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Carrying Capacity and Botanical Diversity of Pastoral Range in Gowa Regency

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Abstract

The study was conducted on some pastures in Gowa Regency for approximately one year period. The objective of this study was to determine the botanical diversity and capacities of rangelands in Gowa Regency, South Sulawesi. A case technical survey method was used in the present study. The survey was conducted in the paddocks by identifying and weighing the plants that were growing in the paddocks. Botanical diversity found in pastures in this area as dominant was 15 species, which consisted of Cyperus rotundus grass, Axonopus compressu, African grass, Imperata cylindrica, Cynodon dactylon, Paspalum conyugatum, Stenotaphrum secundatum; legumes consist of Desmodium intortum, Calopogonium muconoides, Crotalaria junce; Eughorbia hirta L, and Phyllanthus niruri L. The other plants consisted of Mimosa pudica, Chromolaena odorata and Lamtana camara. Carrying capacity of pasture in Gowa Regency was 0.88 AU/ha/ year.

Keywords: Carrying capacity; Botanical diversity; Pasture; Plant.

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1. Introduction

Demand for livestock products is increase from year to year, this due to the increasing of human population, increasing household incomes and the improving of public nutrition awareness. Food in form of livestock products are mainly meat, milk and eggs, is a commodity of animal food that is needed to improve the quality of food consumption.

Ruminants as a producer of meat and dairy with its main feed are forage has obstacle in the provision due to the lack of area/pasture and forage availability is strongly influenced by the seasons. In the dry season, availability of forage is less and contrary, during the rainy season availability is high enough for the animals. This condition make the availability of forage is not continuous throughout the year. Development of livestock, especially ruminants is still depending upon the adequacy of feed; especially forage quantity, quality and continuity throughout the year. In addition the use of land for feed crops is still competing with food crops, whereas for feed crops have not been a priority [1].

Adequacy of feed for livestock raised by the farmers is a fairly serious challenge in the development of animal husbandry in Indonesia. Indication of a shortage of supply of feed and nutrition is still low level of productivity of livestock produced. Ruminant feed in the form of grass and legume have been obtained and derived from the paddock grazing. The last few years paddock grazing have decreased the productivity, these conditions affected by the decline in grazing paddock area throughout Indonesia, caused by changes in land use.

Thus, the steps that can be taken to increase the production of ruminant livestock that are kept by small farmers in the countryside are to improve botanical composition of the pasture. This subsequently improves the quality of the pasture. Furthermore, cattle grazing on natural pasture in accordance with the capacity of its maximum capacity must be arranged.

Efforts to improve the composition of botanical and increased capacities of pastures can be done through an approach based on the information on botanical composition and capacities in the field. However, to our knowledge, until now the resource potential of forage on pasture in Gowa Regency have never been studied especially as effort utilization for ruminant livestock development in general, and beef in particular. Therefore, study on this is important because such information parameter pasture forage production and food availability and nutritional quality of pasture forage in an area will greatly assist the government and other parties in designing the development of animal husbandry. Therefore, the aim of this study was to inventory the forage on pasture based capacities and botanical diversity.

2. Materials and Methods

2.1. Location

This study was conducted on pastures that are farmers usually used for grazing their animals in Gowa Regency, South Sulawesi, Indonesia. The choice of location is based on the consideration that the study of botanical diversity and capacities has not been done in this region. The present study was carried out during approximately one year.

Materials used in the study included a variety of plants found in pastures. While the tools were quadrant, scales, scythe, cutting scissors, machetes, plastic bags, tires and rope plaques, labels and stationery.

Survey method of a case study technique was used in this study. Cases in this study were the condition of botanical composition and capacities of pastureland. The survey was conducted in the paddocks by identifying and weighing the plants contained in the paddocks.

Location of the study was choosing based on regional conditions of Gowa Regency. Gowa is located on longitude of 120.0317˚ W and 119.3773˚ E and latitude of 5.0829342862˚ N and 5.577305437˚ S. Basically, Gowa regency is largely a plateau which is around 72.26% and the remaining is lowland (27.74%). Furthermore, the locations were categorized as low, middle, and high; the District of Pattalassang (about 0-25 m asl), District of Parangloe (25-500 m asl) and the District of Tinggimoncong (500-1000 m asl).

2.2. Sample and cluster

Carrying capacities of the pasture were measured according to Susetyo [2], as follows:

- Quadrant size of 1m x 1m dropped randomly in the pasture;
- Forage in the quadrant were cut as close as possible from the ground;
- The forage was then kept into plastics to be weighed ;
- The second forage in the quadrant was measured to the right and left for five steps to 10 steps;
- The first and second forage were then categorized as a cluster

The next cluster was subsequently measured at a distance of 100-125 m from the first cluster in accordance to the wide pastures that will be analyzed.

