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Emphasis on Rice Milling by Products Instead of Straw for Feeding Livestock

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Abstract—*Rice straw is sole feed for livestock in some rice producing countries. Although it has low nutritive value but earlier some mechanical and biochemical means adopted to improve its quality for low producing native livestock. Now a days the situation changes due to increase the production of high yielding varieties of rice because the plant become shorter and stronger, which indicates further lignifications. So, cultivation of high yielding variety of rice makes the straw meaningless to consider for feeding. Alternatively high yielding varieties of rice increase production of rice and simultaneously rice milling by products. Rice milling by products would be a potential source of animal feed after improving their quality following some biochemical methods.*

Keywords: *Rice milling, animal feed, straw, rice bran.*

Global rice production: Rice is the cheapest and most effective staple food around 50% of the global population. In Asia and South Asia the figure is around 70% (Bishwajit *et al.*, 2013). Bangladesh is the fourth-largest rice producer among other rice producing countries. In spite of the decline in the country's arable land since its independence in 1971, the area harvested increased from almost 10 million ha in 1995 to nearly 12 million ha in 2010. Rice yield also increased in the last decade, from a low of 2.85 t/ha in 1995 to almost 4.42 t/ha in 2014 (http://ricepedia.org/bangladesh). These increases in rice yield and total harvested area contributed to higher rice production, which nearly double from over 26 million tons in 1995 to 52 million tons in 2014 (http://ricepedia.org/bangladesh). Rice production trend in the world and in Bangladesh shown in Figure 1 and 2, respectively. Higher production of paddy increases the production of straw and milling by products. Now it's a question either the straw would still consider as feed for livestock or give emphasis on the milling by products.

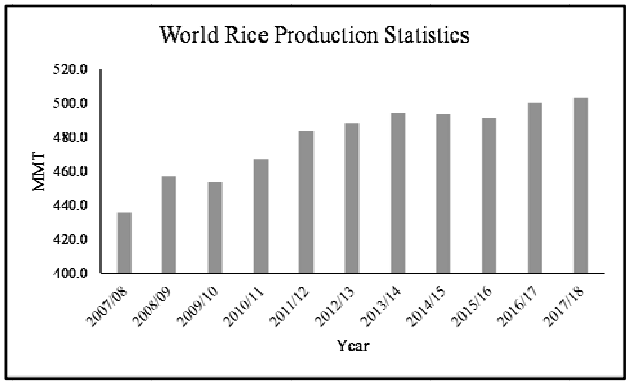

Figure 1. World rice production trend(IRRI 2015)

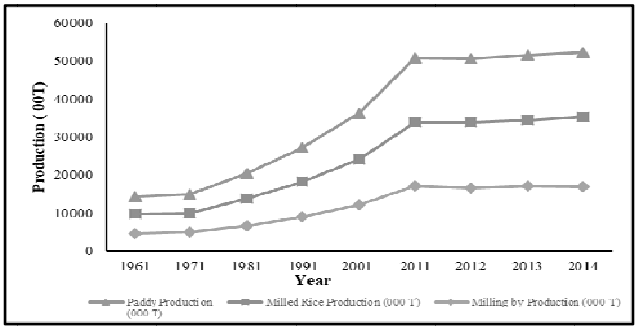

Figure 2: Paddy, milled rice and rice milling production trends in Bangladesh (http://ricepedia.org/bangladesh)

Straw as crop residue: Due to presence of lignin, fiber and silica (mainly in leaf), several researchers suggested for chemical, physical and microbiological treatments to improve the quality of straw for feeding livestock. Some cases urea considered as non protein nitrogenous substances to add for treatment of straw for the synthesis of protein by ruminal inhabitant. Molasses also added as a source of readily available carbohydrate to enhance microbial growth. Treatment by ammonia and alkali are some strategy to improve its nutritive value. But, now a day the straw from

high yielding varieties of rice are shorther, stronger and erected leaf, which is related to lower biomass yield and further lignifications. Those factors are also related to higher grain to straw ratio (Figure 3 and 4). So, straw production reduced and quality further decrease for feeding livestock.

Quality of straw from high yielding variety has relationship with palatability as feed for livestock was studied. Several case studies reflected that most of the cattle were pasturing where very short length grasses were available (Figure 5). Cattle have no interest for feeding straw and they avoid when they have choice for grazing scarce situation of grasses (Figure 6).

