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Beef Cattle Production in Bangladesh- A Review

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Abstract: A large number of farmers involved in bull fattening just before 3 or 4 months of Eid-Ul-Azha (Muslim festival), when they sell the animals with profitable prices. Cattle fattening for beef production have become an important business of the small farmers in Bangladesh. In few areas of Bangladesh a small scale commercial beef fattening program has already been started. Straw is the important crop residue; contribute the major portion of the fibrous part of the diet of the beef cattle. Rice straw is the basal feed for ruminants with low nutritive value and low digestibility. Farmers use rice straw of traditional varieties, green grass, sugarcane tops, wheat and rice bran, molasses, pulse bran and locally available resources such as pumpkin, carrot, banana, vegetable by products, rice gruel, boiled rice bran, oil cakes etc for beef fattening. The chemical treatment of straw is the most effective and economic method to improving the quality. Straw is mainly treated with urea and molasses and in some cases chemical treatment also done by the farmers. Urea molasses straw treatment in beef cattle resulted higher body weight, dressing percentage and also in better carcass quality than untreated straw. The acute shortage of feeds and fodder has long been identified as a serious constraint to optimum livestock production in Bangladesh. The nutritional factor is considered a major constraint to livestock productivity. Traditional grazing field is scarce except in some pokets in Pabna and Sylhet districts. Farmers used three years old cattle for beef fattening and maximum growth rate between 1.1 to 1.4 years of age. Cattle fattening period is 4.5 months in rural areas of Bangladesh.

Key words:

Introduction

Livestock is recognized as an integral component of rice based agricultural production system in Bangladesh. The economy of the country largely depends on agriculture. Livestock being one of the four components of agriculture (such as crops, livestock, fisheries and forestry) plays a

vital role in national economy, contributing about 6.5% of gross domestic products (GDP) and 13% of total foreign exchange earnings (Anonymous, 1991). Livestock plays an indispensable role in the traditional agriculture and largely subsistence economy of Bangladesh (Haq, 1992). The landless and marginal farmers largely depend on livestock for their survival (Ahmed, 1992). The total livestock population in Bangladesh is estimated as 24.34, 0.88, 11.55, 30.33,123.00 and 16.00 million cattle, buffaloes, sheep, goats chicken and duck respectively (FAO, 1996). Cattle of Bangladesh is an inseparable and integrated part of the agricultural farming systems and it ranks 12th in the world and in the Asian countries, her position is third (Alam ***et al.***, 1994). Bangladesh has a higher cattle population than any other countries of European Economic Community (EEC) (Allen, 1990) and distributed with a greater density (2.6 cattle and buffalo heads ha^{-1}) compared to other Southeast Asian countries (Assaduzzaman, 1996). Though livestock are huge in number in Bangladesh but in respect of per animal output, they are one of the poorest in the world.

It is reported that 75% of the world's cattle population is in the developing countries (Asia, Africa and Latin America), but it contribute only 34% of the beef production (Rahman, 1992) in the world. The annual meat production in Bangladesh is about 290000 metric ton, where as beef contributes 161000 metric ton (FAO, 1998) of the total meat production. Modern technologies, if properly generated through research and adopted in respect of breeding, feeding, management and disease control can raise the production to a much higher extent. For instance, a large number of farmers involved in bull fattening just before 3 or 4 months of Eid-ul-Azha, when they can sell the animals with profitable prices. Even, some landless people carry out fattening programmed year round as a way of their livelihoods. Cattle fattening for beef production have become an important business of the small farmers in Bangladesh (Sabur ***et al.***, 2000).

Straw is the important crop residue, contributes the major portion of the fibrous part of the diet of the ruminants in the tropical and subtropical countries. In Bangladesh, out of the total 29.1 million tons roughages available for ruminants, rice straw contributes around 23.57 million tons (81%) and green grasses only 1.6 million tons (Tareque, 1985). Four metric ton fodder produced in Bangladesh every year which is very scant from required amount (Saadullah, 1991). Therefore, rice straw is the basal feed for ruminants with low nutritive value and low digestibility.

Hossain ***et al.*** (1995) conducted an experiment to asses the rural beef fattening programme with traditional feeding practices (tethering, grazing and tree leaves with rice straw). They stated that farmers use rice straw of traditional varieties, green grass (road sides and weeds), sugarcane tops, wheat and rice bran, molasses, pulses bran and locally available resources such as pumpkin, carrot, banana, vegetable by products, rice gruel, boiled rice bran etc for beef fattening. Hossain and Alam (1993) conducted a feeding trial with raising indigenous bull for beef purpose. The practice would be done by 4 kg green grass/day/bull and 1-2 liter rice gruel per

day in a modified technology.

