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Rice Straw Losses and its Impact on Livestock Rearing in Bangladesh

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Abstract: The existing practice of storing rice straw, routes of straw losses and problems related to livestock rearing in rural areas were studied in four selected villages of Mymensingh district of Bangladesh. The base line information on storage system of rice straw and livestock rearing problems were collected through PRA technique using a pre-designed questionnaire. From the survey it was identified that majority of the farmers stored rice straw traditionally making stack on the ground in unroofed condition and that caused considerable damage and losses of straw resulting shortage in the availability of rice straw for animals. Farmers reported that straw is lost in three stages - during harvesting, processing and storage condition. Harvesting loss was accounted for about 8 and 10% for Boro and T. aus straw, respectively. In wet season 25 and 23% of Boro and T. aus straw respectively, was lost during processing. About 18-20% of straw was lost during storage, which was mainly due to earthen evaporated gas, rat, termites, *anjona* (a reptile pest), poultry birds and excessive rainfall. In case of storage of rice straw the single most common solution for many problems as recommended by the farmers was to improve storage system. It may be concluded from the above results that traditional storage method leads to significant loss of rice straw resulting in feed shortage and impaired livestock productivity.

Key Words: Rice straw, routes of straw losses, impact, livestock rearing

Introduction

In Bangladesh ruminant animals are mainly fed on low quality roughage based diets. About 70% of the roughage available is crop residue and rice straw contributes about 87% of the dry roughage available for cattle and buffaloes (Tareque, 1991). Due to inadequate production of green grasses, rice straw has become the major feed resource for livestock production in Bangladesh. In some areas of the country rice straw constituting over 90% of dry matter intake due to lack of alternative feed resources. However, wet weather leads to serious losses in the quantitative and qualitative availability of straw due to heavy rainfall. Post harvest losses of rice straw during wet season due to spoilage is a major contributing factor to the subsequent feed shortage. In Bangladesh it has been estimated that about 7.7 million tons of rice straw dry matter is being rotten during the monsoon (Chowdhury and Huque, 1996). It has been reported that overall 21% of rice straw is lost due to spoilage as a result of faulty storage and heavy rainfall in Bangladesh (M. A. Akbar, personal communication). The adoption of improved storage technique will certainly improve the keeping quality of rice straw available for feeding to livestock. It will also enable farmers to store rice straw for longer periods. Improved storage technique could also help to store rice straw during the rainy season and periods of flooding when livestock feeding can be a major problem. Considering the above points the present research was undertaken to know the existing practice of storage of rice straw, routes of straw losses and problems related to livestock rearing.

Materials and Methods

Keeping in view the objectives of the study, PRA was conducted in experimental areas. Four villages in Mymensingh District were selected purposively. Among 4 villages Rajpur and Garaikuti are in Muktagachha Thana, and Mothbari and Boradoba are in Trishal Thana. The government officials of respective Thana offices helped in selecting these areas. The experimental period lasts from January to March, 2001.

Climatic condition of the experimental sites: The climatic condition of the experimental sites is characterized by light

rainfall during April- May and heavy rainfall during June- September. The soil is silt loamy to silty clay loamy and gray brown to dark gray. The agro-climatic condition of the experimental areas is shown in Table 1.

Baseline survey: A baseline information was collected through Participatory Rural Appraisal (PRA) using a pre designed questionnaire. PRA is a set of participatory and largely visual techniques for assessing group and community resources identifying and prioritizing problems and appraising strategies for solving them. However, PRAs were conducted to fulfill the following specific objectives for two groups of farmers in four selected villages of Mymensingh district. PRAs with cattle farmers aims to explore:

1. Feeding practices and storage facilities of animal feed specially rice straw.
2. Constraints to the production and safe storage of animal feed.
3. Opportunity for improving feed quality and availability.
4. Causes of straw losses during harvesting, processing and in stored condition.

