Characteristics of the Location of Forage Crops at Dairy Cattle Backyard Farming in Banyumas Regency

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Abstract. One of the supports of the dairy farm productivity is forage crops whose existence is a major factor. Location as a land use pattern has many characteristics in line with situation. The purpose of this study was to describe the characteristics of area locations of forage crops at backyard dairy farms in Banyumas Regency. The method of this research was a survey with qualitative approach as a model of naturalistic paradigm. Phenomenological research was impelemented in this study. The research sites were on 5 (five) developing sub-districts of backyard dairy farm locations. The results showed that the pattern of land use for the forage plant source in backyard dairy cattle farm in Banyumas Regency in each district area was is affected by the parameters of different landscapes of land ownership. Based on the results it can be concluded that the characteristics of the pastures ware flat land, sloping and undulating topography, that were located near the rice fields, roads and yards. The location of the forage crops included the use of wet and dry land, and the combination of them, in monoculture and mixed cropping with other crops, not only on lands owned by farmers themselves, but also the uses of land owned by their families.

Keywords: land use, dairy farm, forage crops, Banyumas Regency

Abstrak. Salah satu pendukung produktivitas usaha peternakan sapi perah adalah adanya kebun tanaman sumber hijauan pakan yang keberadaannya menjadi faktor utama. Lokasi kebun sebagai pola pemanfaatan lahan mempunyai berbagai karakteristik sesuai kondisi lapangan. Tujuan penelitian adalah untuk mendeskripsi karakteristik lahan lokasi tanaman sumber hijauan pakan pada peternakan sapi perah rakyat di Kabupaten Banyumas. Metoda penelitian adalah metoda survei dengan pendekatan kualitatif sebagai model paradigma naturalistik. Kajian fenomenologis diterapkan pada penelitian ini. Lokasi penelitian pada 5 (lima) wilayah kecamatan pengembangan peternakan sapi perah rakyat. Hasil penelitian menunjukkan bahwa pola pemanfaatan lahan untuk tanaman sumber hijauan pakan ternak sapi perah rakyat di Kabupaten Banyumas pada setiap wilayah kecamatan berbeda yang dipengaruhi oleh parameter bentang lahan dan kepemilikan lahan. Berdasarkan hasil penelitian dapat disimpulkan bahwa karakeristik lokasi tanaman sumber hijauan pakan berupa tanaman yang ditanam pada lahan topografinya datar, miring maupun bergelombang, terletak di dekat sawah, jalan maupun pekarangan, juga pada penggunaan lahan basah dan kering serta kombinasi ke duanya. Pada pola tanam monokultur dan campuran dengan tanaman lainnya, tidak hanya pada lahan milik peternak sendiri, namun juga menggunakan lahan milik familinya.

Kata kunci: pemanfaatan lahan, sapi perah, hijauan pakan dan Kabupaten Banyumas

Introduction

The peoples dairy cattle backyard farms that are developed in rural Banyumas Regency are organized to meet human needs (Dharmawan and Suyono, 2009). As a spatial mixture of settlement, according to Hendarto (2011), in practice, they require a juridical recognition related to spatial planning in order to secure sustainability of the production function. Gordeyasemas et al. (2007) mentioned that the space required in the dairy farm system, among others, are the needs of animal house and space for forage crops, although according to Salendu et al. (2012) it can be integrated with other sectors as agro-ecosystem. The existence of forage crops according to Woodard and Prine (1991) is one of the factors that can affect the sustainability of backyard dairy farm system.

Forage is the main feed for dairy cattles as ruminants (Purbayanti et al., 2009). In the absence of forage, livestock productivity suffers. In this regard, according to Gordeyasemas et al. (2007) it is important to provide the continuity of pastures of high forage quality and quantity. Sudjatmogo (2010) and Kaplan et al. (2007), state that the location of forage crops as a form of land use are that influenced by the landscape and the background of the farmer, will result in further productivity of different crops that affect the performance of livestock. It is added by Dhalika et al. (2005) that forage quality is affected by plant age and the fertility of the soil where the plants grow. The research objective was to describe the characteristics of land-use of forage crops site to support ruminant livestock productivity of backyard dairy farms in Banyumas Regency.

