Forage Resources for Bali Cattle (*Bos javanicus*) in Small Holder Farming Systems in South Sulawesi Province, Indonesia

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Abstract. Bali cattle (*Bos javanicus*) are a vital component of Indonesia’s crop-livestock farming systems. A research has been conducted to analyze the resources of cattle forage and its use on the systems of small holder farming in Bone regency, South Sulawesi Province, Indonesia. The research particularly conducted on the centre of “Bali cattle” development at Libureng district, Bone regency aiming to optimize the use of available forage and introducing the new forage. Research conducted on 4 (four) controlled villages namely Mattirowalie village, Bune village, Tappale village and Laburasseng village. The determination of selected farmers or called as “best bet farmers” conducted through selection towards the farmers to each village. The results of selection of “best bet farmers” obtained 5 (five) persons in each village so total farmer were 20 persons “best bet farmers” expected to be the example case study farmer or the pioneer farmer for the other farmers in conducting the innovative technology of improving cattle forage. The results of research showed that the forage resources of cattle were varied. The system of feed giving the combined forage between shepherd system and cut-carry system. If compared with the forage resources condition of cattle after this project implemented, there were the significant influence where farmers have been familiar to plant the forage in form of grasses and legumes then remain rice and peanut crop residues conservation for their cattle, while before they only focused on Native pasture or field grasses mixture and a little plants straw or crop residues.

1. Introduction

Forage is the important component in supporting the growth and production of cattle. Forage given to appropriated quantity and good quality will assure the productivity of cattle. In this case, the remedy effort of forage towards the cows and calves of cattle become the main attention. This will support the program of regional department of animal husbandry, South Sulawesi with the achievement target of one million cattle population in 2010 [4].

In the effort to achieve the increase of forage quality given and the quantity of forage fulfilling the life need for growth. New innovation to solve the problem of forage availability with the adequate quantity and good quality through the optimal use through the optimal use of local resources and introducing the new forage in form of the various grasses and legumes. This conducted to support the growth of cows affecting to the growth of calves through the application of remedy technology for location specified forage. Research about the remedy of cattle forage will be showed the optimal and good results where farmer were not only as the object, but also as the subject of analysis. Therefore researchers and farmers together conducting the analysis to farmer land and direct use obtained by farmers. This has been previously conducted by Corfield, et al. [3]; Hadi et al [5]; Horne and Stur [6] gave the real impact towards the behavior of farmers through mutual learning and working together.

In this paper, it is analyzed generally about the resources of forage for cattle then discussed on the case study of farmers activity. Guidance and consulting activity to farmers continuously conducted to make the understand and capable to manage the forage for cattle. Finally the will be the example
farmers/pioneer farmers for the other farmerseither around the controlled location or outside of location.

2. Material and methods
This research conducted in Libureng district, Bone regency, South Sulawesi province, Indonesia is one of the centre of “Bali cattle” development. This research was ACIAR-SMAR/2006/061 program i.e. the cooperation between AIAT/BPTP (Balai Pengkajian Teknologi Pertanian)South Sulawesi and CSIRO team Australia, Hasanuddin University Makassar, regional Department of Animal Husbandry (Dinas Peternakan) South Sulawesi province and regional department of Animal Husbandry Bone regency.The time of implementation included the preparation conducted started from 1 June 2007 to 31 may 2010
Research activity covered some parts as follow :
- Social economy survey and territorial biophysics analysis
- Finding the available potency particularly cattle forage
- Offering the alternate remedy of forage for the local cattle farmers
- Practicing the selected option together
- Diffusing to the other farmers either around the analysis location or outside of location.

Particularly in this writing, it was described about the use of available forage and introducing the new forage for the cattle in the small holder farms/small scale farming systems at Libureng district, Bone regency. Analysis conducted at 4 (four) controlled villages namely Mattirowalie village, Bune village, Tappale village and Laburasseng village. The determination of selected farmers or called as “best bet farmers”, conducted through the farmers to each village. The results of selection of “best bet farmers” obtained each 5 farmers at every village, so total farmer was 20 persons selected farmers where expected to be the case study example farmers pioneer farmers for the innovation of cattle forage technology. This analysis conducted on the field experiment together with field assistance (on ground team), researchers (project specialist team) and PPLs (field agriculture extension advisor).