Rice straw is the major crop residue being used as sole feed for cattle and buffaloes in Bangladesh. The animal productivity in Bangladesh largely depends upon the efficient utilization of this poor quality rice straw with low nitrogen content and low digestibility due to high lignin and silica content. The chemical treatment of straw is the most effective and economic method to improving the quality. Many experiment have been done on calves, heifers, bulls and dairy cows to know the effect of urea molasses treatment of straw on milk yield, body weight changes and reproductive performance but few research works on intake, nutrient digestibility, feeding behavior, fattening and carcass characteristics have so far been conducted. Some related research works are reviewed and discussed below.

Animal feed resources for beef fattening

The acute shortage of feeds and fodder has long been identified as a serious constraint to optimum livestock production in Bangladesh. The nutritional factor is considered a major constraint to livestock productivity. A sensible livestock development strategy needs to match the feed resources, type of animals and the animal products with the national requirement (Devendra, 1993). It is obvious from the experience over generation in Bangladesh, that an almost exclusive diet of rice straw, with little or no supplementation covers the nutritional needs of livestock, but that stunts growth, impairs reproduction, lactation and working ability. The main feed supplies for cattle, buffaloes, sheep and goats come from by-products of cash crops. The animals graze for grasses or any feeds that may be available on the non-cultivated areas along with wayside. The bulk of the roughage for livestock feeding consists of rice straw, wheat straw and sugarcane tops and wayside grasses besides aquatic plants and tree fodder. Water hyacinth, banana leaves and stems, tree leaves and sugarcane tops also constitute a green supplement with straw based diet when available. Estimated total production of rice straw (based on grain production and a extraction rate of 100-150%) in respect of all varieties is about 16.9 million tons (Tareque and Saadullah, 1988). Doyle ***et al.*** (1986) suggested a formula for estimation of straw from grain that, grain: straw is 1:1 but in Bangladesh the ratio followed for grain to straw of local variety is 1:1.3 (Haque and Stem, 1993). The estimated rice straw production in Bangladesh is 36410.4 MT (FAO, 1996).

Total production of rice bran, wheat bran, mustard oil cake, sesame oil cake, and coconut oil cake were 2800800 MT, 143750 MT, 172200 MT, 27440 MT and 29370 MT (FAO, 1996; Haque and Stem, 1993) in Bangladesh, which is very much insufficient for our large cattle population. Saadullah (1991) conducted an experiment with straw (treated and untreated), water hyacinth and oil cake supplementation at different levels to observe calf growth and dressing percentage. Calves untreated straw group (with water hyacinth and 250 g oil cake) showed comparatively

lower live weight gain (114 g/day) than the calves supplied with 500 g oil cake and no water hyacinth (132 g/day). In case of dressing percentage, 250 g oil cake and water hyacinth showed a greater dressing percentage (35) than 500 g oil cake supplementation (32). Very little grains are available for feeding animals in the country conventionally. The major feed of livestock is straw. About 2 kg of straw is available per head per day (Jackson, 1980) and supplementation is limited to about 1 kg of green fodder plus marginal quantities of cereals and oilseed by-products. It has been estimated that 44% of the dry matter, 26% of the crude protein and 17% of the energy requirements are presently met from the available feed resources (Saadullah, 1995). Concentrates consist of rice bran, wheat bran, oil cakes, pulse bran, molasses and some cases fish meal and contribute 6.8% of the total dry matter. Traditional grazing field is scarce except in some pockets in Pabna and Sylhet districts (in winter only). These areas also become too deeply flooded for cropping in the monsoon and are used for production of fodder during the dry season.

Seasonal effects on the types and quantity of feed offered peaks in the availability of straw alternated with peaks of green feeds. More straw based rations are offered in January-March, July-August and again in November (Saadullah and Hossain, 2000). Most green materials are supplied from mid-March to July and during the month of September and October (FSRDP-BAU, 1986-87). These fluctuations follow more or less the succession in dry and wet season and the harvest with the straw peaks corresponding to the dry season and the green peaks to the wet season.

