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Production and nutrition potency of swamp local forage in South Kalimantan as ruminant feed

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Study on swamp forages in South Kalimantan was conducted to evaluate potency of their production and nutritional qualities. As it is recognized that there are about 235,676 ha of swamp are in South Kalimantan poses potential forage, which traditionally used for ruminants. Four indigenous swamp forage plant predominantly grow in the swamp of South Kalimantan. They are Kumpai Batu (Ischaemum polystachyum. J. Presl), Kumpai Minyak (Hymeneche amplexicaulis Haes), Beberasan (Ludwigia hyssopifolia), and Pipisangan (Polygonum barbatum L). Survey method was used to conduct field observations to identify swamp forage, level of production, carrying capacity, and nutrient content of swamp forage within water loged and unlogged season. The results showed that the dominant species has a high production and good quality nutrition in the spring tide is grass Hymeneche amplexicaulis Haes, production amounted to 1032.60 kgDM ha^{-1} harvest^{-1}, nutrient content of 10.88% crude protein (CP), crude fiber (CF) 16.37% with carrying capacity of 3.53 Animal Unit/season. Ischaemum polystachyum. J. Presl production was 989.16 kg DM ha^{-1} harvest^{-1}, CP content of 14.3%, CF 17.35%, with carrying capacity of 3.39 Animal Unit/season. Ludwigia hyssopifolia production amounted to 851.67 kg DM ha^{-1} harvest^{-1}, CP content 15.96%, CF 25.23%, and carrying capacity of 2.91 Animal Unit/season. Polygonum barbatum L production was 889.71 kg DM ha^{-1}harvest^{-1}, CP content of 16.45% and 16.27% CF, with carryng capacity of 3.04 Animal Unit/season. It can be concluded that there were four types of species as a potential forages for ruminants feed.

Keywords: Animal Unit, carrying capacity, dominant, productivity, swamp forage

INTRODUCTION

Forage feedstuffs that are absolutely necessary either quantitatively or qualitatively throughout the year in ruminant livestock production systems and forage as a source of feed nutrients (Abdullah et al., 2005). People are still subsistence farms, most of the feed is grass, just an attempt to improve and develop domestic grass or forage crops locally be productive still very limited. Constraints common domestic grass or forage locally is this low productivity associated with soil factors, climatic, biotic and potential forage (Sutiana, 2010)

Swamp forage is a forage that grows in swampy land keeps potential feed for livestock areas such as ruminant feed primarily swamp buffalo (buffalo kalang), cows and goats. The abundance of a variety of grass (kumpai) and

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Table 1: Variety of swamp forage vegetation during spring tide and low tide season

Local name	Latin name	tribe,	Spring tide	Low tide season.
Kumpai Juluk	Hymenachne amplexicaulis (Rudges) Ness	Poacea	√	√
Kumpai minyak	Hymenache amplexicaulis Haes	Poacea	√	√
Kumpai miyang	Hymenachne interrupia Buese	Poacea	√	–
Kayamahan	Sesbania sericea (Wild) Link	Fabaceae	√	√
Kasisap	Altenanthera sesilis	Amantheacea	√	√
Pipisangan	Ludwigia hyssopifolia	Polygonacea	√	√
Belaran	Ipomea sp	Convolvulaceae	√	√
Beberasan	Polygonum barbatum L	Polygonacea	√	√
Bundungan	Actinoscirpus grossus (L.f) Goetgh	Cyperacea	√	√
Babatungan	Persicaria barbata (L) H, Hara	Polygonacea	√	√
Dadangsit	Ludwigia adscendens (L). H. Hara	Onagraceae	√	–
Kangkung	Ipomea aquqtica	Convolvulaceae	√	√
Kayambang	Salvinia cuculata	Salviniacea	√	√
Kumpai batu	Ischaemum polystachyum. J. Presl	Poacea	√	√
Jungkut berang	Echinochloa crass-galli	Poacea	√	–
Eceng gondok	Eichornia crassipes	Ponterderiacea	√	√
Supan-supan	Neptunia oleracea Lour	Fabaceae	√	–
Kayapu	Pistia stratioles	Convolvulaceae	√	√
Banta	Lersia hexandra	Poacea	–	√
Rumput grinting	Cynodon dactylon (L) Pers	Poacea	–	√
Jajagungan	Brahiaria plantaginea	Poacea	–	√