Materials and Methods

The experiment was conducted in Banyumas Regency, Central Java Province. The research materials were the forms of landscape locations of elephant grass (*Pennisetum purpureum*) or king grass (*Pennisetum purpurium*) pastures. Qualitative approach focus on phenomenological research was used in this study (Muhadjir, 2002; Mulyana, 2002; Kuswarno, 2009).

The steps of this study were successively as follows: (1) To determine tentatively the limit and content of study on the basic of problem's background, (2) To cover and record field phenomenon of the study area on the basic of primery and seconder by data, (3) Early grand tour around the study area, (4) Doing mini tour or focused deep observation to get information of the object units, (5) From the c and d, a reference was resulted in order to obtain guidence for interviews, (6) Doing interviews to get information on (i) land topography, (ii) land condition and location, (iii) the pattern and form of land use (iv) land ownership; (7) Grouping obstractively on information catagorization (based on similarity or interrelationship) to build sub theme, and (8) Doing analysis or dialoque to build theme and conclusion. The populations of the study were the sum (number) of all individuals unit of people dairy cattle from locations in Banyumas regency at 5 district presented in Table 1.

The technique of analysis data representation of phonomenology was implemented in this study (Kuswarno, 2009) as follows: (a) data organization, (b) data figurazition : the figurazition of meaning and facts during the study, (c) data classification and grouping to obtain meaningful statement, (d) data interpretation to build structural description of the occurring evens, know the even exist and how to compose the whole evens, (e) data visualization and presentation, the statements of narration of the even essence, completed with table of meaning units.

Results and Discussion

Conditions of Research Site

The study took place in rural Banyumas Regency by the influence of Mount Slamet ecosystem. The development of dairy farming in mountainous areas would probably result in higher milk production levels due to the suitability of its carrying capacity. This is in accordance with the Sudjatmogo (2010) and Dongre et al. (2011) suggestion the farming of dairy cattle in locations that have climatic similarity to their origin (especially with low air temperature) will result in a greater chance to produce high performance in milk productivity.

Activities of the dairy farm have been growing since 1987 in 10 villages of 5 (five) districts namely Sumbang, Baturraden, Karanglewas, Cilongok and Pekuncen (Table 1) which was a community empowerment efforts in accordance with the directives of Act

No. 18 of 2009, on Animal Husbandry and Animal Health in particular to Article 76 paragraph (1) which states that backyard farmings do provide facilities for the advancement of farms and the increasing competitiveness, and Article 32 that states that the central and local governments should strive for many citizens who hold livestock farming.

In the northern area of the development, there were production forests owned by Perhutani plants grew among the grass field that had supported the supply of forage. The potential for forage, according to Tomar et al. (2003) has minimize the shortage of forage crops grown by farmers. The existence of a variety of site conditions where the source of forage crops grow should be taken into account as a holistic in all characteristics which, according to Hadi (2010) should be managed in order to sustain business activities, including dairy cattle farm in Banyumas Regency. Related to productivity, usefulness and sustainability, land condition of forage crops for backyard dairy farm is influenced by the landscape, land ownership and socioeconomic factors of farmers. According to Adesehinwa at al. (2004), each factor influence, directly or indirectly.

Topography of Land

Land with flat topography, was the most preferred by farmers (47.73%) as the location of the forage crops. Detail condition of land of this study presented in Table 2. Crop management is easier on the flat land, including fertilization activities (Slamet et al., 2005) and the rate of growth and crop production is also better.