Beef cattle fattening

Indigenous cattle (***Bos indicus***) are reared by the farmers of Bangladesh mainly getting drought power, milk calves and meat. Cattle contribute about 98% of drought requirement, 99% of milk produced and 50% of meat sold in the market (Anonymous, 1991). Cattle fattening for beef production has become an important business of the small farmers in Bangladesh. The Directorate of Livestock Services (DLS) of the Government of Bangladesh has taken beef fattening as an action program to generate income for the rural poor farmer. Cattle are bought by the farmers usually 3-6 months before Eid-ul-Azha (Muslim festival) and then they are fattened and sold during the Eid festival. There is little information available on cattle fattening by the rural farmers. Hossain (1986) worked on management systems of cattle regarding feeding, housing, disease prevention and marketing in the Comilla district. Hossain ***et al.*** (1996a) conducted a study on beef fattening in the Manikganj district. Huq ***et al.*** (1997) reported that the farmers were benefited highly by selling fattened cattle before the Eid-ul-Azha in the Mymensingh district. One of the advantages of the cattle by the rural farmer is that they use locally available cattle feed resources. Family members of the farmer are involved in feed processing and offering feed daily. No improved feeding technologies such as urea treated of straw and urea molasses

block (Hossain ***et al.***, 1996b) supplement were used by the farmers. Indigenous knowledge on cattle fattening (Rahman ***et al.***, 1998) practiced by the rural livestock farmers of Mymensingh district of Bangladesh were found. Castration has a negative effect on growth rate and carcass characteristics of cattle (Plasse ***et al.***, 1995), which may be the reason for using uncastrated cattle. Hossain ***et al.*** (1996a) reported that farmers used three years old cattle in Manikganj district of Bangladesh. Singh and Patel (1996) also reported that cattle in Gujrat, India showed maximum growth rate between 1.1 to 1.4 years of age. Hossain (1986) and Hossain ***et al.*** (1996a) reported cattle fattening period of 4.5 months in rural areas of Bangladesh. Keeping cattle for fattening purposes in separate houses was cited by Hossain ***et al.*** (1996a). Hossain ***et al.*** (1996a) found buying cost Tk. 5350 cattle^{-1}. They also showed that net income cattle^{-1} was Tk. 7745 in a period of 5.7 months. Ali and Anwar (1987) and Hossain ***et al.*** (1996b) reported that the shortage of animal feed was the greatest problem of the farmers for rearing cattle.

A study (Hashem ***et al.***, 1999) investigated the cattle fattening programs of rural farmers in different districts of Bangladesh through field survey. In that study 51.2% farmers had primary level education and 28% had no education at all. About 60.4% farmers used cattle of 2-3 years of age and 32.2% farmers used cattle of 1-2 years age. About 70.4% farmers used bulls and only 5.2% used females. About 71.20% farmers had an average of 2 cattle for fattening and 28.80% farmers had an average of 3 cattle. 42% and 30% farmers reported fattening periods of 3-6 and 7-12 months, respectively. Separate houses for cattle were provided by 86% of the farmers. All the farmers washed and groomed their cattle in ponds and rivers. About 92% of the farmers did not have any training on cattle fattening, where as only 8% farmers has taken training on livestock rearing from the local Youth Training Centres. About 61.2% farmers dewormed their cattle before starting the fattening programs. About 72.8% farmers did not vaccinate against infectious diseases for their cattle. For treatment of cattle only 24% of farmers had taken help from a Veterinary Surgeon. About 46.4 of farmers bought their cattle at 2- thousand taka cattle^{-1}. Average buying and selling prices and net profits (Tk. cattle^{-1}) were Tk. 5043, 8360 and 3648, respectively.

In recent years, the women farmers of Bangladesh have involved and sustained beef fattening program in rural areas of the country. The women farmers borrow money from local bank or credit organizations. Hossain ***et al.*** (1996a) conducted a study upon nine selected women of Dhalla village under singair Thana of Manikganj district to evaluate the beef fattening as an income-generating source being practiced by the vulnerable group of women. The fattening programmed was financed by the local Grameen Bank, Dhalla branch. It was found that each woman borrowed an average loan money accounting to Tk. 7,333.00 @ 20% interest per annum from the Grameen Bank. The study revealed that the average net income of each woman was Tk. 7,745.00/season (5.77 months) having 1.78 animals on an average. Individual record showed that two, out of these nine women earned an average net income of Tk. 650.00 where as the other

four women had an average income of Tk. 4,800.00/season. On the other hand, the remaining three women earned a net income of Tk. 11,700.00, 16,500.00 and 21,000.00/season, respectively. The seasons behind these increased amounts of income by these three particular women were that their investment per animal was higher and the overall management of the fattening programme was very good.

