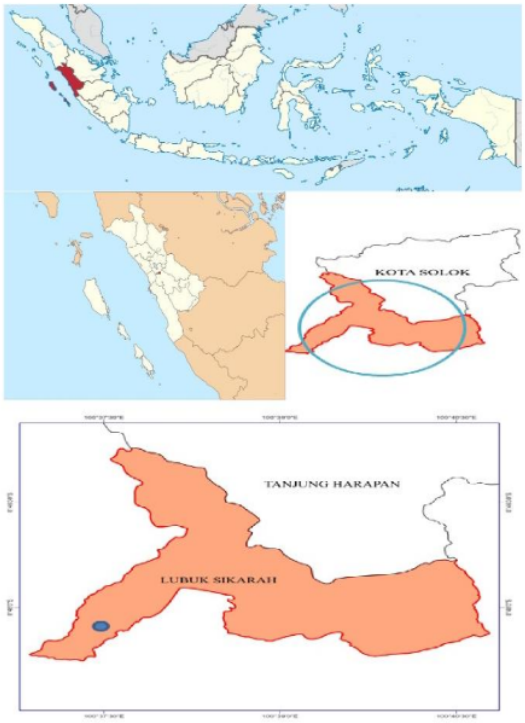

Figure 1. Forage sampling map.

2.2. Materials

The equipment used in this study were digital scales, plastic samples, cutting knives, and laboratory equipment and materials for proximate analysis.

2.3. Research design

Identification of feed ingredients conducted by field survey and material sampling. Chemical analysis using the proximate analysis method [3]. Recommendations for ration formulations for local cattle are based on modified linear programming [4].

3. Results and discussion

3.1. Plants have the potential as animal feed

The identified feed ingredients in the Payo Tourism Area are presented in Table 1. The feed ingredients are *Panicum maximum*, *calliandra calothyrsus*, *Stachytarpheta jamaicensis*, corn waste, *Tithonia diversifolia*, *Bidens pilosa*, *Digitaria Sp*, *Ipomea triloba, Micania Scandes*, *Asystasia gangetica, Centosema pube*scen, and *Gliricidia sepium*.

Table 1. Chemical composition of feed ingredients in the Payo.

No	Feed Ingredients	Chemical Composition									
		DM	OM	Ash	CP	TDN	Fat	CF	EIWN	Ca	P
1	*Panicum maximum*	27.26	90.86	9.14	11.42	46.62	3.96	46.12	29.36	0.43	0.23
2	*Calliandra calothyrsus*	33.47	94.64	5.36	19.93	60.20	2.83	32.43	39.45	0.58	0.23
3	*Stachytarpheta jamaicensis*	24.28	92.55	7.45	14.46	59.47	2.93	26.53	48.63	1.01	0.33
4	Corn waste	30.94	91.33	8.67	11.04	52.47	1.78	37.43	41.08	0.51	0.24
5	*Tithonia diversifolia*	17.01	90.09	9.91	14.44	57.78	2.37	25.82	47.46	0.99	0.33
6	*Bidens pilosa*	14.86	89.46	10.54	16.75	57.92	2.44	26.91	43.36	0.98	0.29
7	*Digitaria Sp*	26.73	93.14	6.86	16.98	60.76	2.71	26.78	46.67	0.61	0.34
8	*Ipomea triloba*	19.39	90.40	9.60	15.17	55.55	2.61	31.46	41.16	0.89	0.34
9	*Micania scandes*	21.52	90.13	9.87	13.4	51.05	3.06	38.78	34.89	1.13	0.26
10	*Centocema Pubescens*	29.28	92.63	7.37	18.18	54.97	1.69	43.85	28.91	0.98	0.27
11	*Asystasia gangetica*	20.16	92.11	7.89	16.59	63.98	2.87	20.26	52.39	0.63	0.36
12	*Gliricidia sepium*	21.42	94.85	5.15	19.11	67.60	2.98	19.75	53.01	0.77	0.23

Note: DM; dry matter, OM; organic matter, CP; crude protein, CF; crude fiber, TDN; total digestible nutrients, EIWN; extract ingredients without nitrogen.

The nutritional content of organic materials as feed ingredients is presented in Table 1. In the Table, it can be seen that fresh forages generally contain dry matter ranging from 17 to 33%. The lowest 14% dry matter was *Biddens pilosa* while the highest was *calliandra*. Feed ingredients as a source of protein (crude protein content of at least 18%) are *calliandra, Centrocema pubes*cen, and *gliricidia sepium* leaves. The lowest energy content was found in *Panicum maximum* (TDN 46.2%), while the highest energy was found in *Gliricidia sepium* leaves.

All forage for animal feed found in this area belongs to the high-quality forage except for *Panicum maximum*. [5] Classify forage quality in three categories based on CP and TDN content, namely low quality forage (CP <4%, TDN> 40%), medium quality forage (CP 5-10%, TDN 40-50%) and high-quality forage (CP> 10%, TDN> 50%). Forage with good protein quality will optimize rumen microbial protein synthesis [6]. The growth and activity of rumen microbes greatly determine the productivity of ruminants because rumen microbes have an important role in the food fermentation process. A high TDN fulfills the energy needs of livestock so that it will maximize production and reproduction.

3.2. Feed formulation

Based on the availability and nutritional content of feed ingredients, several alternative feed formulas can be prepared as presented in Table 2. The table shows four alternative feed formulas according to the availability of corn waste, namely without corn waste, 10%, 20%, and 30% waste corn. The higher the use of waste corn, the cheaper the feed price with the same nutritional content of the feed. This formula is based on the minimum protein and energy requirements for cattle, namely TDN 58% and crude protein 12% [7].

Table 2. Alternative feed formulas based on local resources to local cattle.

No	Feed Ingredients	(%) DM			
		Ration A	**Ration B**	**Ration C**	**Ration D**
1	**Energy Source**				
	Corn waste	0	10	20	30
	Panicum maximum	24	18	12	7
	Digitaria Sp	36	32	28	23
2	**Protein source**				
	Kaliandra	10	10	10	10
	Tithonia	10	10	10	10
	Gliricidia	10	10	10	10
3	**Etc**				
	Stachytarpheta jamaicensis	1	1	1	1
	Biddens Spilosa	1	1	1	1
	Ipomea triloba	2	2	2	2
	Micania Scandes	2	2	2	2
	Centocema Pubescens	2	2	2	2
	Asystasia gangetica	2	2	2	2
	Total	100%	100%	100%	100%
	Nutrient Content				
	Dry matter	25%	26%	26%	27%
	Crude Protein	16%	16%	15%	15%
	Total Digestible Nutrien	58%	58%	58%	58%
	Price (Rp/kg)	270	260	250	240

4. Conclusion

Twelve plants have the potential to be used as a source of forage for ruminants based on the proximate analysis carried out. *Calliandra calothyrsus* has the highest crude protein content and Corn straw contains the lowest crude protein. The highest and lowest TDN values were *Gliricidia sepium* and *Panicum maximum*, respectively. These 12 plants can be formulated into four ration formulations with 58% TDN and 15-16% crude protein through the linear programming program.

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