2.3. Plant cutting, identification, and data analysis

All the plants contained in the quadrant were cutting approximately 5 to 10 cm from the ground or as high as to be taken by the cattle. The plant were then separated by type and weighed. Identification of plants in order to know the botanical diversity at each plant species was conducted based on a guide book for determination of plants [3]. All data obtained were tabulated and calculated based on a formula determined and subsequently be described.

3. Results and Discussion

3.1. Botanical composition

Carrying capacity is the analysis of the ability of the pasture to produce forage that is needed by a number of cattle for grazing in the area of one hectare or the ability of pasture to accommodate cattle per hectare [4]. Forage productions of pasture in Gowa Regency are shown in Table 1 for the dry season and Table 2 for the rainy season.

Season affects the forage production, especially the production of forage that comes from grass. Production in the rainy season is higher than the production in the dry season. This due to that the water needed to grow and develop for the grass is sufficient during the rainy season, although in the dry season these plants can also be grown. In fact, according to Reksohadiprodjo [4], grass production in the rainy season can reach production twice than in the dry season.

Table 1: Forage production of the pasture in the dry season (ton/ha) in Gowa Regency.

Location	Grass	Legume	Other plants	Total
High	0.45	0.27	0.36	1.08
Middle	0.72	0.15	0.58	1.45
Low	0.92	0.27	0.46	1.65
Total	2.09	0.69	1.40	4.18
Average	0.70	0.23	0.47	1.39

Table 2: Forage production of the pasture in the rainy season (ton/ha) in Gowa Regency.

Location	Grass	Legume	Other plants	Total
High	3.09	0.78	0.79	4.66
Middle	2.37	0.63	2.01	5.01
Low	5.56	0.45	0.38	6.39
Total	11.02	1.86	3.18	16.06
Average	3.67	0.62	1.06	5.35

The average of carrying capacity of natural pastures in Gowa regency was 0.88 AU/ha/year. This indicated that carrying capacity of natural pastures in this region was relatively very low. This based on the statement of [5], that the capacities of the tropics generally at 2-7 AU per hectare.

Low capacities of pastures in Gowa Regency were associated with lower forage production. Forage grown on pasture was dominated by native grasses in which the production was very low. The growth of the other plants which was fast enough was one of the factors that lead to low production of grasses and legumes. These conditions will certainly affect the productivity of forage in the pastures that were only reached an average production of forage 1.39 ton/ha in the dry season and 5.35 ton/ha during the rainy season. Carrying capacities are closely related to the productivity of forage in an area of grazing animals. The higher productivity of forage in a pasture area results in higher carrying capacity for animals. This indicated by the number of cattle that can be grazed in the pasture.

The results showed that, low availability of forage is closely related to the number of cattle grazing. Number of

cattle grazing in this region tended to be over stocking. Basically, over stocking does not provide adequate opportunity for forage to re-growth, consequently the growth and development of forage are hampered, while the other plants (non-edible) grow better. If this conditions last for a long time led to decrease the availability of forage, which in turn affect carrying capacity. Such conditions in line with the statement of Fan et al. [6], that an excessive number of animals cause over stocking is often found in natural pastures resulting in lower forage production which will further results in low capacities.

Efforts that can be made to improve the capacities of pastures in Gowa Regency are through the eradication or eliminate these types of non-feed plants and replace with the type of forage, either in the form of grass or legume with ideal proportions. On the other hand, to maintain the productivity of forage in pastures is to control or regulate the number of cattle grazing in the pasture. Control can be applied by making agreement between the farmers who utilize the pasture.

3.2. Botanical composition

Generally, there were two types of plantation in pasture; plants that can be used for animals as forage and those that cannot be used. Botanical composition of pastures in Gowa Regency is shown in Table 3.

Tabel 3: Plant species composition in natural grazing pasture in Gowa Regency.

Plant species composition		
Grass	**Legume**	**Other plants**
Cyperus rotundus	Desmodium intortum	Mimosa pudica
Axonopus compressus	Calopogonium muconoides	Chromolaena odorata
African grass	Crotalaria juncea	Lamtana camara
Imperata cylindrica	Eughorbia hirta L	
Cynodon dactylon	Phyllanthus niruri L	
Paspalum conyugatum		
Stenotaphrum secundatum		

On the natural pastures in Gowa encountered as many as 15 species of plants that comprising 12 plants species classified as palatable (7 grasses and 5 legumes) and 3 species were categorized as non-palatable. All these plantation species in the pastures were natural local species and there are no introduced species. Based on the number of species encountered (15 species), it can be said that natural grazing pastures in Gowa Regency quite vary. The description of the botanical composition of the pasture as a whole can be seen in Figure 1.