Information: √ = here is swamps forage, - = no swamps forage

legume in a natural swamp into cattle feed, has been the mainstay of farmers including the arrival of the dry season when. Utilization of swamp forage instead of turf ahead by traditional farmers directly with the system shepherd or as a source of of cut and carry forage (grass cutting) is one of the efforts in the provision of feed for livestock(Endang,2008). .
South Kalimantan is currently estimated to have reached 235.676 ha swamp potential to be developed for agriculture, fisheries, and forestry plantations. (Noor, 2007). Utilization of wetlands has reached 41.81% equivalent to 98 536 ha, while the remaining 58.19% is equivalent to 137 139 ha of land in the form of sleep that has not worked at all (BPS, 2010). Thus wetlands is still great potential to be developed as it is supported by the availability of large areas of land, flat topography, availability of abundant water and enough technology available (Noor, 2007).

The potential production of grass Kumpai (Hymenachne amplexicaulis) is estimated at 57 tons ha^{-1} $year^{-1}$ and Padi Hiang (Oryza rufipogon) reached 28 tons ha^{-1} $year^{-1}$. Nevertheless, the availability of forage grass and legume swamp both still very limited because of the season. At low tide season forages elusive swamp. This is due to the lack of important information relating to the types of grass and legume existing swamp habitat, the types of edible forage, forage nutrient content information on the swamp, the level of productivity of each forage swamp (Fahriani and Eviyati, 2008).

Swamp habitat in South Kalimantan can be divided into two categories during the year, ie, when the level of high tide (high water period) with pasture grass floating (Floating meadows) and at low tide or dry (low water period) where the pastures start dry and only a certain part of stagnant water (Mansur et al., 2005). Thus the availability of forage grass and legume swamp both still very limited because of the season. At low tide season forages elusive swamp. This is due to the lack of important information relating to the types of grass and legume existing marsh habitat, the types of edible forage, forage nutrient content information on the swamp, the level of productivity of each forage swamp.

Table 2: Nutrient composition swamp forage at spring tide (% DM)

Local name	Ash	CP	Fat	CF	Ca	P	WSC	NDF	ADF	Hemi Selulosa	Selulosa	Lignin	Tanin
Pipisangan	3.04	15.92	0.85	25.23	1.05	0.14	6.55	64.48	23.83	0.65	20.07	3.76	17.26
Beberasan	2.18	16.45	0.61	16.27	0.85	0.18	2.85	56.42	51.62	4.8	34.03	17.59	4.07
K. Batu	2.48	14.36	1.29	17.35	0.29	0.13	4.71	40.38	39.26	1.12	25.77	13.49	3.74
K. Minyak	3.28	10.88	1.2	16.37	0.29	0.12	4.21	62.6	36.75	25.85	33.95	2.8	2.46

Table 3: nutrient composition sawamp forage during low tide season (% DM)

Lokal Name	Ash	CP	Fat	CF	Ca	P	WSC	NDF	ADF	Lignin	Hemi selulosa	Selulosa	Tanin
Beberasan	4.37	14.10	1.22	16.25	1.4	1.1	2.47	84.48	44.39	10.06	40.09	34.33	2.96
K. Minyak	9.83	9.37	2.35	26.10	0.31	0.1	4.63	74.39	69.02	61.12	5.37	7.90	0.34
K. Batu	3.23	12.60	1.33	33.58	0.17	0.12	6.76	80.04	73.19	36.47	6.85	36.72	0.78
Pipisangan	7.47	13.52	1.21	14.78	2.43	0.14	1.71	86.84	56.85	18.54	29.99	38.31	5.42

This study aims to determine the nutrient content and carrying capacity swamp grass that has potential as ruminant feed.

MATERIALS AND METHODS

This research was conducted in the swamp that is Danau panggang (Kab. Hulu sungai Utara), and the District of Labuan Amas (Hulu Sungai Selatan) in South Kalimantan. Time data collection was carried out in mid-season and mid-season receding tide.

