Changing Dynamics in Buffalo Production Systems in South Asian Region

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ABSTRACT

Buffalo population in South-Asian countries is increasing more rapidly than rest of the world due to their unique qualities and emerging role in economic development. This region possesses most of the well-known breeds of buffaloes which are reared by adopting extensive, semi-intensive and intensive production systems by the farmers. But, Bangladesh does not follow intensive production system as almost all the animals are swamp type and low producers. However, these systems are being replaced from extensive or semi-intensive to more intensive high input systems due to new socio-economic pressures and perceptions. These approaches are expected to provide enhanced food security and economic prosperity to the people of the region.

PREFERENCE FOR BUFFALO

The buffalo population in Indian sub-continent is growing annually at the rate of 1.5 percent. The buffaloes have spread over the traditionally non-buffalo regions as these animals possess certain unique qualities in comparison to cattle. In the present scenario where trend shows a decline in area under forage production and also decline in grazing community lands over the past 4 decades, milk producing animals will have to depend more and more on crop residues. The problem is likely to get further aggravated due to growing human population resulting in higher pressure on land for food crops.

Buffaloes are known to be better converters of poor-quality roughage into milk and meat. They are reported to have 5% higher digestibility of crude fiber than high-yielding cows; and 4-5% higher efficiency of utilization of metabolic energy for milk production (Mudgal, 1988). Buffaloes can gain as much as 1.0-kg daily body weights a day on good-quality roughage and concentrate.

The investigations carried out during the past three decades or more have amply confirmed that the buffaloes digest feed more efficiently than do cattle, particularly when feeds are of poor quality and are high in ligno-cellulose. It has also been found that buffaloes can digest crude protein, fat, calcium, phosphorus and non-protein nitrogen more efficiently than other ruminants. The ability of buffaloes to digest fiber efficiently is partly due to the presence of some typical microorganisms in the rumen which convert feeds into energy more efficiently than those in cattle. Other reasons for the buffalo's being a better converter of feed might be the higher dry-matter intake, longer retention time of feed in the digestive tract, ruminal characteristics more favourable to ammonia nitrogen utilization, less depression of
cellulose digestion by soluble carbohydrates, superior ability to handle the stress environment and a wide range of grazing preferences.

Hence, preference for buffaloes has continued to increase due to higher fat content of milk (7-8%), ability to thrive on harsh conditions, genetic potential for disease resistance and low quality rations as well as ever increasing export market for buffalo meat and milk products. It is expected that buffalo will ultimately emerge as the future animal of dairy-cum-meat industry in the region.

BUFFALO POPULATION DYNAMICS IN SOUTH ASIA

South Asian buffaloes dominate the world population (Table 1), representing about 75% of the world buffalo population (FAO, 2010). During the last ten years, world buffalo population has increased at the rate of 1.24 per cent per year, whereas, in South Asian countries the buffalo population increased at the rate of 1.49 per cent per year, largely contributed by India and Pakistan.

GLOBAL OVERVIEW OF BUFFALO MILK AND MEAT PRODUCTION

The world total milk production was 703.35 million tonnes in 2009 comprises cow milk, buffalo milk and other animals, which was a considerable jump from 697.573 million tonnes in 2008. The world cow milk output in 2009 was 587.44 million tonnes, of which USA was on top with 85.86 million tonnes and India was second largest producer with 45.14 million tonnes. On the other hand, regarding the world buffalo milk output, India ranks first with a production of 59.87 million tonnes in 2009, followed by Pakistan, China, Egypt and Iran, respectively. The world total output of buffalo milk in 2009 was 89.96 million tonnes. Out of the world milk output, cow milk represented 84 per cent in 2009 and 13 per cent taken up by buffalo milk. In recent years, cow milk production has been declining in many parts of the world like the European Union, USA, Australia, Japan and China. On the other hand, buffalo milk production has kept on increasing particularly in South Asia region. Of the total buffalo milk output, more than 90 per cent is produced in India and Pakistan and South Asian countries contribute about 93 per cent.

The annual growth rate in world buffalo meat production was 1.66 per cent, whereas, in South Asian countries the increased rate was 2.24 per cent during last ten years: 1998 – 2008 (FAO, 2010). Undoubtedly, majority of buffalo meat is from South Asia region, representing approximately 71 percent and with volume of 2,398,922 tons with the greater bulk contributed by India and Pakistan (Table 2).

GENETIC RESOURCES

Asia is famous for its riverine and swamp types of buffaloes. River buffaloes are generally large in size mostly with colour horned and are mainly available in India and Pakistan. These animals have a preference for water and basically raised the milk production. Swamp buffaloes are mostly found in Bangladesh and are mainly used as draught animals. A few animals are also found in North- Eastern State of India bordering Myanmar. India is a harbinger of some of the best riverine breeds of buffaloes. Murrah, Nili-Ravi, Surti, Mehsana, Jaffarabadi enjoy pre-eminent position among high producing germplasm. Some breeds like Bhadawari, Pandharpuri possess a very high fat (8.5%) and highly economical to regional areas
of these habitats. Indian buffaloes have been categorized in five groups on the basis of well-defined characteristics and habitats.