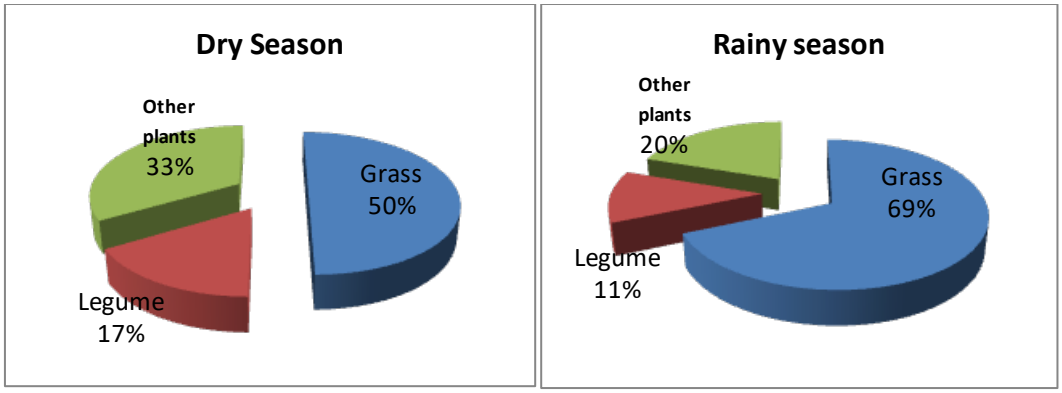

Figure 1: The proportion of plant species (%) on the pasture in Gowa Regency.

Figure 1 shows that the grass species dominate the pasture, followed by other plants and legumes. In the dry season, the grass composition was lower than in the rainy season, and it was inversely that the composition other plants were higher in the dry season. This difference is expected due to external factors (environment) which is the most important factor that determines growth and forage production in addition to genetic factors (internal). This was confirmed by Whiteman and his colleagues [7,4,8] which stated that the climatic factors that affect the growth and production of forage or forage crops including radiation, day length, temperature, humidity and rainfall.

The large proportion of non-feed forage or other plants indicated that the site area of grazing pasture in general need to be improved, because the other plants that grow together with the forage was able to compete for space or nutrients in the soil. Moreover, the proportion of legumes was still below 20%. Based on the standards recommended by [9], that the quality of the pastures are classified as good when the proportion between grasses and legumes is 3 : 2. This means that the quality of natural pastures in Gowa is low.

In addition, high grass species composition might be due to the growth of grass faster than legume. This is because the type of grass commonly grown form clumps, have a root system that is strong that, growing back quickly, rhizomes creeping and form new plants that quickly spread if it were cut either by animals or defoliation [9]. This is supported also by [5], that natural pastures were overgrown by grasses and legumes together, generally legume growth will quickly suppressed or hampered because it is influenced by the shade of the higher grass.

Based on the observations, the poor quality of forage on natural pasture was due to the utilization for grazing performed continuously, without any break. Pastures continuously used without being rested will cause the forage in the paddocks, both grasses and legumes under heavy pressure, causing stunted growth. Species that classified as legume forage is the type most affected by this problem. Vulnerable legume due to severe pressure because of legume has roots are less strong and resistant to trampling. In contrast, non-feed forage that is not eaten by the animals can grow well. These conditions will certainly affect botanical composition in the pasture. This in line with the study of [2], which stated that the quality of the forage is determined by the composition of the forage in a pasture planting area or to change the composition of the influence of climate, soil conditions and the effect of the use by livestock.

Therefore, efforts to improve the quality of the pastures including: 1) resting the pasture in order to give a chance to the legume grow better and 2) increasing the number and type of legume in the pasture, and 3) to set the time and the number of cattle grazing on the pasture.

4. Conclusions

It can be concluded that carrying capacity of the pasture in Gowa Regency was only 0.88 AU/ha/year. Botanical composition of the pasture consisted of 15 species as dominant, both grasses; Cyperus rotundus, Axonopus compressu, African grass, Imperata cylindrica, Cynodon dactylon, Paspalum conyugatum, Stenotaphrum secundatum, and legumes; Desmodium intortum, Calopogonium muconoides, Crotalaria junce; Eughorbia hirta L, and Phyllanthus niruri L; Another plant consists of Mimosa pudica, Chromolaena odorata and Lamtana camara.

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