Procedure for conduction of PRA: The multi disciplinary team of the BAU including two women facilitators conducted PRA in four selected villages. After selecting the target groups, the facilitators explained the specific objectives to the participants of respective group of farmers and women participants. Local educated persons, NGO and DAE personnel assisted in conducting PRA survey. Initially, team members from BAU visited the study areas and tested the proposed methodology with each respective group of farmers. In the first place, team members sat with the participating farmers, introduced themselves, and clearly stated the purpose and objectives of the visit. Team members discussed with participants of each villages the salient physical and biological features of the village e.g. topography, cropping system, cultivated crops, livestock rearing, storage of straw and feeding, systems roads and houses and other socioeconomic infrastructures and recorded these informations. After that the PRA participants mentioned the primary problems, intermediate

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Table 1: Agro-climatic conditions of Trishal and Muktagachha

Experimental area	Agro-ecological zone	Soil texture and colour	Physiography	Climate		Drainage/Flooded
				Annual rainfall (mm)	Mean annual temp. (°C)	
Trisal and Muktagachha (Mymensingh)	9b	Silt loamy and silty clay loamy. Gray brown to dark gray	Most areas have broad ridges and basins. Relief is irregular. The difference in alleviation between ridge tops and basin centers usually is 2-5 meters.	2000-4000 (<15->40)	25.3	Shallowly flooded. Early and rapid flooding by run off from adjoining higher land when heavy pre-monsoon or early monsoon rainfall occurs locally. Other time flood level are controlled by flood level in the Jamuna.

Source: FAO-UNDP, 1988

Table 2: Village wise target group participation in the PRA

	No. of participants participated in the PRA				No. of session
	Small farm households		Medium farm households		
	Farmers	Women	Farmers	Women	
Muktagachha					
Rajpur	8	8	8	8	4
Garaikuti	8	8	8	8	4
Trishal					
Motbari	8	8	8	8	4
Bhoradoba	8	8	8	8	4
All villages	32	32	32	32	16

problems and finally the root causes of each problem. Before the session it was pre-designed the procedure of finding and ranking of the problems using Causal Diagram. In the second step, primary problems were scored by the selected farmers according to the severity of the problem. Each problem was assigned maximum of ten marks and the farmers allocate marks out of ten to each of the primary problem. The allocated mark of each primary problem was then divided into the intermediate causes according to their severity. Finally, root causes were identified by farmers and scored by adding the individual scores of all related intermediate causes. In the third step, the ranking of each root causes was made according to scores. After identification of the root causes of problems, ranking was made by summing up the scored value and then attempts were made to find out their solutions. Opinions of the participants were obtained in chalking out probable solutions of each problem.

Target group selection: Considering the majority and concentration of farm households, small and medium farmers were selected for conducting participatory rural appraisal (PRA). Secondly, one of the main criteria of selecting these farm households was that, only those farmers were selected who owned at least two cattle heads. For each household wives of respective group of farmers were also being included as participants of PRA to know their participation in cattle rearing and other household activities. Therefore, there were four groups of participants in each village and accordingly four individual PRAs were considered (Table 2). In each group there were 8 participants and in total 64 farmers and equally 64 women participated in PRA.

In all the selected villages, the different sizes of farm households

were identified using their own criteria. Bearing in mind the objectives of PRA study, four groups of participants as shown in Table 2, were selected to conduct PRA. In each group of PRA sessions there were 8 participants and in total 64 farmers and equally 64 women participated in PRA. Table 2 and 3 show the details of target group segmentation.

Survey data analyses and presentation: The data information collected through PRA questionnaire were analyzed and presented in the form of tables, figures, flow diagram and scored causal diagram.

Results and Discussion

This is almost a new study in Bangladesh aspect since very limited work has been done relating rice straw losses and its impact on livestock rearing. So, this study has been conducted to collect information in that field.

Existing practices of storing rice straw: Majority of the farmers in the study areas cultivated rice at least twice a year, once in winter season (T. aman rice) and also in wet season (Boro rice). Very few of them cultivated Aus rice. Crop calendar indicating the sowing and harvesting time of different varieties of rice is shown in Fig. 1. After harvesting, the farmers thresh rice and dry up the straw in the sun for storing. Except rice straw, no other crop residues were stored by the farmers to feed their animal. After drying straw properly, they follow the traditional method of storage - making stacks on the ground in open area by putting layers of straw and making the shape like the dom of mosque. The stacks were not covered to protect it from rain - water damage. This

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Table 3: Socioeconomic characteristics of target groups in selected villages

Small farmer	Own small size of land (<1.00 ha). Many of them (>50%) rented in land to make size of holding larger and to have more farm production. Few of them temporarily work as a day labourer to supplement their household income. About 60% small farmers own cattle heads 2-3 in nos. Some of them have only one, preferably a cow. Produce 2-3 times rice production is available for household consumption. Straw is the main feed for animal and its supply is available, in most cases, for 9-10 months. Farmers store rice straw in open place that cause damage and losses.
Medium farmers	Own land 1.01-3.03 ha. Some of them also rented in land. More than 80% farmers own cattle heads 2-4 in nos. Most of them (90%) produce sufficient amount of straw but open storage causes damage of straw. Produce 2-3 times rice in a year. Rice is a principal food and it is sufficiently available for consumption.
Women participants	Women of different farm households, most of them are housewives. They are actively involved in household activities particularly in cattle rearing, and processing and storing of rice straw.