A total of 15.91 % of farmers had taken advantage of the topography of the sloping land to grow grass crops. Eich inch of lands, for example slope lands, at the edges of the roads and the river banks were used to plant forages. Sloping lands with grass crops,

Table 1. The number of people dairy cattle backyard farms in Banyumas regency

No	District	Village	The Number of Farmer
1	Sumbang	Limpakuwus	33
		Kotayasa	3
2	Baturraden	Kemutuglor	23
3	Karanglewas	Singasari	4
4	Cilongok	Gununglurah	7
		Sambirata	4
		Panembangan	6
		Karangtengah	9
5	Pekuncen	Tumiyang	40
		Glempang	3
Total			132

Table 2. The percentage of topographic conditions land used for forage crops

Districts	Percentage of Topographic Conditions Land (%)				
	Sloping	Flat	Wavy	Combination	Amount
Sumbang	2.27	15.15	2.27	7.58	27.27
Baturraden	5.29	7.58	1.52	3.03	17.42
Karanglewas	0	3.03	0	0	3.03
Cilongok	2.28	9.85	2.27	5.30	19.70
Pekuncen	6.07	12.12	5.30	9.09	32.58
Amount	15.91	47.73	11.36	25.00	100.00

according to Deffo at al. (2011) help in the conservation efforts. Added by Sanderson and Paul (2008), the king grass and elephant grass can repair the damaged of soil erosion. According to Gonggo et al. (2005), dense clump of forage crop up to 1 meter diameter can function as a force to bind soil aggregates. According to Sinaga (2007) farmers use the land with sloping topography as marginal land, not to obtain a high production level, but to grow plants and can help fuel the needs of forage for livestock feed. Pekuncen was the district, whose land area is mostly sloping topography.

As many as 25 % of farmers manage more than one locations with more than one forms of topography. In all forms of land topography, the farmer felt comfortable in managing the land partly due to the farm they lived became a culture of everyday life, so did not feel like a burden. This was in accordance with the opinion of Adesehinwa at al. (2004) and Mastuti and Hidayat (2009), that although some farmers did their business as a sideline business, but the farmers did the job in earnestly, among others to obtain yields in the form of milk and money to support the needs of their families.

Location of Land

Forage field sites owned by dairy farmers were near highways, settlements, gardens or rice fields and combination in some farmers who had more than one field sites. There were various impacts due to these locations, conveniences or limitations. On lands near the roads (as much as 15.15%; Table 3), among others, it was easy to transport the forage and supervise the growth of forage (Sudjatmogo, 2010). The information from all locations of forage land owned by farmers, showed that several locations were near the fields or properties, but far away from the road. Farmers did not feel heavy to carry grass crops, because it can be transported in brindings. This was in accordance with Adedeji et al. (2009) who states that the farming has no burden to do the hard work. According to Hendarto (2011), the work showed be done because they found, it only in the location that of farmers were able to plant forage crops. The work of managing the forage lands were conducted because the farmers felt that only in those location they were able to grow forage crops.

Farmers who had forage lands near to the rice field, reported a better crop growth rate due to the potential better photosynthetic activity because the intensity of sunlight was greater than that of the plants that were planted near and possibly the shaded yards (Santoso, 2009). In addition, it also did not disturb the rice plant which position is even close to grass plants. The grasslands that were located beneath the fields, were exposed to the water flow of paddy fields, showing production rate much higher than that of the gutter because the presence of nutrient run-off from fertilizer in the rice fields. The limited

Table 3. The percentage of the land location to forage crop

Districts	Percentage of the Land Location (%)				
	Near the road	Near the field	Near the dry garden	Mix	Amount
Sumbang	6.82	6,82	7.58	6.07	27.27
Baturraden	3.79	5,29	3.79	4.55	17.42
Karanglewas	0	3.03	0	0	3.03
Cilongok	2.28	10.61	4.55	2.27	19.70
Pekuncen	2.28	4.55	18.93	6.82	32.58
Amount	15.15	30.30	34.85	19.70	100.00

intensity of the sun, according to Sinaga (2007) and Deffo at al. (2011) led to the lower activity of the photosynthetic of plants. Photosynthetic activity generates energy for plant growth and crop production components which include the addition of plant height, the increase of leaf number, the addition of stem diameter and the increase in the number of plants in each of the mass.