Materials and tools used include sample bag for grass sample taken place, paralon to make plots measuring 5m x 5m kuadrant, a knife to cut the grass, 75% alcohol to preserve forage collected so as not to wilt, and newsprint.

Methods and Sample Analysis

Sampling was done prior to flowering (pre-blooming). Measurement of the content of the proximate analysis of nutrient content using AOAC method (1999) include dry matter content, ash, crude protein, crude fiber. The content of NDF and ADF, hemicellulose and cellulose tannins were analyzed using the method of Van Soest (1991). The data obtained were processed statistically using analysis of variance. Further tests with different test real honest (BNJ) found that in the entire F-if the count is greater than the F-table (Steel and Torrie, 1995)

RESULTS AND DISCUSSION

Plant Variety swamp vegetation

Based on the results of the identification of a variety of South Kalimantan swamp vegetation during the season of sping tide and low tide, there are 18 species of swamp plants. Variety of swamp vegetation presented in Table 1. Variety and composition of plants that can adapt to both seasons showed specific differences. This is evident from the diversity of plants found in wetlands. At the time of sping tide to grow 18 species of plants grow but not Jajagungan (Brahiaria plantaginea), grass Ginting (Cynodon dactylon (L) Pers) and Banta (Lersia hexandra) whereas at low tide season when the plants do not grow Supan-Supan (Neptunia oleracea Lour), Jungut berang (Echinochloa crass-galli), Kumpai Miyang (Hymenachne interrupia Buese) and Dadangsit (Ludwigia adscendens (L). H. Hara). This shows that not all swamp plants can

grow on both different seasons. These results match the Pielou (1999) that bore the influence of the climate of high species diversity and patterns of spread of plant. Differences plant species is influenced by the availability of climatic factors, light intensity and soil water availability. (Wilsie 1987).

Nutrition Quality Swamp Forage

The quality of a forage crop is determined by its chemical composition through a laboratory analysis mainly crude protein. Forage quality can be achieved if the rate of photosynthesis is higher than the rate of respiration performed by plants. Fotosisntesis will run fine if supported by the availability of nutrients, sunlight, water and CO2 are quite (Arief et al., 2008). Swamp forage nutritional quality based on proximate analysis and analysis Vansoest for fiber fractions are presented in Tables 2 and 3.

Crude protein content in two different seasons shows different results where the swamp forage Kumpai Batu (Ischaemum polystachyum. J. Presl) the tide gives the protein content of 14:36% while at low tide season is only 12.60%, Kumpai Minyak (Hymeneche amplexicaulis Haes) CP 10.88% to 9.37%, Beberasan (Polygonum barbatum L) CP 16.45% to 14.10% and Pipisangan (Ludwigia hyssopifolia) CP 15.92% to 13.52%, as well as on other forage nutritive value of protein content besides other differences which occur in the spring tide higher nutrient content than the low tide season.

Forage nutrient content difference is likely due to the flood tide, which carries organic materials that can improve the nutrient content of forage, while at low tide season has a pH level of 3.9-4.8 swampland that the acid content of the soil nutrient quality of forage produced decreased, wherein when in an acidic soil nutrient is not available due to the low solubility of Almunium (Al) and phosphorus (P), so the plants do not get optimal nutrient supply, in addition to the availability of water for swamp forage is a very important factor, because the water involved in the process of nutrient uptake, photosynthesis, respiration, as well as the formation and translocation of carbohydrates in addition to the fertility of the soil is determined by the physical, chemical and biological soil. (Zheng et al., 1998; Larsen et al., 1998; Ma et al., 1999), acidic soils impede root growth, nutrient uptake and water, was added to the opinion of Gutteridge and Shelton (1994) that the nutrient content of forage is influenced by soil nutrient content, while Crowder and Cheda (2002) states that forage nutritional value associated with the chemical composition of forage that will affect the final result of forage.

