ADOPTION OF AMMONIATED STRAW TECHNOLOGY BY FARMERS AT SUB-DISTRICT OF DONRI-DONRI, SOPPENG DISTRICT, INDONESIA

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Abstract

The low availability and quality of forage for livestock during the dry season is the main problem faced by the farmers in Indonesia. To alleviate the problems, the use of agricultural by-products that their nutritive value has been improved like ammoniated straw as animal feed is recommended. However, most farmers have poor understanding about ammonisation of straw technology. For this reason, an extension on ammonisation of straw technology was introduced to the farmers. However, after teaching on the ammonisation technology, practice of making ammoniated straw and demonstration on the superiority of using ammoniated rice straw as animal feed had been introduced to the farmers, only one of 20 farmers followed the training who adopted the technology. It is suggested that the purpose of raising the cattle is the main factor determining adoptability of the technology by the farmers.

Key-words: adoptability, ammonisation, extension, farmer, rice straw

Introduction

In Indonesia, lack of forage for ruminant animals during the dry season, both in quantity and quality is the main problem faced by most farmers. One way of alleviating the problems is through the utilization agriculture by-products or concentrates as feed to the animals. Due to high prices of concentrates, the utilization of agriculture by-products in Indonesia is more promising. During the dry season, agriculture by-products that has been used by farmers as feed to their animals is rice straw. Rice straw is the most abundant feed resources in rice producing areas like South Sulawesi that in 2015 yielded grain production of 5.47 million tons (BPS, 2016). Because the ratio of rice production and rice straw is 1 : 1 (FAO, 1989), it is estimated that rice straw production in South Sulawesi in 2015 was also 5.47 million tons. If cattle with body weight of 200 kg can consume rice straw of 2% of her body weight, such amount of rice straw can accommodate about 3.747 million of cattle annually. This figure are above the population of beef cattle and dairy cattle in South Sulawesi that in 2017 is estimated to be about 1.5 million head.

Although its high production potential, utilization of rice straw is low. After harvesting, most rice straw is wasted. The largest part is burnt in the paddy field that pollutes the air and contributes to global warming. A substantial part of rice straw in left in the field, undergoing natural decomposition that can impoverished soil because of its high C : N ratios. Although it can be used for many purposes such as livestock feed, compost materials, making paper, energy generation etc., its utilization in rural areas is low. During the dry season, a substantial amount of rice straw is used as animal feed, although it is unpalatable to cattle.

As animal feed, rice straw has low nutritive value. Its palatability is low, mighty because of its high fiber contents. Under natural conditions, cattle prefer to eat natural or improved grass rather than rice straw. Its crude protein content also low (2 – 4%), it is far under 7%, that considered a minimum value for maintaining high feed intake in ruminants.(Milford and Minson, 1968). Although it contains about 80% of substance which are potentially digestible, but actual digestibility by ruminants is only 45 to 50%. The net results is an energy intake which provides little or no surplus energy for growth, work or production (Jackson, 1978). When rice straw is used as sole diet, poor animal production has usually occurred.

One way of increasing crude protein, digestibility and intake of rice straw is through ammonisation using anhydrous ammonia or urea. According to Guo (1996), digestibility and feed intake of ammoniated straw can be increased by approximately 20% and the content of crude protein can be increased by two to three times compared to control. In rural areas of Indonesia, ammonisation of rice straw using urea may the best method to improve the nutritive value of rice straw because its price is cheap and easily found.

In rural areas of Indonesia, the increase of palatability of rice straw sometimes conducted through sprinkling with salt solution. Although this practice increases the palatability, it does not increase its protein content and digestibility. Due to its superiority, ammonisation of rice straw technique needs to be disseminated among the farmers to increase feed availability for their animals. For these reasons, an extension activity were performed with the objectives: 1.to introduce ammonisation of rice straw technology to the farmers, 2 to demonstrate how to make ammoniated rice straw and the superiority of ammoniated rice straw over non-ammoniated rice straw when fed to cattle, and 3. to determine the adoption rate of farmers to ammonisation of rice straw technology.

Materials and Method

The extension activity was performed from September to November 2017 at Kessing village, sub-district of Donri-Donri, Soppeng district, South Sulawesi Indonesia. There were three main extension activities were performed, i.e.:

1. Teaching on ammonisation of rice straw. This activity involved: the importance of providing good quality of feeds to ruminants, the superiority and limitedness of rice straw as feed for ruminants, how to overcome the low quality of rice straw, mainly through amm onisation. Ammonisation of rice straw was discussed in depth. This activity was attended by 20 farmers.
2. Practice of making ammoniated rice straw. This activity involved farmers who actively cut of long rice straw to shorter length, making urea solution, sprinkling urea solution on rice straw and sealing ammoniated rice straw with thick plastic. The method of making ammoniated rice straw followed the method proposed by Tengyun (2000). In brief, rice straw was spread over the thick plastic placed above hard soil. The rice straw (100 kg) was sprinkled with urea solution (40 litres water : 1 kg urea). The fermentation lasted for one month.
3. Demonstrating of superiority of ammoniated straw over non-ammoniated straw and superiority of supplementation of grass over non-supplementation. In this trial, we used four head of cattle weighing of about 120 kg. The grass species used as supplement to ammoniated straw were elephant grass (*Pennisetum purpureum*), *Brachiaria mutica*, and *Cynodon dactylon*. The cattle is kept in individual house with each drinking water and feed trough. The cattle was fed with ammoniated straw as much as 2 kg/day and supplemented with the four grasses *ad libitum*. The time of feeding the grass was at 8.00 AM and 16.00 PM. During the feeding trial, the farmers was asked to take grass from neighboring areas, weighing, fed them to cattle and counting its intake by cattle. This activity was lasted for one month and parameter measured was intake of fresh matter.
4. Determining adoption rate by the farmers who had followed all activities relating to rice straw ammonisation technology.