Table 4: Rice growing season indicating sowing and harvesting period

Crop	Sowing period	Harvesting period
T. aman	Late June-September	Late November-January
Boro	December-Mid February	Mid April-June
T. aus	Mid March - Mid April	Mid July -August

Table 5: Farmers reported the causes of straw losses

Crops	% of straw damaged and losses from total amount produced	% of losses suffered from (considered spoilage amount = 100%)		
		Continuous raining	Less sun shine	*Others
T. aman	18	-	20	80
Boro	50	80	10	10
Aus	48	85	5	10

*Termite, rat, *anjona* (a reptile pest), poultry, birds and evaporated gas from the soil.

system of storage exposed straw to rain water on the surface area of the heap as well as to the pests like rodents etc. from the ground attached portion which seriously damaged the dried straw. In a previous study in Asia (Doyle *et al.*, 1986) and Bangladesh (Chowdhury and Haque, 1996) have also described that the farmers stored rice straw in stacks in open area. Moreover, Doyle *et al.* (1986) also indicated that stacks may be built under trees to give some protection; raised wooden platforms, polythene, corrugated iron or coconut tree leaves can also be used to improve storage condition.

Causes of straw losses: The sample farmers participated in the PRA programme and discussed and passed their views regarding damage and losses of straw from harvesting to storing. Three stages of straw losses as reported by PRA participants are shown in Fig. 1. In a previous study Tripathi *et al.* (1995) described that storage losses range from the shattering and loss of leaves, the most nutritious part of straw, leaching of soluble nutrients by rain, potentially large losses due to mould damage and bleaching by exposure to sun shine causing losses of nutrients.

Straw losses during harvesting: Usually Boro and T. aus are harvested during wet season as shown in Table 4. Due to excessive and continuous rainfall sometimes water stand in the crop field at the time of harvesting and in that case the farmers can collect straw partially. Secondly, because of the continuous raining, farmers can not make good harvest of rice which also causes loss of straw. Farmers reported that 8 and 10% straw of Boro and T. aus, respectively, was lost during harvesting.

Straw losses in processing: Fig. 1 and Table 4. show the crop calendar, and sowing and harvesting period of rice. Only T. aman was harvested in dry season but Boro and T. aus in wet season. During dry season, there was enough sunshine for drying straw which was not available in the wet season because of the frequent rainfall and the farmers faced serious problem of drying straw, consequently there was spoilage. That the estimated spoilage of Boro and Aus straw to be 25-23%, respectively which is also reported by Akbar *et al.* (1995). In dry season, farmers dried their harvested T. aman paddy in the field. At the time of drying straw grazing cattle and birds destroyed straw only a little quantity(2%). However, out of total losses of straw for Boro and Aus, more than 80%, (Table 5) and sometimes 98% (Akbar *et al.*, 1995) caused by continuous raining. Participated farmers reported that the spoilt straw was used for making compost with cow dung however, sometimes the less spoiled straw was used for feeding animals during crisis period. After feeding spoiled straw, animal health as well as milk production were affected.

Straw losses in time of storage: Both small and medium farmers stored rice straw in unroofed condition in open area and did not use any platform for storage. Accordingly, quality and safety of straw had been affected. Most of the farmers expressed their opinion that rain water damage the upper layer of straw stack, and poultry birds and *anjona* (a reptile pest) make losses and deteriorate the quality of straw (Table 6). Secondly, due to unplanned storage, rat and termite also damaged the straw. Thirdly, evaporated earthen gas destroyed the bottom portion of stored straw. Adding all these causes farmers mentioned that estimated total loss might be 18-20%.