The content of fiber fractions consisting of NDF, ADF, cellulose, hemicellulose and lignin in the forage growing season spring tidal provide NDF content ranged from 26.62 -70.95%, ADF ranged between 20.89 -58.47%, while at lows on the season NDF content ranged from 52.72 - 88.12%, ADF ranged between 29.00 - 76.72%, the highest yield in the ADF content of grass Jungkut Berang (Echinochloa crass-galli) was 70.95%, while at low tide season on forage Babatungan (Persicaria barbata (L) H, Hara) is equal to 88.12%. These results are not much different from the Fahriani (1996) states that the content of ADF and NDF in some marsh forage NDF content ranged from 66.30 -72.30%, ADF ranged between 38.03 -41.07%. Fahriani and Eviyati (2008) reported NDF content three types of swamp forage ranged between 67.89% - 71% and ADF content ranged from 38.03 - 41.07%, NDF and ADF content of forage slightly higher than the swamp grass cultivation ranged between 36.70 - 41.40%. Minson (1990) reported a tropical grass has the NDF content ranged from 45-85% and 21-55% ADF. ADF and NDF content of forage is still in the swamp area of the normal range of tropical grasses in the spring tide of cellulose content ranged from 17:41 - 48.73%, hemicellulose ranged from 0.65 - 27.75% and lignin ranged between 2:52 - 17.99%, while at low tide season cellulose ranged from 7.90 - 51.73%, hemicellulose ranges between 5,375 - 30.38% and lignin ranged between 8:25-46.20%. The results of this study is slightly higher than the results reported Fahriani and Eviyati (2008) reported that the cellulose content ranged from 34.21-37.01%, hemicellulose ranged between 27.62 - 29.93% and lignin ranged between 3.65 - 4:45% in the marsh grass while on terrestrial forage cellulose ranged between 30.30 - 37.30%, hemicellulose 29.60 - 31% lignin ranged between 3.90 - 6:40%. Minson (1990) reported that most of the cellulose in the plant wall is protected by a layer of lignin is difficult to digest unless chemically treated. (Fahriani 1996; Endang 2008) states that the overall nutrient content of tropical grasses have lower nutrient content than sub- tropical grasses, content tropical grass nutrient content of Italian ryegrass is closer to that in the final phase of the current crop of flowering (late blooming), while Jones and Wilson (1987) that the structural content of each component of the lignin fibers contained significantly different with nutrition and relationship between components. Minson (1990) tropical grasses have reported crude fiber content of 19-47 % and 2-11.5 % lignin. Van Soest et al., (1982) states there is a negative correlation between the content of lignin with digestibility of cellulose.

The content of fiber fractions of a plant is affected by plant species, climate, soil fertility, and management (Devitrianto, 2001). Genetic factors differ according forage species and environmental factors influenced by soil and climate, according Puger (2002) that the production and quality of the grass is affected by temperature and precipitation. Fluctuations in water levels greatly affect swamp plants, the availability of nutrients is very good at water level (low water period) or so-called small pairs that occur on a daily basis (1-2

Table 4: Swamp forage dry matter production in the spring tide and low tide season

Name swamp forage	DM kg^{-1} ha^{-1}harvest $^{-1}$ spring tide	DM kg^{-1} ha^{-1}harvest $^{-1}$ low tide season
Hymeneche amplexicaulis Haes	1032.6	518.3
Ludwigia hyssopifolia	851.67	498.58
Polygonum barbatum L	889.22	516.26
Ischaemum polystachyum. J. Presl	989.16	752.79

times a day), whereas at high tide only happens once a year (flood water phase) swamp grass is less available, except adaptive species (Mansyur et al., 2005). Groundwater level is the main factor that is very important because it set up a 70-90% (Kurniawan et al., 2007) of plant fresh weight, (Rahman, 2001: Rahman et al., 2003) 80-95% of the fresh weight of the plant, while Taiz and Zeiger (2002) reported that the water content of 35-75% of the crop being grown.

Potency Productivity Swamp Forage

Conditions fluctuated swamp water can interfere with the growth and development of plants, resulting in a decrease in plant biomass. Swamp forage biomass production obtained in two different seasons namely winter season of ups and downs indicates a difference where dry matter production at spring tide than low tide season. Swamp forage biomass production as presented in Table 4.