Results and Discussion

With low education levels and poor understanding about ruminant nutrition, the farmers seem hard to understand what ammonisation technology is, what's its purpose, how this technology can increase intake and animal production, etc. There were many farmers who did not believe if urea can be used to increase the quality of rice straw, because from their experience, many death of cattle derived from feeding urea. Further there were many scientific words like crude protein, digestibility, etc. that they didn't understand. It needed more time using easy understand local language (Bugis language) to answer what they asked.

The discussion about ammonisation technology continued until practice of ammoniating rice straw. The farmers was given opportunity to practice of making ammoniated straw. While reading manual book on ammonisation technology that had been distributed before, some of them asked why in rice straw ammonisation, urea, water and rice straw must be used in the fixed proportion ?. They also asked why urea solution should be mixed well with rice straw, why ammoniated straw must be sealed with thick plastic ?, etc. This questions were answered by us as soon as possible The activity and teaching on ammonisation of rice straw lasted about four hours.

The purpose of feeding trial was to convince the farmers to the superiority of feeding of ammoniated rice straw. Although data on intake of cattle in our work was not presented as this trial was un-replicated, intakes of cattle fed ammoniated straw and supplemented with grasses were higher than fed only rice straw. Results of our study is in agree with work of some other authors (Trach *et al*., 2001, Gunun *et al*., 2013) that ammonisation of rice straw improved intake of cattle. In the present study, it was revealed that in the first week of study, intake of rice straw and intake of rice straw supplemented with the three grasses were low, but at second and third week, intake was steadily increased and it peaked at the fourth week of study.

In the present study, cattle gain was not measured, however, it can be predicted that increasing feed intake would be followed by increasing cattle gain, as dry matter intake and gain of cattle is highly correlated (Davis *et al*., 1970). This indicates that in the present trial, ammonisation of rice straw is not only improved intake, but also increased the growth of cattle.

Although convincing and positive results had been obtained from feeding trial, adoption rate of farmers to rice straw ammnisation technology in quite low. Only one of twenty farmers who had followed the training will soon to feed ammoniated straw to his cattle. The other farmers are still considering to apply the technology. The farmer who adopted the technology is the man who fed the cattle and measuring their intake in the present feeding trial. He had watched well the superiority of feeding rice straw to cattle and he will soon to ammoniate wasted rice straw and feed it to his seven head of cattle that he reared on his backyard. He reared the cattle with cut and carry system and every day he take natural grasses in the field, carrying and feed these grasses to his cattle in the barn. With ammonisation technology, he feels very helpful because he can increase his feed sources. He intends to increase the number of his cattle in the near future because he feels that rearing cattle yields more profit than cultivating rice.

Different from one farmer who has adopted the ammonisation technology, most farmers in the extension area are reluctant to adopt the technology. This, partly might be related to the small amount of cattle they have. Most of these farmers have only two to four head of cattle per household. The cattle generally are left to graze on natural grasses located in road sides, lake sides, unplanted paddy field and other non-conventional areas as there are no grazing land in the area.. During the dry season most cattle were losing their weight, as there were no supplement feed was given to the cattle. Sometimes in the season, the cattle entering cropping areas and causing social problems. The purpose of raising cattle for them is mostly as saving material that can be sold anytime. They didn't care about feed quality, including quality rice straw, as their purpose to raise cattle is not to fatten the cattle. They will satisfy if their cow is pregnant and giving birth.

Besides the above factors, there are, perhaps, two additional reasons for the farmers not yet to apply the technology. First, the cost of collecting of the rice straw from the field to feeding location in the present time has been increasing. By using rice harvesting machine, distribution of rice straw in the field is more evenly. This makes collection cost of rice straw in the field become high. This is different from before when rice straw was harvested manually, in which rice straw placement in the field was more concentrated. Second, the farmers have poor understanding about ruminant nutrition and feeding. This is because no good linkages between researcher, agricultural extension worker and target farmer. When we introduce the technology to the farmers in the area, the farmers never heard and see the technology before.

Conclusion

Livestock production will continue to play a vital role in Indonesia, including in Soppeng regency. However its further development is hampered by problems related to low quantity and quality of forage during the dry season and the low quality of crop residues. Improved utilization of ammoniated rice straw would be a strategic solution to increase the farmer's income derived from livestock keeping. Although encouraging results of feeding of ammoniated straw to livestock has been demostrated, adoption rate by the farmer to the technology in extension area is low. Apparently, the purpose of raising cattle by the farmers is the dominant factor determining adoptability of the technology.

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