Problem ranking of storage of rice straw and rearing of livestock and the causes and recommendations for solution: As has been mentioned earlier that rice straw is the main feed for ruminants in Bangladesh and the farmers usually store rice in the open place and that causes damage and losses, and deteriorate the quality of straw. On the other hand, due to shortage of animal feed, cattle owners face serious problem of rearing livestock. Therefore, safe storage of rice straw and livestock rearing are interdependent and interrelated. Accordingly, these two issues were taken into account to identify the major causes and constraints of storage of rice straw and rearing livestock by small and medium farmers. However, to determine the scale and magnitude of problems and constraints of storage of rice straw and rearing livestock, the method of Causal Diagram was used. Among the group of PRA participants, both small and medium farmers were considered to discuss the problems and constraints they face in storage of straw and rearing livestock. Issues raised in discussion with the selected farmers of Rajpur, Garakuthi, Motbari and

Table 6: Farmers' experience of causes that affected the quantity of stored straw

Causes affecting quantity and quality of stored straw	Small farmers (%)	Medium farmers (%)	All farmers (%)	*% of stored straw losses
Rain water damaging upper layer of open stored straw	80	70	75	5
Damaged by poultry birds and <i>anjona</i>	90	95	93	8
Rat and termite damaging bottom portion of stored straw	60	70	65	3
Evaporated earthen gas and wet soil spoil bottom layer of piled straw	90	80	85	2

*Considered 100% in stored condition

Table 7: Root causes of problems resulting in losses of stored straw

Overall rank	Total scored	Root causes of problems and constraints
1	23	Poor management of farmers in storing straw (farmers follow traditional unroofed storing, and they are unconcerned and reluctant to improve management).
2	6	Lack of capital of farmers to take measures for protection of losses of straw

Table 8: Root causes of problems of rearing livestock

Overall rank	Total scored	Root causes of problems and constraints
1	10	Extensive and intensive cultivation of rice (left small land for other crops)
2	8	Lack of administrative control (in providing services of veterinary doctors and facilities of veterinary hospital, and security of cattle farmers).
3	5	Veterinary hospitals services are not available in villages
4	5	Poor management and losses of stored straw
5	1	Degradation of social security and stolen of cattle

Bhoradoba and estimated scoring were documented in Fig. 2 and 3, respectively. It may be noted here that the problems faced by small and medium farmers were almost same and also in the same scale, and accordingly their common problems and views are presented here together.

Scored Causal Diagrams on storage of rice straw and rearing livestock are presented in Fig. 2 and 3, respectively and their corresponding root causes are discussed in Table 7 and 8. The root causes of problems of storage of rice straw and rearing livestock and their recommendations for solutions are discussed below the Table 7 and 8, respectively.

In case of storage of rice straw the single most common solution for many problems as was recommended by the farmers was to improve storage system through better management.

To overcome the losses of stored straw management of storing should be improved. Polyethylene, old fishing net and other necessary materials should be used on unroofed storage of straw. Wooden or bamboo platform should be made in order to protect straw losses from earth surface heat and rodents. Low cost roofed storage might be introduced through extension and motivation of farmers and by training on structural design of roofed storage. Credit on simple terms and condition should be provided to the farmers for proper storage of rice straw.

To overcome the problem of rearing livestock, supply of green fodder to animals should be increased by introducing fodder crops without or with minor changes in the existing cropping system, as