Patterns of Land Use

There were 3 (three) patterns of land use by farmers in the effort to plant the forages. The patterns were monoculture, mixed with other crops and combinations of them. The percentage of the land use pattern applied by forage crop presented in Table 4. Some farmers managed the land of more than one locations, however most farmers, 41.66% managed the 3 patterns of land use. Small ownership of land by farmers (Adesehinwa at al., 2004) was possible to be the cause. For on 1 (one) unit of livestock, Tomar et al. (2003), 700 square meters are of grassland should be available. In general, productivity of grass forage in backyard dairy farm was low, which resulted in lack of forage (Kaplan at al., 2007). To increase the deficiency, farmers added forage from other areas which, according to Hendarto and Suwarno (2005) and the Khampa (2009) could be a field of grass or other roughages. The majority of them were taken from forests owned by Perhutani. Based on research from Hendarto (2011), all farmers accustomed to feed their cattles in the form of roughage mixtures.

Farmers who raused them livestock in the Kinak (Farm Industrial Estate), a form of dairy cattle farming in one area, planted the forage crops as monoculture forages. According to Khulman (2003) and Sinaga (2007), this condition of implemention is an ideal conditions for grasses a into a single unit with the hausing, and according to Astuti (2005) liquid waste from the animal house is directly fertilized on to grassland and can increase the productivity of forage crops. This pattern was present only in some villages and the most numerous was in the district of Cilongok. Santoso et al. (2009) say it is also possible to get a high level of production of forage because of competition in caching nutrients and sun exposure is low.

A total of 28.79 % of farmers planted elephant grass or king grass in mixture with other crops by utilizing the sidelines of the land in their yards, on the sidelines of staple crops, partly by utilizing the rice fields, on land near the river and so forth. Through this pattern every inch of land productivity increases. According to Budihardjo (2010), any utilization of land regardless of its form, will increase the productivity and usefulness. Most areas are as much as 14.39% farmer of Pekuncen farmers. This was largely due to the dairy cattle farm was held on dry land.

On the basis of the above (discussion and results), land use patterns were influenced by landscape, land ownership and socioeconomic factors of the farmers. Observing the

Table 4. The percentage of the land use pattern applied by forage crop

Districts	Percentage of Land Use Pattern (%)			
	Monokultur	Mix	Combination	Amount
Sumbang	5.30	4.55	17.42	27.27
Baturraden	5.30	5.30	6.82	17.42
Karanglewas	3.03	0	0	3.03
Cilongok	9.09	4.55	6.06	19.70
Pekuncen	6.83	14.39	11.36	32.58
Amount	29.55	28.79	41.66	100.00

condition the number of livestock owned, the majority (62.71%) had only a 1-3 heads of cattle and 22.03 % had 4-5 cattle, indicating that the condition of farmers were the category of low economic level. According to Mastuti and Hidayat (2009), the dairy farm families provide benefits if the number of cattle are at least 6 heads. The low level of farmer economics, among others, led to the narrowness of the land ownership and also lead to the management of more than one locations.

Forms of Land Use

There were 3 (three) forms of land use planted with elephant grass or king grass, wetlands (rice), dry land (yard) and a combination of both. But the majority (38.64%) of farmers used dry land (yard), which caused the low productivity of the grass. Detail of land use form of forage crops presented in Table 5. Aminudin and Hendarto (2000) and Sinaga (2007) states that in order to have a high level of productivity of forage, elephant grass or king grass crops should be grown on irrigated lands. Added by Eck et al. (1990) that the drainage of the animal house (animal waste) will add nutrients into the soil and improve soil physical properties and increase production because manure from animal is rich in nutrients needed by the plants.

The growth rate and production of grass plants grown in wet fields was better than plants grown in dry lands because of the higher intensity of sunlight (Sinaga, 2007; Lundqvist, 2007). A total of 28.79% of farmers used the land for growing rice due to the perception that their fields of rice crops is more profitable than elephant grass. If compared between districts, there was no uniformity as each region had a distinct regional characteristics. In this regard, it could not be determined the most desirable land use by farmers related to their utilization for forage crops. This was in accordance with the statement of Hadi (2010) that the implementation of the development application form is largely determined by environmental conditions, among other, forms of landscapes.