Eating and rumination behavior of beef cattle

Feeding and rumination behavior was studied (Varlyakov ***et al.***, 1994) in 4 male Black and White calves and 4 male buffalo calves (Murrah Bulgarian) at 10 months of age using a system of 24 h periods. During first period animals were fed on a diet containing concentrate mixture (CM, 3.0 kg), Lucerne haylage (LH, 6.0 kg) and meadow hay (MH, 1.2 kg), with a concentrate to roughage ratio of 48:52. In the second period, proportions of diet components were changed to CM 1.3 kg, LH 9.0kg and MH 2.4 kg. Animals were kept tied up in individual pens, feed was offered at 08.00 h and 13.00 h and feeding behavior was observed at the end of each experimental period by visual chronometry. Increasing the proportion of roughage in the diet resulted in a decrease in time spent from the start of eating to the first rumination, a decrease in the number of boluses per rumination period an increase in the time for rumination per bolus. Changing the proportion of concentrates and roughage in the diet had no influence on the number and duration of rumination periods, the rumination index and feeding activity (time for feeding+rumination). Higher rumination index and feeding activity were species specific feeding behavioral characteristics of buffalo calves compared with calves.

Grant ***et al.*** (1990) conducted an experiment in a 33 Latin square design, 3 rumen cannulated Holstein dairy cows housed in free stalls (with 0.7% slope) were fed on 3 total mixed rations, differing in silage particle size. They found that maximum rumination activity occurred during the night. On day 40 of a 138-day feeding trial 93 crossbred yearling steers were observed (Hicks ***et al.***, 1989) every 30 minutes for 24 h. Steers spent 6.6, 15.5 and 54.4% of their time eating, ruminating and lying, respectively. Peak eating times occurred at 06.50 h (47.3% of steers eating) and 17.00 h(36.8% of eating) that corresponds to times of addition of fresh feed with another small peak at 21.00 h (17.9% eating). Ruminating and lying peaks during the day occurred at times inverse to eating. Individual steers with highest eating times had highest rumination and lying times. Steers that spent more time for eating and ruminating gained weight slightly more rapidly. Daily gains increased by 0.02 lb for each 1% increase in lying time. Results suggest that the frequencies of eating, ruminating and lying are correlated with animal performance.

Nutritive value and effects of UMS (urea molasses straw) on live weight gain

Many research work have already been done for the improvement of the quality of straw by

treating with physical, chemical and micro-biological means. Saadullah ***et al.*** (1980) treated rice straw with one liter of animal urine kg^{-1} straw in a pit for 20 days. The nitrogen content increased from 0.53 to 0.90% of DM and the organic matter digestibility increased from 45 to 55% as the result of urine treatment.

The chemical treatments of straw with acids or alkali improving the quality of straw (Schiere and Ibrahim, 1989). Alkali supplies OH-- which breaks down the fibres by chemical action (saponification of ester bonds in the lignin-hemi cellulose molecules) as well as physical action (swelling which is due to the ions attracting water molecules which cause the fibres to rupture), which makes the straw easy digestive. They also stated that physical treatment like grinding, pelleting, chopping etc. decrease the particle size which results power the digestibility but increase intake. Higher intake occurs due to higher rate of passage.

Manurung and Zulbardi (1996) conducted an experiment to evaluate the effect of urea molasses treatment on the quality of rice straw. Five levels of urea (0, 0.5, 1, 1.5 and 2%) and 4 levels of molasses (0, 1, 2 and 3%) were used with 5 kg chopped rice straw and stored for 21 days in plastic bags. The results showed that urea and molasses treatment on rice straw decreased the dry matter and silica contents but increased in crude protein (P 0.01). Dry matter and organic matter digestibility were not significantly affected by urea treatment but were increased highly significant by molasses treatment. In an experiment Huque and Chowdhury (1995) used urea, molasses and straw in the ratio 3:15:82 in urea molasses straw (UMS) and analyses the chemical composition. They found that DM is higher in dry straw (875 g/kg) than UMS (734 g/kg) and OM is slightly higher in dry straw (882 g/kg) than UMS (865 g/kg). But crude protein is higher in UMS (100.0 g/kg) than dry straw (53.7 g/kg) and acid detergent fibre is lower in UMS (406 g/kg) than dry straw (430 g/kg).