Figure 3: Conventional (left), high-yielding and low tillering ideotype (right)

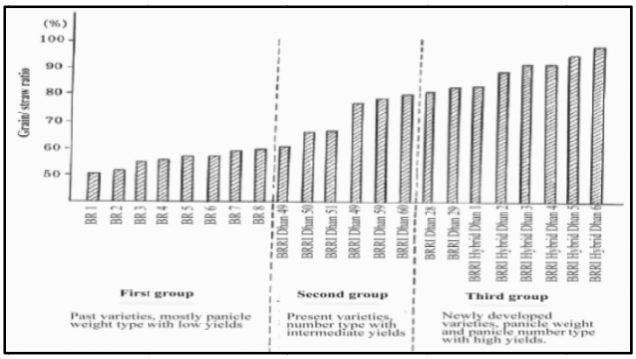

Figure 4: Trend to increase the grain and straw ratio (http://ricepedia.org/bangladesh)

Figure 5. Grassing in a poor pastureland

Figure 6: Cattle does not like fresh straw

In rice producing countries straw has fed to the livestocks those are low producer but recent development of high yielding varieties of rice the situation become more crucial. Due to less straw production, highly lignifications, high silica content in leaf the straw from high yielding variety is not suitable feeding modern dairy cow even for low producer local breed. So, this is real time to give emphasis on fodder production for livestock feeding. Fortunately high yielding variety of rice producing low quality straw and less amount of straw but producing large amount of by products from rice milling industry would be a good source of feed for livestock.

Types of rice milling industry: Most rice varieties are composed of roughly 20% rice hull, 11% bran layers, and 69% starchy endosperm, but the categories and the amount of by products depends upon the type of rice and milling industry. The rice mills are generally classified as traditional rice mill, husking rice mills, semi-automatic rice mills and automatic rice mills.

a) Traditional rice mills are those rice mills, which are operated at village level using simple traditional technology and local made devices. The process involves cleaning of paddy, soaking, parboiling (traditional), sun drying, and milling with Engelburg huller, aerating and bagging.

b) The production process of a husking mill also follows different stages like automatic rice mill and most of the works of a husking mill is conducted manually.

c) The process of semi auto rice mill involves cleaning of paddy, steaming, mechanical drying, milling with rubber-roll huller, rubber polishing, aerating, bagging and weighing. Rice produced in semi-automatic rice mill is well polished and less broken. Husk and bran are obtained separately, and have better use in briquetting and edible oil extraction.

d) Automatic rice mill has four basic stages-dryer, husking, whitening-polishing and finishing (grading, blending, and packaging). After milling a good quality rice has produced as well as different types of by product produced.

Rice mill by products: Following table (Table 1) giving a clear picture of capacity, separation method, product and by product of different catagories of rice mill. There is a clear picture that around 15% by products are available after milling the paddy, which would be use full as feed for livestock. Each of the byproducts has special feature for chemical composition and nutritive value. Utilization of bran as feed especially for monogastric animals is limited due to its high fiber content and ant nutritional factors such as phytic acid. Inclusion of deoiled rice bran is not more than 10.0% in poultry ration has recommended. But further processing would improve the quality of by products.

Table 1: Categorization of rice mill and their products

	Traditional	**Husking**	**Semi auto**	**Autometic**
Bran separation	Manually	Manually	Mechanically	Fully mechanically
Total steps	Seven (7)	Eight (8)	Ten (10)	Sixteen (16)
Min. Capacity (t/h)	0.3-1.0	0.6-1.0	2-5	5-20
Product (%)				
Milled Rice (edible)	70.00	62.50	62.50	65.00
Husk	-	23.25	23.25	20.00
Rice Bran	30.00	8.75	8.75	7.30
Rice Polish	-	-	-	2.70
Broken Rice	-	5.50	5.50	1.25
Black Rice	-	-	-	2.10
Paddy Dust	-	-	-	1.65
Total	100.0%	100.0%	100.0%	100.0%

Improvement the quality of feed mill by products: The previous researchers had attempted to follow different techniques to increase inclusion level of rice bran in poultry ration, such as fermentation (Wizna *et al.,* 2012), enzymes supplementation (Tirajoh *et al.,* 2010). Supriyati *et al.,* (2015) also found significant ($p<0.05$) effect of fermentation on the fiber content of rice bran. Yanke (1998) studied that phytate phosphorus decreased from rice bran by using rumen liquor. Fermentation of rice bran with *Bacillus amyloliquefaciens* increase digestibility of crude protein, calcium and phosphorus (Abbas, 2012). So, fermentation by yeast increase single cell protein in rice bran which is a quality protein having perfect amino acid profile as animal protein, would reduce phytate-P, fiber content as well as some cases use non protein nitrogenous substances as a source of nitrogen may useful for body protein of microorganism. Consideration above factor rice mill by products should be emphasized for further development to consider as promising animal feed.

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