There was a decrease of dry matter (Table 4) at low tide season; this decline is reduced due to the presence of water on the swamp at low tide season, so plant growth is interrupted. Jun-Feng et al., (2010) reported an adverse impact of water shortage on plant growth that can lead to a decrease in crop production. (Jaeel et al., 2009; Taiz and Zeiger 2002), the cause of the decline in production due to the high evaporation rate that exceeds the rate of absorption of water by plant roots, while Borges (2003) lack of water in plants causes low water content, stomatal closure and reduced enlargement and cell growth, which is done by the defense mechanisms of plants in response to drought.

Dry matter production of research results (Table 4) shows the dry matter production ranged between 43.79-1032 kg^{-1} ha^{-1} harvest^{-1} in the spring tide while in the season ranged from 38.53 - 752.79 kg^{-1} ha^{-1} harvest^{-1}. The highest production of forage types Hymeneche amplexicaulis Haes. that is equal to 1032 kg DM ha^{-1} harvest^{-1}, Ischaemum polystachyum J Presl DM at 989.16 kg / ha / crop, Polygonum barbatum L of DM 889 kg^{-1} ha^{-1} harvest^{-1} and Ludwigia hyssopifolia of DM 851 kg^{-1} ha^{-1} harvest^{-1}. The results of this study are low compared to the results of research Fahriani and Eviyati (2008) reported that swamp forage to kumpai dry matter production ranged between 1935-3515 kg $^{-1}$ ha^{-1} harvest $^{-1}$. Endang (2008) reported the production of dry matter for Brahiaria decumben approximately 5,285 tons $^{-1}$ha^{-1} harvesting and Pennisetum purpureum approximately 2.5 ton ha^{-1}harvest^{-1}. Dry matter swamp forage yield lower than Brahiaria decumben production but higher when compared to the dry matter production of Pennisetum purpureum

Carrying Capacity Swamp Forage

Carrying capacity is a picture of the ability of the land to accommodate the number of animals in a given unit area. Carrying capacities of the swamp as a source of green fodder requirement calculated under the assumption dry ingredients 1 Animal Unit is 6.25 kg day^{-1} (NRC 1984). If the rainfall is assumed by the long tide, low tide season transition and succession are 5, 4 and 3 months, cutting interval on the spring tide, intermediate and downs of each 40 days, 30 days and 50 days. “Proper use factor” (puf) 40 – 60% (Devitrianto 2001; Purnomo, 2006).

In general, if one assumed a swamp area where livestock commodities were able to explore a whole site, then the production of biomass 15 927.86 kg DM ha^{-1} year^{-1} and poof by 50%, then the resulting capacities in the spring tide at 3.53 AU^{-1} ha^{-1}, thus swamp land area of 22 320 ha is capable of supporting as many as 78 789.6 AU throughout the year. With the production of biomass by

Table 5: Carrying capacities swamp forage in the spring tide and low tide season

Name swamp forage	Carrying capacities Spring tide (AU)	Carrying capacities Low tide season (AU)
Hymeneche amplexicaulis Haes	3.53	1.77
Ludwigia hyssopifolia	2.91	1.71
Polygonum barbatum L	3.04	1.77
Ischaemum polystachyum. J. Presl	3.39	2.58

1032.6 kg DM^{-1} ha^{-1} at low tide season decline capacities be 1.77 AU^{-1} ha^{-1} as shown in Table 5.

Potential high swamp grass produced by Kumpai Minyak (Hymeneche amplexicaulis Haes) of 1032.60 kg DM ha^{-1} $harvest^{-1}$, with a crude protein content of 10.88% of forage consumption 6.25 kg DM AU^{-1} day^{-1} , is able to give 68 g of crude protein to cattle, while Kumpai Batu (Ischaemum polystachyum J.Presl) of DM 752.79 kg ha^{-1} $harvest^{-1}$, with a protein content of 12.60%, then able to give 78.75 g of crude protein to cattle.

CONCLUSION

The diversity of forage swamp South Kalimantan has 18 types of forage, obtained four types of forage that is dominant swamp grass Hymeneche amplexicaulis Haes. Ischaemum polystachy, L. Polygonum barbatum and Ludwigia hyssopifolia

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