Acorda ***et al.*** (1992) used rice straw with various combinations of 2% NaOH, 5% soybean meal (S), 5% urea (U), 10% molasses (M) and 30% cage layer manure (CLM) were packed in double layer polyethelene bags and allowed to ferment for 45 and 90 days. They also found that crude protein contents of rice straw plus S+U, S+U+M, CLM, M+CLM, S+U+CLM and S+U+CLM+M were higher than other mixtures. All mixtures had consistently higher digestible organic matter in dry matter than rice straw alone. Barnah ***et al.*** (1992) conducted an experiment to observe the effect of urea and molasses treatment of paddy straw on its chemical composition and nutritive value in crossbred calves. For these purpose 12 male crossbred calves 6-7 months old and average live weight 42 kg, were fed on diets containing untreated or 2:5, 3:7.5 and 4:10 urea molasses treated rice straw ad-libitum (groups A and D, respectively). They also observed that the dry matter intake was increased (P 0.05) in group D. Digestibility of dry matter, organic matter, crude protein, ether extract, crude fibre and nitrogen free extract was higher (P 0.01) in group D compared with group A. Digestible crude protein content of 4% urea and 10% molasses treated

rice straw increased from 0 to 5.11% and total digestible nutrients increased from 40.16 to 54.43%. Sarker ***et al.*** (1990) described the effect of urea supplementation on the total intake of dry matter, crude protein, crude fibre, ether extract, nitrogen free extract and net metabolizable energy. Urea supplementation in the form of ammoniated straw and/or urea molasses block lick increased in voluntary intake of total dry matter.

The physical and chemical treatment of straw increases its available nutrient, the intake and digestibility of straw by the animals (Saadullah ***et al.***, 1982 and Tareque, 1985). Dolberg ***et al.*** (1980) in their experiment treated the straw with 5% urea and preserved for 20 and 40 days. They also observed that ***in vitro*** analyses of digestibility was increased from 35.2 to 52.3% on dry matter basis in an earthen pit and increase in nitrogen was from 0.59 to 1.00 per cent in stack covered with banana leaves. Ahmed and Dolberg (1979) reported that animals could be fed treated straw for maintenance and consumed about 4 to 6 kg straw day^{-1}. They also described that soaking of straw in water resulted small increase in digestibility and the addition of 10% molasses and 2% urea by weight with straw ration at feeding time is adequate to meet the animals maintenance requirements.

Chowdhury ***et al.*** (1995) stated that algae could be successfully used as animal feed. Heifers of indigenous breed consumed algae suspension at 10% of their live weight. In comparison to oil cake (0.5 kg day^{-1}), algae suspension supplemented to a basal straw diet increased fibre digestibility (76 vs. 81%), growth rate (399 vs. 458 g d^{-1}) and feed conversion efficiency [10.3 vs. 8.6 g DOMI (digestible organic matter intake g^{-1} live weight gain)].

Rahman (2001) reported that higher feed intake and weight gain through feeding of urea molasses straw (UMS) for fattening indigenous bulls compared to feeding rice straw alone. Baset ***et al.*** (2002) observed that feed intake were more in case of UMS and UMS+concentrate than straw feeding. Average live weight gain/animal/day were 204.17 g, 400.0 g and 418.75 g incase of straw, UMS and UMS+concentrate treatment group, respectively. Live weight changes in UMS and UMS+concentrate treatment groups were significantly differ from 2nd month to the end of the experiment at 1% level. Maximum live weight gain was observed at UMS+concentrate treatment group where extra wheat bran was added. Daily live weight gain and selling price were more in the steers of UMS+concentrate group but net return was observed maximum in the steers of UMS group.

Nutritive value of rice straw can be improved by proper chemical treatment and supplemented with nitrogen and energy. It was found that if urea and molasses mixture is supplied to the animals with straw than feed intake and digestibility of straw increases (Tareque, 1985). Urea is a non-protein nitrogenous compound that can be used in the ruminants' ration as protein supplement. Rumen micro flora converts urea to protein. Molasses is a sugar mill by product, which can be obtained easily and can provide energy, minerals and vitamins very

quickly. It adds sweet flavor and odor and has a special value increasing the palatability and efficiency of feed. The use of non-protein nitrogenous component incorporated with molasses is an economical means of providing suitable protein and energy for ruminant. Urea molasses straw (UMS) is the suitable feed to incorporate straw with urea and molasses.