Pakistan is also credited to possess high yielding Kundi and Nili-Ravi buffaloes in areas bordering India and contribute 71% of total milk to national pool.

BUFFALO PRODUCTION SYSTEMS

The buffalo production system in South Asian countries are categorised into extensive, semi-intensive and intensive production system.

**Extensive or Zero-input Production System:** The typical extensive and traditional unique buffalo production system in India adopted by livestock breeders (Maldharis of Banni, Kachchh, Gujarat) and pastoralists predominantly depend on buffalo keeping under extensive production system. This system shows larger diversity in buffalo populations in remote areas, arid and semi-arid regions of the country like Banni area of Kachchh, Gujarat, Orissa and North-East region. The extensive production systems adopted by pastoralists in different parts of the country integrates well with the local feed/fodder resources, plants, soil and climate. The animals develop capacity to survive under shortage of feed/fodders, prevalent diseases, drought and other adverse climatic conditions.

The above examples for unique extensive buffalo production system in India based on indigenous knowledge adopted seasonal and spatial grazing system that are holistic, complementary to natural feed/fodder resources and symbiotic with agro-ecosystems. In Bangladesh, buffaloes rose under extensive production system in coastal and hilly area, where, no housing provided and generally natural breeding practices. Animals are kept in a single herd in large number in open throughout the year. Animals maintained on natural pasture, no concentrate/mineral supplements and rice straw is fed.

**Semi-Intensive Buffalo Production System:** In South Asia, small-scale semi-intensive systems have developed and intensification has led to combining grazing, stall-feeding of planted forage and crop residues. The semi-intensive or mixed farming system adopted in majority tropical highlands, arid, semi-arid, humid and sub-humid zones. The tropical highlands mix farming system in Himalayan region found in India, Nepal and Pakistan. The buffaloes are maintained in small numbers and have secondary importance in income generation, compared to the crops farming. In Uttaranchal Hills, dairy production by small scale farmers is widespread and buffalo kept in sedentary systems, grazing is done during day time, at night they are fed crop residues and tree leaves.

Under this system, buffaloes are allowed for grazing according to the season and supplemented with concentrate, mineral mixture, green and dry fodder as per the productivity and milk yield of animals. The supplements used for the feeding of buffaloes are highly variable and depends on stage of lactation, economic condition and requirement of buffalo keepers. In this system lactating and pregnant buffaloes are provided concentrates, green and dry fodders, whereas, dry, growing stock and male calves are least cared.

In Bangladesh, buffaloes are raised under a semi-intensive system with minimum inputs. They are allowed to graze on natural pasture on fallow land or road side in day time. No concentrate or mineral supplements are usually fed. For milch
buffaloes, the calves are usually separated from the dam in the evening or night and the milking only once in the morning. The staple food for buffaloes is rice straw, which is an inadequate source of energy and protein. Sugarcane leaves, micro silage of sugarcane leaves, cassava leaves, roadside grass, elephant grass, and maize with corn cob and pineapple bran are also used as feeding stuffs.

**Intensive Buffalo Production System:** Milk production system in the South Asian region changing very fast and market-oriented dairy farms are concentrated in out skirt or within urban / metros cities near fluid milk consumption centres. Less proximate production occurs only in those regions where there is an efficient market infrastructure. Therefore, the potential to increase dairy production depends largely on the unit costs of collection and transport. Those in urban peripheries are doubly advantaged, because with better access to markets, the unit costs of the support services such as input supply, animal health services and milk marketing decrease as production increases. In India, this system is predominantly found in and around large cities, such as Delhi, Mumbai, Calcutta, Bangalore, Ahmedabad, Surat. Usually these buffaloes are kept for milk production and are not for breeding purposes. After completing lactation majority dry buffaloes slaughter for meat production. This system in urban and peri-urban areas purchased selected buffaloes of high milk production potentials from the breeding tract and after extracting last drop of milk majority of them disposed in abattoir. For feeding the animals all feed items are purchased from local market due to which non-productive animals are immediately disposed of.

In Pakistan, intensive production system is growing rapidly in cities such as Karachi, Lahore, Rawalpindi and Islamabad. Pregnant buffaloes are purchased from rural areas, after calving, female calves usually sold or and a small number are kept as replacement for breeding while male calves are fattened for meat production. At the end of lactation, females are also slaughtered for meat purposes. Buffaloes under intensive production system are maintained under stall feeding and fed satisfactory diet comprising mixture of chaffed straw or stoves, concentrate mixture of locally available cakes, flours of grains, dal chunnies and bran etc are fed through mixing with chaffed green fodders during feeding time. Buffalo keepers adopted intensive production systems are also using compounded feeds and mineral mixtures for providing relatively more balance diet. However, intensive system for buffalo production is not practiced in Bangladesh.