The analyzed sector was the use of the available existing forage namely Native pasture or field grasses mixture, Elephant grass (Pennisetum purpureum), tree legume leaves (Gliricidia sepium) and the remain agriculture crop residues in form of straw conservation. In addition, to introduce, to plant and to use the new forage in form of grasses such as Paspalum (Paspalum atratum cv Higane), Mulato (Brachiaria hybrid cv Mulato), Panicum (Panicum maximum TD 58), Setaria (Setaria sphacelata cv Narok) and herbaceous legumes types or species such as Clitoria (Clitoria ternatea cv Milgarra), Centro (Centrosema pubescens cv Cardillo), Stylo (Stylosanthes guianensis CIAT 184). All new forage offered to the farmers to plant and to use. Started with the plantation of small plot which then expanded and developed based on their own land. If there were some preferred forage, it will be developed extensively and then introducing to surround farmers. The nearby farmer try to plant and to use the new forage obtained from 20 persons the selected farmers, that called as “scale-out farmers”. The diffusion from one farmer to other farmers will fast the adoption process of cattle forage remedy technology adoption because there were the process of knowledge transfer, working together and learning together in the natural equality.

3. Result and discussion
Before the project, the resources of cattle forage was varied although the limited quantity and low quality. The availability of cattle forage to 20 persons selected farmers previously has not yet fulfilled the need of forage dry matter per day namely average 2% DM towards the live weight of cattle. This caused by the cattle just feeding in the communal grazing area and the limited availability of land to plant the forage and a little use or has not yet use the agriculture waste optimally for example storing the peanut straw and rice straw conservation, however after the activity of this project implemented, the need of forage slowly fulfilled because farmers have already planted the new forage on their own land and storing the waste of agriculture crop residues for forage stock. The system of giving forage was still the combination between the shepherd system and cut-carry system. Therefore the Native pasture or field grasses mixture from the shepherd field was still the resources of main forage, beside the Elephant grass that started to plant and cultured particularly for the providing of cattle forage. While the plants waste such as rice straw was also
selected as the forage resources but restricting to harvest time. There were still a few farmer storing for the forage stock. It was also with the straw of peanut pointed as the resources of cattle forage although the limited quantity. The use of legume was still a little. There were still a few of Gliricidia type that sometimes given to the cattle. There were still a few obstacles where some forage still less preferred by cattle.

Figure 1 showed the available of forage condition and figure 2 showed the composition before the project of ACIAR-SMAR/2006/06. The availability of forage counted based on dry matter (DM) the quantity of cattle owned by farmer. Therefore the quantity of cattle owned by one farmer to other farmers were greatly difference, so the results of forage availability was differ for the quantity.

Figure 3 showed of the forage available condition and figure 4 showed of the forage composition after the implementation of the project ACIAR-SMAR/2006/061, this implemented to farmers who have already planted the new forage and storing the crop residues of agriculture plants waste as the forage conservation. In this case the availability of cattle has already fulfilled with the need 3% DM towards the live weight of cattle.

The preferred new forage were Paspalum grass and Mulato grass. Two type of this grass planted extensively because it easily cultured, low plants so it easy to harvest, leave was not itching, and preferred by cattle. The other advantage of Paspalum grass was not only can be planted with full sun shine directly or open air, but also can be exposed to under the cover tree with less sun shine, while the other advantages of Mulato grass was the capability to stand up from the dry climate.

Figure 1 showed that the availability of cattle forage to each 20 persons selected farmers before the project implemented average 7.08 ton DM per year not yet fulfilling of dry matter only about 2% DM towards the live weight of cattle per day. Figure 2. showed that the composition of cattle forage for each 20 persons selected farmers where dominated by Elephantgrass (51.5%), then respectively Native pasture or field grasses mixture (24.2%), peanut straw (17.6%), rice straw (8.5%), tree legumes leaves (0.9%) and a little of maize straw (0.1%) and banana stem (0.1%). Figure 3. showed that the availability of cattle forage to each person from 20 persons selected farmers after the project implemented average 11.4 ton DM per year capable to fulfill the need of dry matter 3% DM towards the live weight of cattle per day. Figure 4. showed that the composition of cattle forage for each farmer from 20 persons selected farmers where dominantly Elephant grass (44.9%), then respectively peanut straw (14.8%), Native pasture or field grasses mixture (14.5%), and rice straw (9.3%), Gliricidia (6.1%) and new grasses and legumes namely Paspalum (4.8%), Mulato (2.4%), Setaria (1.3%), Panicum (1.1%), Clitoria (0.4%), Stylo (0.3%) and Centro (0.1%).
Figure 2. The composition of cattle forage before the project