Daniel ***et al.*** (1986) carried out an experiment with crossbred calves fed on urea molasses liquid diet, six Holstein Friesian Hariana calves, 8-12 months of age were given a conventional ration (CR). A similar group was given to appetite for 150 days urea 2.5, molasses 9.2, minerals 3 and water 2.5% then CR to day 306 and final 1.5 times CR to day 336. The control group was given 2 kg green sorghum and wheat straw to appetite where as the second group got straw 0.8 kg^{-1} live weight. The animals were weighed initially and at 150, 306 and 336 days. Daily weight gains for the three periods were 458, 651 and 608 g, 102, 679 and 983 g in control and second group, respectively. It was concluded that younger calves fed on urea molasses had a much lower growth rate than older ones. An experiment was carried out by Lozand ***et al.*** (1987) for 70 days with Hereford Aberdeen, Angus Zebu steers weighing initially about 274 kg in a 2 randomized block factorial experiment. Taking 3 replications each of two steers were given diet of molasses and urea with sunflower meal or cottonseed meal. Average daily gains were 1.015, 0.980, 0.0884 and 1.060 kg with the four treatments respectively.

Su ***et al.*** (1984) observed body weight change with beef cattle using molasses and urea. A total of 30 Charolais Chinese Yellow cattle of 17-19 months old were fed in 5 groups on a low energy, low protein diet without or with urea 0.06 and molasses 0.5, 1.0, 1.5 or 2.0 kg $head^{-1}$ day^{-1}. The result showed that average total body weight gain was 32.3, 36.0, 37.2 and 37.5 kg. The 4 th group which gain 39 kg at 1.96 kg concentrates daily, 1.5 kg molasses and urea at 1.06-1.45 and 0.1-0.2% of body weight, respectively was suitable. Manget and Gupta (1991) carried out an experiment on male crossbred calves. For these purpose they were divided into four equal groups fed wheat straw ad-libitum as basal roughage and concentrate mixture (group-1), UMMB lick II (group III) and UMMB lick III (group IV). They showed that wheat straw intake was significantly higher (P 0.01) in groups II, III and IV as compared to group I.

Haque ***et al.*** (1984) in an experiment used three groups of local Bangladeshi male calves 4 in each group and were given diets based on rice straw untreated or treated with ammonia generated from urea or from urine. Daily supplement of rice bran (400 g), oil cake (200 g) and fresh rode side grass (1 kg) were given during 105 days. Body weight gains from straw treated with ammonia using either urea or urine as a source, 162 and 171 g d^{-1} were significantly higher than the gain untreated straw, 95 g d^{-1}. In a 60 day study by Chowdhury and Huque, (1998) 12 native growing bulls, 35 months old, 273 kg live weight, were assigned to treatments consisting of chopped rice straw ad-libitum supplemented with 3% urea (US) 3% urea+15% cane molasses (UMS) or 3% urea+30% rice gruel (UGS) and observed daily live weight changes during the experimental

period were 292, 125 and 19 g, respectively for UMS, UGS and US.

Intake and nutrient digestibility

On a urea molasses straw (3:15:82; UMS) based diet effect of graded leaves of cotton seed cake (CSC) supplementation on the performance of native (***Bos indicus***) bulls has been studied (Chowdhury, 2001) for 167 days. Eighteen growing bulls of 129 13.4 kg weight and about 14 months old were randomly allocated to three dietary treatments designed in completely randomized design, having six animals in each treatment. Three dietary treatments were 0, 0.5 and 1.0 kg CSC per head/d. In addition, each animal also received ad-libitum UMS, 4 kg Napier (***Pennisetum purpureum***) grass, 500 g of each of rice and wheat bran and 60 g mineral mixture daily. For unit increase in CSC, total DM intake was increased by 1 g/kg w 0.75/d the straw DM intake decreased by 0.54 g/kg w 0.75/d. Whole gut digestibility of DM and OM was not affected but N and ADF digestibility increased with incremental increase in dietary CSC. For unit (1 kg) increase in dietary CSC intake N and ADF digestibility increased by 10 (1.155) and 3 (1.732) unit, respectively.

In a 60 day study (Chowdhury and Huque, 1998), 12 native growing bulls, 35 months old, 273 kg live weight, were assigned to treatments consisting of chopped rice straw ad-libitum supplemented (on a DM basis) with 3% urea (US), 3% urea+15% cane molasses (UMS) or 3% urea+30% rice gruel (UGS). Daily organic matter (OM) intake was higher (P 0.05) in bulls fed on UMS (64 g/kg 0.75) followed by UGS (53 g/kg 0.75) and US (49 g/kg 0.75). Estimated (from digestible OM intake) daily ME intake was 396, 348 and 301 kj/kg 0.75 for UMS, UGS and US respectively. Huque and Chowdhury (1997) conducted an experiment on supplementing effects of feeding systems of molasses and urea in indigenous bulls and found that UMS increases digestion and intake in association with reduced methane production in the rumen and that such a mixture (3:15:82; UMS) may be the best way of feeding molasses and urea to ruminants fed on straw.