Furthermore, the results of Hendarto's study (2011) showed that in addition to landscape factors, socioeconomic factors with the appearance of weak farmers whose ownership of the number of cattle were low, showed that backyard farmer can not give an adequate contribution to the welfare of farmers. Socioeconomic factors was a weakness in the dairy cattle farm business which led to the low efficiency and profitability of farmers. It also affected the form of land use that were highly variable or even be said to be improvised according to the low economic capacity of farmers.

Land Ownership

In relation with the economic condition of farmers, some farmers did not have their own forage crops. Land used as forage crops was rent or borrowed from relatives without any compensation. This can occur (Adesehinwa, 2004) and Hadi (2010) due to the high level of tolerance between people of the rural population. A total of 18.18% of farmers used land owned by relatives or neighbors for planting elephant grass. Although the land area under cultivation was widespread and generally in the status of dry land, but the trust that existed, is something that was very supportive to the backyard dairy cattle farm in the center of the settlement area. Attitude according Hendarto (2011) supports the formation of mixed space management between small holder dairy farms and rural settlement area. Supported by Lkhamjav (2008) which states that the form of land use

Table 5. The percentage of land use form to forage crops

Districts	Persentage of Land Use Form (%)			
	Wet	Dry	Combination	Amount
Sumbang	4.55	9.09	13.63	27.27
Baturraden	7.57	5.30	4.55	17.42
Karanglewas	3.03	0	0	3.03
Cilongok	9.09	6.06	4.55	19.70
Pekuncen	4.55	18.19	9.84	32.58
Amount	28.79	38.64	32.57	100.00

Table 6. The percentage of the land ownership status for forage crops

Districts	Persentage of the Land Ownership Status (%)					
	Own	Neighbors	Family	Rent	Mix	Amount
Sumbang	14.39	2.27	3.79	3.03	3.79	27.27
Baturraden	9.85	2.27	1.52	0	3.79	17.42
Karanglewas	0	0	0	3.03	0	43.03
Cilongok	7.58	1.52	0.78	9.09	0.78	19.70
Pekuncen	19.70	3.03	3.03	0	6.82	32.58
Amount	51.52	9.09	9.09	15.15	15.15	100.00

by communities is affected by one of their land ownership patterns.

Although many farmers used the land that was not belong to the grass plants, but Table 6 showed that 51.52% of the farmers, planted grass on their own lands. As businessman, farmers had sought appropriate capabilities. A total of 15.15% of farmers rent their land to plant grass and the most rented land that was owned by the village. Harmonious community relations, including the use of land for the forage crops, according to opinion of Lundqvist et al. (2007), is the lives of the rural population that is still strong with the atmosphere of family and kinship that lead to a harmonious life.

In connection with the use of land that was not belong to themselves, farmers had to use it to its full potential, partly by intensive fertilization after plants were harvested in order to produce consistently high. This according was in line with to the direction and results of research by Suntoro (2001) that the yield residual effect of fertilizer will increase crop yields in the next growth period. In connection with the forage crops, economic factors that influenced farmers were very prominent. This was in line with a research by Adesehinwa at al. (2004) that socio-economic factors, gives the effects to the form of farm activities the conditions in the field showed that the number of livestock kept often fluctuated. Some farmers never sold their livestock because of family needs and did not buy the cattle back. Another phenomenon indicated that the land used by farmers in the Karanglewas district for elephant grass and king grass, a lease of land for farms that are held in Kinak leased land owned by the Singasari Village.

Conclusion

The patterns of land use for forage crops at backyard dairy farms in order to support cattle productivity in Banyumas Regency in each region are affected by different landscape parameters over land, land ownership and economic and social factors of the farmers. The forms of forage land location for forage crops on backyard dairy farms in Banyumas Regency include the use of wet and dry land of crop monoculture and mixture, not only on land owned by farmers themselves, but also

the use of lands that are rent or of relatives, can be at the flat topography land, oblique or wavy, both located near the rice fields, roads and yards.