Figure 3. The availability of cattle forage after the project

Figure 4. The composition of cattle forage after the project
As case study example—“best bet farmer” (Nurdin), at Mattirowalie village

As the description of cattle forage system given by farmers, so one of case study on farmer described as follow. Giving the forage needs the attention from the aspect of quantity and quality. From the quantity aspect, it is necessary 3% DM towards cattle live weight in the calculation of dry matter needs consumed for the main life in achieving the growth level 3% DM x 275 Kg LW = 8.25 kg DM per day per AAE (Adult Animal Equivalent).

Farmer previously gave the forage less than 3% DM followed by the guidance and the advise conducted by farmer where already applying the forage needs suitable for their cattle. One example from this case study “best bet farmer” (Nurdin) in Mattirowalie village, has already conducted the forage remedy from forage consumption aspect that closely approaching to optimal needs for their cattle. In fulfilling the needs of cattle forage, farmer used the available forage resources i.e. Native pasture or field grasses mixture, Elephant grass, tree legume leaves and the crop residues of agriculture plants. It also introduced the resources of new forage in form of grasses and legumes. Farmer provided their land during this project were only as the place for their cattle shepherd. Any new grasses forage planted on the farmer land namely Paspalum, Mulato, Setaria, Panicum and herbaceous legumes as well as Clitoria, Centro, Stylo. This new forage previously planted in small plot then together selecting the preferred types or species and then to expanded.

From the quality aspect, it is necessary to pay attention on the given forage proportion. The dominant forage given were Native pasture or field grasses mixture and Elephant grass. This type of this grass previously given normally but after introducing the new forage, farmer started to combine the new forage and then suggested to use tree legume leaves (Gliricidia sepium). The new grasses mostly preferred by cattle and dominantly planted by farmer was Paspalum grass, while there were still grass types that still developed by farmers. Paspalum grass mostly preferred caused by the production of this grass was higher as reported by Bahar [1] that Paspalum grass managed intensively by regularly cutting, fertilizer and watering so it indicated the productivity equally with Elephant grass. Some type of herbaceous legumes type for example Clitoria, Centro and Stylo that has already planted and growing well but the extension was still small so the percentage of cattle forage composition was still small. Form the production of herbaceous legumes, it can be harvested 3 times [2]. Farmer has already given gradually as the first step as the test of “palatability”.

The significant result on introducing the new forage was the farmer capable to familiar and to know some types of new forage for cattle and also knowing the advantage of legumes as the protein resources to increase the quality of their cattle forage. In this activity, it is necessary to encourage the farmer to give the nutrient forage for the cows because the healthy cows can give the health of calves.
Figure 5. showed that forage quantity (Kg) given based on the calculation of dry matter, previously low then started increase with the addition until level 3% DM live weight or average 8.25 kg DM per day per AAE (Adult Animal Equivalent). Figure 6. showed that forage composition given per AAE (Adult Animal Equivalent), previously dominated by Elephant grass, then started variously with the addition grasses such as Paspalum and Mulato and also legumes such as Gliricidia, Stylo.

4. Conclusion
Forage resources for cattle in the research location was varied with the system of forage giving in the combination between the shepherd system and cut-carry system, however to obtain the quality of better forage quality was to plant the forage grasses such as Elephant grass, Paspalum, Mulato, Setaria and Panicum and forage legumes such as Gliricidia, Clitoria, Centro and Stylo. If compared with the forage resources condition of cattle after this project implemented, there were the significant influence where farmers has been familiar to plant the forage in form of grasses and legumes for their cattle, while before they only focused on Native pasture or field grasses mixture and a little plants straw or crop residues. This change expected to spread to other farmer around the village even to outside village so it can be obtained the add value for farmer.

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