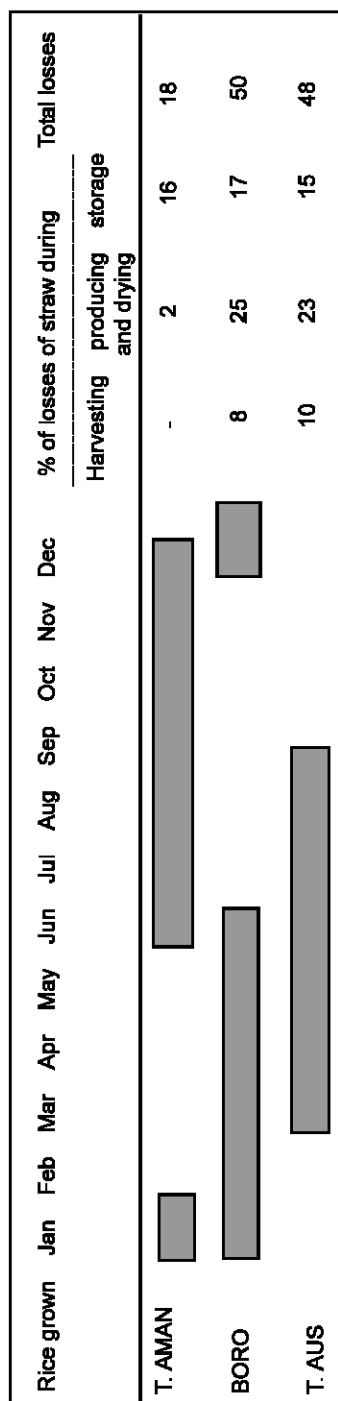


Fig. 1: Crop (rice) calendar and percentage of losses of rice straw

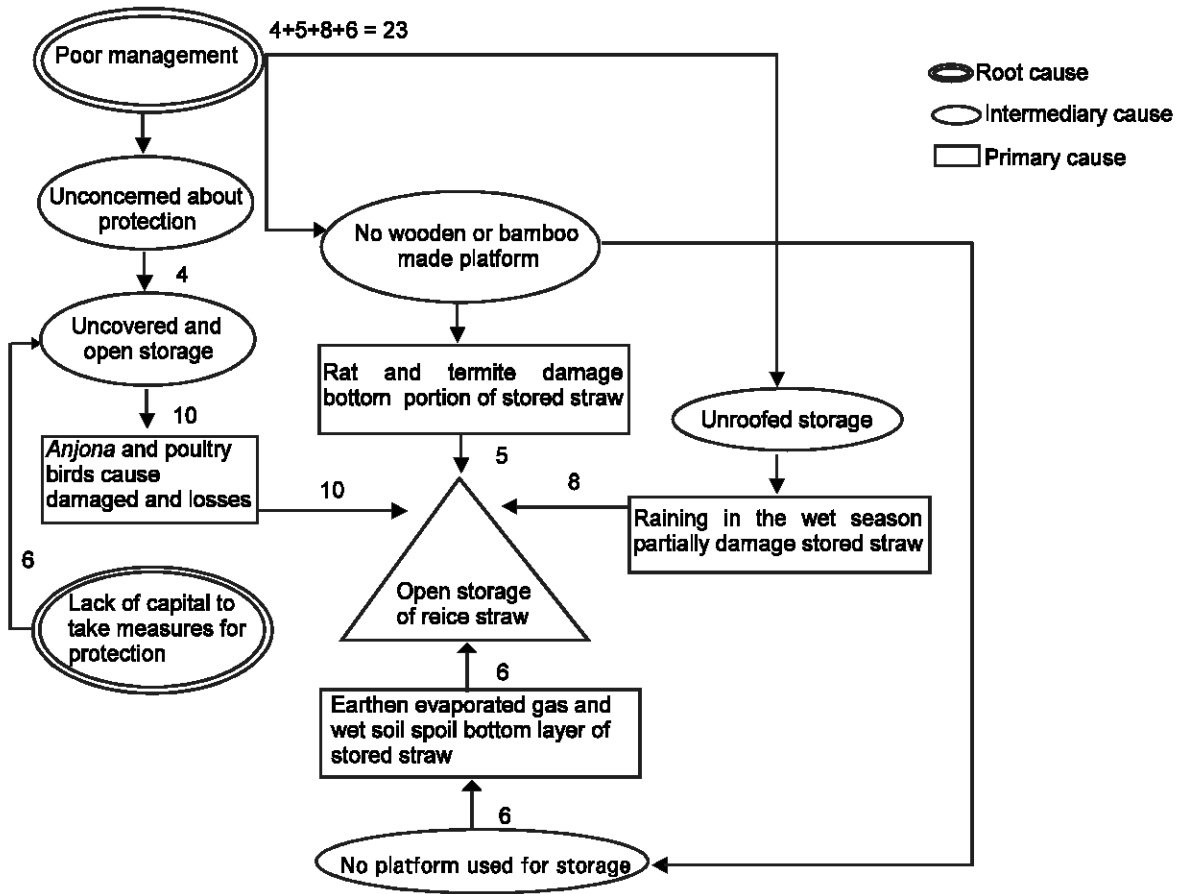


Fig. 2: Scored causal diagram on storage of rice straw in the study areas

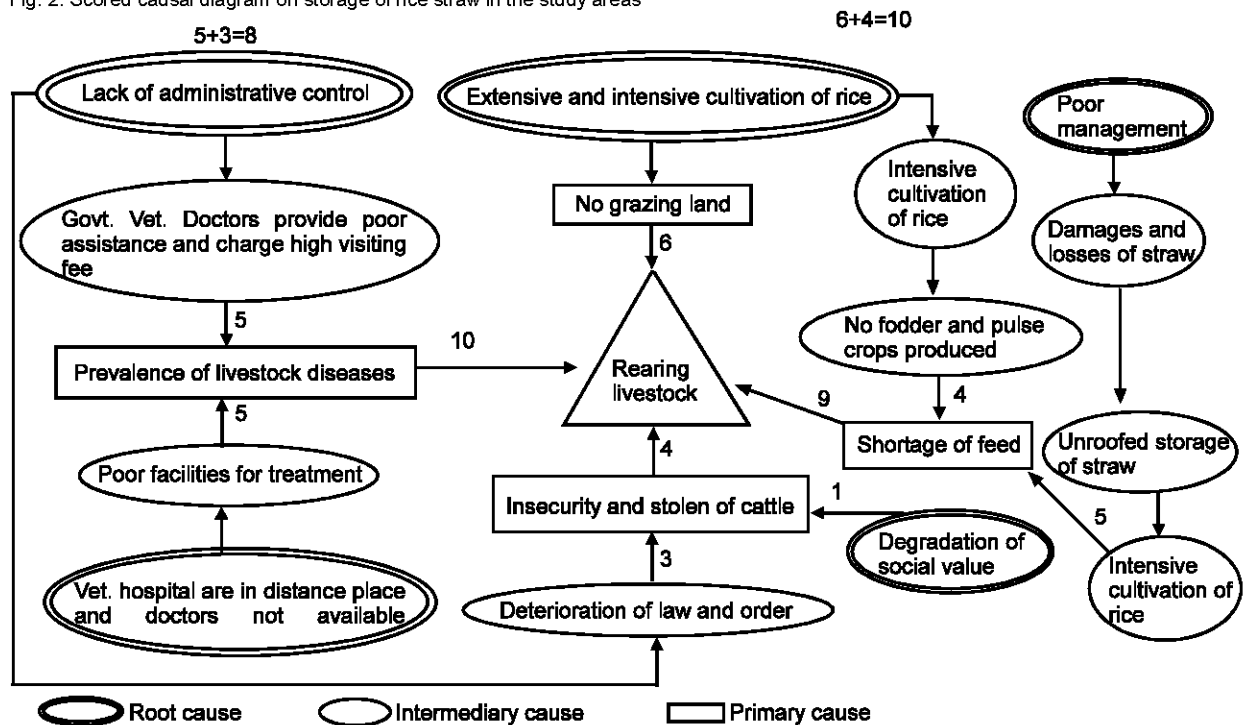


Fig. 3. Scored Causal Diagram on rearing livestock in the study areas

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suggested by Akbar *et al.* (1995). In between T. aman and Boro rice, short duration legume fodder should be introduced. Disciplinary steps should be taken by the administration against irresponsible officials to ensure veterinary services to each farmer. Government should take measures to improve law and order situation and thieves of cattle should be punished. Training and motivation should be organised to develop social values and awareness of government veterinary doctors and other relevant officials.

It may be concluded that for improving seasonal availability and to conserve straw quality, improve storage technique is essential. Measures should be taken to protect straw losses by using low cost roofed storage.

References