References

Adedeji H,Oludare and IA Ademiluyi. 2009. Urban agriculture and urban land use planning : need for a synthesis in Metropolitan Lagos, Nigeria. J. Geography and Regional Planning. 2(3):043-050.

Adesehinwa AOK, JO Okuola and MK Adewumi. 2004. Socio economic characteristics of ruminant livestock farmers and their production contraints in some parts of South-western Nigeria. J. Lives. Res. Rural Dev. 16 (8).

Astuti A. 2005. Aktivitas proses dekomposisi berbagai bahan organik dengan aktivator alami dan buatan. J. Ilmu Pertanian. 13(2):92-104.

Budihardjo E. 2010. Tata Ruang Sebagai Landasan Pembangunan Berkelanjutan. Proseding Seminar Nasional Dalam Rangka Hari Lingkungan Hidup Se-Dunia. Program Magister Sains Ilmu Lingkungan. Program Pascasarjana Universitas Jenderal Soedirman. Purwokerto. P.3-7

Deffo V, ET Pamo, M Tchotsoua, M Lieugomg, C Areme and EC Nwagbo. 2011. Determination of the critical period for cattle farming in Cameroon. International J. Liv. Prod. 2(5):59-68.

Dhalika T, B Ayuningsih and A Budiman. 2005. Efisiensi penggunaan ransum lengkap (complete ration) dengan sumber hijauan daun pucuk tebu pada Sapi Fries Holland jantan muda. J. Ilmiah Ilmu-Ilmu Peternakan. 7 (2):76-84.

Dharmawan B and Suyono, 2009. The potency of livestock subsector development in Banyumas Regency Central Java. J. Anim. Prod. 11 (2):71-78.

Dongre VB, RS Gandhi, A Singh and A Gupta. 2011. A brief review on lactation curve models for predicting milk yield and different factors affecting lactation curve in Dairy Cattle. Internat. J. Agric.: Res. and Rev. 1 (1):6-15.

Eck HV, SR Winter and SJ Smith. 1990. Sugarbeet yield and quality in relation to residual beef feedlot waste. Agron J. 82(2): 250-254.

Gonggo BM, B Hermawan and D Anggraeni. 2005. Pengaruh jenis tanaman penutup dan pengolahan tanah terhadap sifat fisika tanah pada lahan alang-alang. J. Ilmu-ilmu Pertanian Indonesia. 7(1):44-55.

Gordeyasemas IK, R Hartanto and WD Prastiwi. 2007. Proyeksi daya dukung pakan limbah tanaman pangan untuk ternak ruminansia di Jawa Tengah. J. Indonesian Trop. Anim. Agric. 32(4):23-29.

Hadi SP. 2010. Dimensi Lingkungan Tata Ruang. Proseding Seminar Nasional Dalam Rangka Hari Lingkungan Hidup Se-Dunia. Program Magister Sains Ilmu Lingkungan. Program Pascasarjana Universitas Jenderal Soedirman. Purwokerto. P.8-13

Hendarto E. dan Suwarno. 2005. Forage as a Post for The Environmental Construction of Ruminant Livestock Farming. Paper presented at The International Seminar of Environment Construction. 2nd International Seminar and Workshop on Ecological Architectureand Environment in The Tropics. LMB Center of Education. Soegijapranata Catholic University. Semarang. P.352-356.

Hendarto E. 2011. Dimensi Lingkungan Tata Ruang Peternakan Sapi Perah Rakyat Di Kabupaten Banyumas, Provinsi Jawa Tengah. Disertation. Program Pascasarjana. Universtas Diponegoro. Semarang

Kaplan A, T Taskun and A Onenc. 2007. Visual Quality Assesment within the Continuum of Rural or Urban-fringed Landscapes and Livestock Farm by District. Paper of 3rd Joint Meeting of the Network of Universities and Research Institutions of Animal Science of the South Eastern European Countries. 10-12 February 2007, Thessaloniki.