Using a diet based on urea molasses straw (3:15:82; UMS) the effect of graded levels of mustard oil cake (MOC) supplementation on the performance of native bulls was studied (Chowdhury, 1999). Four cannulated adults bulls, 415 kg live weight, 80 months of age, were given MOC 0, 200, 400 or 800 g daily in four periods in a 44 Latin Square Design. Each bull also received 200 g each of molasses and wheat bran and a mineral mixture. For a unit (1 g) increases in MOC intake, total DM intake increased by 0.8 g daily (r2=0.88) with no change in the straw DM intake. With increasing levels of MOC, CP digestibility increased. However, MOC level had no effect on digestibility of DM, organic matter and ADF. On a UMS based diet supplementation of MOC up to 800g (10% of total intake) of the dietary intake had little or no effect on intake, digestibility, rumen parameters and microbial N yield but slightly increased N balance.

Carcass characteristics

Study of the carcass quality and quantity is important for economic marketing of beef. The amount of marbling fat or intramuscular fat in beef is recognized as an important carcass quality characteristic in North American and Asian markets, particularly when the meat is sold to food service institutions for consumption in an upscale dining environment (Huffman ***et al.***, 1996). Budmaska and Kalinka (1994) conducted a feeding trial, Black pied bulls over 6 months old in 4 groups were fed on a basal diet plus maize silage and concentrates. The diets are supplemented with 2.5% urea, the basal diet plus UMS or ACMS, or maize silage that was mixed with ammonia carbonate 10 kg/t just before feeding. Average daily live weight gain was 713, 726,748 and 807 g, respectively. The trial was repeated on young bulls of initial live weight 167 to 173 kg. Average daily live weight was 728, 781 and 802 g. Bulls took 7.5, 6.9, 6.8 and 6.7 feed units/kg gain. At controlled slaughter, killing-out percentage was 50.4, 51.6, 53.0 and 53.3, carcass yield was 49.9, 50.7, 52.0 and 52.2% and yield of lean was 76.9, 78.0, 77.4 and 78.7%.

Ten Brangus Jersey (F1), 21 Simmental Jersey (F1) and 28 Limousin Jersey (F1) crossbred were studied (Ozbeyaz ***et al.***, 1997) at a state farm in Turkey. For the three crossbred type respectively, overall daily weight gain during the 510 day fattening period averaged 0.64, 0.59 and 0.54kg for males and 0.53, 0.54 and 0.54 kg for females. For both sexes there were no significant differences between breed types in respect of daily weight gain. Brangus crossbred males had gained about 39.6 kg more live weight than Limousin crossbred at the end of the fattening period, but difference was not significant. Brangus crossbred males were 64 kg and Limousin crossbreds were 24.4 kg heavier than Simmental crossbreds; these differences were significant. For groups of 4 Brangus Jersey, Simmental Jersey and Limousin Jersey bulls slaughtered at 457.5, 436.8 and 450.7 kg respectively. Dressing percentage averaged 58.0, 56.1 and 58.2, skin weight 36.5, 37.8 and 39.3 kg, bone percentage 16.0,16.2 and 15.9 and rib-eye area 86.3, 96.4 and 95.6 cm 2.

Fattening performance from 181 to 540 days of age of 27 Polish Black and White and 20 Limousin Polish Black and White heifers and bulls was compared (Nogaski and Kijak, 1998). Crossbred bulls and heifers were heavier at 540 days of age and had greater daily gains than the respective purebreds (P 0.01). Feed conversion efficiency was also greater for crossbreds than purebreds (P 0.05). Crossbreds had a lower percentage of internal fat in the carcass and a greater longissimus dorsi muscle area than purebreds (P 0.01). The purebreds had a lower dressing percentage than the crossbreds (P 0.01). Jorge ***et al.*** (1998) found from 36 months of age, 36 Gir, Guzera, Tabapua and Nelore bulls, with an initial body weight of 357.6, 362.0, 369.6 and 376.4 kg respectively, were finished in a feedlot on a diet containing 50% concentrates. Bulls were slaughtered at a body weight of 405, 450 or 500 kg. There were no significant differences among the bulls with the three slaughter weights in daily gain or carcass daily gain, but bull

slaughtered at 500 kg had a significantly longer period in the feedlot and a lower efficiency of gain than bulls slaughtered at lower weight.