- Akbar, M.A., S.M.A. Islam, and S. U. Bhuiya, 1995. Socioeconomic survey on small-scale rural mixed farming (crop-livestock) of Bangladesh with a view to introducing fodder legumes in their cropping system. Final report EMC A0447. Natural Resources Institute, Chatham Maritime, UK and Bangladesh Agricultural University Research System, Mymensingh, Bangladesh.
- Chowdhury, S. A. and K. S. Huque, 1996. Study on the development of a technique for preserving straw under wet condition in Bangladesh. *Asian-Australian J. Anim. Sci.*, 9: 91-99.
- Doyle, P.T., C. Devendra and G. R. Pearce, 1986. Rice straw as a feed for ruminants. Published by the International Development Program of Australian Universities and Colleges Limited (IDP), Canberra.
- FAO-UNDP., 1988. Land Resources Appraisal of Bangladesh for Agricultural Development. Agro-ecological regions of Bangladesh. BGD/81/035, Tech. Report no. 2, FAO, Rome.
- Tareque, A. M. M., 1991. Feeds & fodder resources in Bangladesh and patterns of utilization. ADB, Second Livestock Project, TA No. 668-BAN.
- Tripathi, H. P., A. P. Singh, V. S. Upadhyay, H. P. P. Kessels, A. S. Harika, S. Sahab and M. N. M. Ibrahim, 1995. Forage conservation, storage and feeding, pp: 303-323. In a handbook for straw feeding systems, ed. Singh, K. and Schiere, J.B., pub. Indo- Dutch project on bioconservation of crop residues