Khampa S. 2009. Effects of malate level and cassava hay in high-quality feed block on rumen ecology and digestibility of nutriens in lactating Dairy Cows raised under tropical condition. Internat. J. Lives. Prod. 1(1):006-011.

Khulman T, E Koomen, J Groen and A. Bouwman. 2003. Simulating Agricultural Land Use Change in The Netherlands. Paper Presented at The International Workshop Transition in Agriculture and Future Land Use Patterns. Wageningen.

Kuswarno E. 2009. Metodologi Penelitian Komunikasi Fenomenologi, Konsep, Pedoman, dan Contoh Penelitiannya. Penerbit Widya Padjadjaran. Bandung.

Lkhamjav O. 2008. The Eastern Steppe's Living Landscape. The International Archives of The Photogrammetry, Remote Sensing and Spatial Information Sciences 37: 575-578.

Lundqvist H, L Norell and O Danell. 2007. Multivariate characterisation of environmental conditions for reindeer husbandry in Sweden. Rangifer J. (1): 3-21.

Mastuti S and NN Hidayat. 2009. Rule of women workers at dairy farms in Banyumas District. J. Anim. Prod. 11 (1):40-47

Muhadjir N. 2002. Metodologi Penelitian Kualitatif. 4th Edition. Penerbit Rake Sarasin, Yagyakarta.

Mulyana D. 2002. Metodologi Penelitian Kualitatif, Paradigma Baru Ilmu Komunikasi dan Ilmuosial Lainnya. PT. Remaja Rosdakarya, Bandung.

Purbayanti ED, S Anwar, S Widyati and F Kusmiyati, 2009. Crude protein and crude fibre Benggala (*Panicum maximum*) and Elephant (*Pennisetum purpureum*) grasses on drought stress condition. J. Anim. Prod. 11(2): 109-115.

Salendu AHS, Maryunani, Soemarno and B Polli. 2012. Analysis of carrying capacity of agro-ecosystem coconut-Ca Le in South Minahasa Regency. J. Anim. Prod. 14(1):56-62.

Sanderson MA and RA Paul. 2008. Perenial forages as second generation bioenergi crops. Internati. J. Mol. Sci. 9:768 -788.

Santoso B, BT Hariadi, H Manik dan H Abubakar. 2009. Kualitas rumput unggul tropika hasil ensilase dengan bakteri asam laktat dari ekstrak rumput terfermentasi. J. Media Peternakan. 32(2):137-144.

Sinaga R. 2007. Analisis model ketahanan rumput Gajah dan Raja akibat cekaman kekeringan berdasarkan respon anatomi akar dan daun. J. Biologi Sumatera. 2(1):17-20.

Slamet W, ED Purbayati and CI Sutrisno. 2005. Pemanfaatan limbah potong hewan dan limbah industri minuman untuk kompos. J. Penelitian Pertanian Tropika. 3(1):17-26.

Sudjatmogo. 2010. Pola Pemberdayaan Peternakan Sapi Perah Di Indonesia Dalam Era Perdagangan Bebas. Proseding Seminar Nasional Hari Lingkungan Hidup Se Dunia. Program Magister Sains Ilmu Lingkungan. Program Pascasarjana Universitas Jenderal Soedirman, Purwokerto. p.14-18.

Suntoro. 2001. Pengaruh residu penggunaan bahan organik, dolomit dan KCl pada tanaman kacang tanah (*Arachis hypogeae*) pada oxic dystrudept di Jumapolo Karanganyar. J. Habitat. 12(3):170-177.

Tomar QS, PS Minhas, VR Sharma and RK Gupta. 2003. Response of nine forage grasses to saline irrigation and the schedules in a semi-arid climate of North-west India. J. Arid Environ. 55(3):533-544.

Woodard KR and GM Prine. 1991. Forage yield and nutritive value of elephant grass as affected by harvest frequency and genotype. Agron J. 83(3):541-546.