**NEW INITIATIVES AND CHANGING PERCEPTIONS**

**Genetic Improvement:** Buffalo breeding programme in India was primarily based on culling and selection policy in Military Dairy Farms as these were only large herds available in pre-Independent India. However, All India Coordinated Research Project on Buffalo Breeding was launched in 1970 in order to improve production potential of buffaloes through breeding, feeding and management. This project could not make much headway in view of low intensity of selection of the sires. Therefore, a new initiative known as ‘Network Programme in Buffalo Breeding’ was started in 1993 by expanding the population base thereby increasing the intensity of selection. The females with the farmers were also included for progeny testing of sires. These steps resulted in significant improvement in average
milk production by achieving the production level of about 2100 litres in a lactation of 305 days.

*Incentives for Buffalo Breeders:* Some of the provincial Government like Haryana have introduced special monetary benefits schemes for Buffalo farmers for conserving and breeding pure elite females. These farmers are paid cash incentives by the Government for maintaining the first and second calves for a period of three years. The male calves from these superior females are purchased back by the State for rearing as future bulls.

*Beef Production:* The old and spent buffaloes are usually used as meat animals in South Asian countries. However, the recent data shows an annual increment of 2.25% in beef production mainly from India and Pakistan. This has been possible due to introduction of new scientific programmes of beef production in buffalo. For example, Hind Agro-industries Ltd, one of the biggest exporters of meat in the country has started project on male calves in the catchment area of the meat plant where the farmers are advised not to sell or dispose of male calves till they attain the live weight of 200 kg under buy back system. The expenditure incurred on feeding and health care of these calves during this period is borne by the company. The farmers are very happy with this arrangement as they receive supplementary income from the sale of the calves in addition to the money from sale of milk. Since the males are maintained and grown by the company under its own watch and care, the quality of meat from such males fetch high price in international market. So, it is a win-win situation, for all the stakeholders. Likewise, Federal Government is funding a national programme on “Rearing of males for Beef production” under self-employment scheme by the educated unemployment youth, these endeavours have started showing promising results and India has become the leader and occupies first position in export of buffalo Beef.

*Specialised farming:* The farmers have started realising the importance of dairy farming in raising their farm incomes. The mixed farming system consisting of one to two milk buffalo and some area under crops is not profitable and unable to meet growing demand of the household and a comfortable level of living. Hence, there is a shift in the system where a large number of farmers have started establishing big farms rather than the smaller ones. This change has been brought primarily due to the availability of markets and creation of infrastructure like roads and power. Secondly, the margin of profit in small production system is not as high as in industrial level.

*Launch of National Dairy Plan:* National Dairy Development Board, Government of India has launched a new initiative in the form of ‘National Dairy Plan’ for providing a further fillip to milk production in the country mainly from Buffaloes. The main emphasis the under this plan will be the use of superior sires through A.I. at farmers door-steps and balanced animal feed. In addition, setting up of more processing facilities and marketing of milk products will also be strengthened.

*Biotechnological Interventions:* Production of elite buffaloes by applying modern biotechnological tools and approaches like embryo production and transfer and Zona free cloning offers a great potential. Multiple ovulation and embryo transfer has been integrated with breeding strategy under Progeny testing
programme undertaken by the Central Institute of Research on Buffalos at Hisar, India. This is expected to reduce the time in selection of bulls of proven merit significantly thus increasing the availability of more semen doses for use in artificial insemination.

Application of newer techniques of cloning is also proving highly beneficial in enhancing reproductive efficiency of these animals. Recently a female calf named as ‘Mahima’ and male calf named as ‘Swarn’ were born to the recipients through a new technique known as “Hand Guided Cloning Technique” by using donor ear skin cell and seminal plasma cell, respectively, at National Dairy Research Institute, Karnal, India.

In conclusion, it may be mentioned that buffaloes have thrived and served the inhabitants of South Asian countries well and are further expected to play bigger role in increasing the income and food security of farmers due to their unique qualities explained earlier. Need to obtain more milk and meat from this species will be stronger in future as the number and quality of dual breeds of cattle capable of producing good quantity of milk and providing draft power is dwindling fast in view of fast mechanization of farm sector in these countries. All the stake holders, therefore, have to join hands in providing desired technical and financial support so as to turn the buffaloes into a highly efficient producing and profitable animal.

REFERENCES

**Table 1.** Buffalo population in world and South Asia.

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<th>Year</th>
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Table 2. Buffalo Milk and Meat Production in the World and South Asia (tons).

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