Colpan ***et al.*** (1995) reported that male Limousin Jersey beef cattle, from 12 to 18 months old in two groups of 6 each were feed on a diet containing 80% concentrates and 20% roughages containing of 85% sugar beet pulp and 15% wheat straw and that diet supplemented with 1.5% zeolite. Average live weight at the end of feeding was 333.25 and 354.80 kg, respectively and average daily gain 1132 and 1246 g. The cattle took 7.860 and 7.418kg DM/kg gain. At slaughter, average cold carcass weight and average weight of meat in the carcass were 188.60 and 148.23 and 204.20 and 161.00 kg, respectively. The average hot and cold dressing percentage was 56.71 and 55.54 and 56.54 and 55.39. It is concluded that 1.5% zeolite had a favourable effect on performance and carcass quality of beef cattle. Rumsey ***et al.*** (1996) observed for the four fed groups, daily empty body weight gain averaged 1.26, 1.43, 1.63 and 1.78 kg, respectively (SEM= 0.05) and daily carcass gain 0.78, 0.97, 0.97 and 1.08kg (SEM=0.04). Compared with controls, empty body and carcass gains were affected by treatment (P 0.01 for SYN and Sbv). Non-carcass gain averaged 0.45, 0.48, 0.60 and 0.60 kg/day (SEM=0.03; Sbv, P 0.01). Kang-Woosung ***et al.*** (1996) reported that castration decreased daily body weight gain and feed conversion efficiency, reduced retail cuts and loin, decreased meat yield, gave smaller rib eyes and increased back fat thickness and body fat ($P<0.01$).

Caton ***et al.*** (2000) cited that a large portion of total energy expenditure associated with ruminant livestock production goes towards maintenance. Approximately 55% of whole body energy use as consumed by visceral tissues with the majority of this going to the liver and gastrointestinal tract. Muscle and adipose tissues consume about 275 of total body energy expenditure. Metabolic components with in the viscera responsible for the majority of energy consumption include ion transport, protein turnover, substrate cycling and urea synthesis (liver). Within muscle tissue of growing animals ion transport and protein turnover account for most of the energy expenditure. Protein synthesis consumes approximately 23% of whole body energy use and visceral tissues account for proportionally more of whole body protein synthesis than skeletal muscle. Research efforts focused on improving energetic efficiency of the tissues and metabolic mechanisms responsible for the majority of whole animal energy expenditure should provide information leading to more efficient production of an edible product.

Problem faced in beef fattening

There are so many problems of beef cattle production in Bangladesh. A large population (120 million) gradually captures the arable land for residence and hence the land for pasture/ fodder production becomes gradually squished. The density of cattle per hectare of land (pasture and arable) is 2.49. The density is much higher in Bangladesh compared to that of many countries of

Asia. But the beef and veal production per animal is much lower than many countries of the world. Hashem ***et al.*** (1999) observed that about 96.8% of farmers reported shortages of animal feed and 84% reported lack of credit as the major problems for cattle fattening. The major causes of lower production of beef per animal are shortage of grazing land (pasture land), lack of balanced feed and green grass and problem to rear hybrid cattle in our local atmosphere and weather. In 1990, the production of beef per animal is 80 kg in India, 158 kg in Pakistan, 240 kg in Indonesia, 109 kg in China, 232 kg in Australia, 178 kg in New Zealand, 247 kg in Denmark, 284 kg in U.K. and 297 kg in the USA. Whereas the production of beef per animal is 62 kg in Bangladesh (Alam, 1995).

Marketing problem has also a negative effect on beef production in our country. Ahmed (1992) found that the marketing and processing of beef products is entirely in the hands of private sector. The shortage of livestock products, prices of beef were relatively high, particularly in relation to average income levels and minimum basic rates of pay. Before slaughtering, cattle were transported mainly on foot from a long distance (Wahiduzzaman, 1981) and slaughtered them without any rest. During selling in the market, broker is common problem. He also found the single highest cost component of marketing beef cattle and beef, the market tolls amounting 63.68% of the total market cost. Illiteracy is also a problem. About 60% cattle traders are illiterate, a quarter have education up to third year in the school and the rest have education varying from third year class to H.S.C. level.

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