CONSERVATION AND UTILIZATION OF INDIGENOUS BUFFALO GENETIC RESOURCES

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Abstract

The indigenous Limé and Parkote buffaloes of Nepal raised by smallholders under varying production systems across agro-ecozones need to be conserved with opportunity for their utilization. The important issues facing the indigenous buffalo species relate to crossbreeding, seasonal reproduction, feeds and feeding, availability of breeding stock and premature disposal of calves. Development and implementation of a simple integrated action plan that includes performance recording, genetic evaluation, breeding strategy, sale of breeding stock, manipulation of their reproductive cycle, adequate veterinary care, milk collection and its quality assurance, development of efficient feeding practices have potential for improving productivity. Participation of stakeholders including governments, international agencies, producers and consumers in the planning process could contribute to conservation with utilization resulting in poverty alleviation of small holders raising indigenous buffaloes.

Keywords: Buffalo; Limé; Parkote; Characterization; Productivity; Utilization

1. Introduction

The indigenous population of buffalo (*Bubalus bubalis*) in Nepal are mainly raised by smallholders. These animals require a relatively low level of inputs in the predominantly mixed farming systems, and are well known for their ability to thrive on low quality crop residues and green forage (Rasali,

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2000a) under harsh climatic conditions. Furthermore, the contributions of milk, meat, manure and draft power from 3.3 million buffalo population to the overall national economy have been overwhelming (Shrestha and Shrestha, 1998).

The physiographic isolation of buffaloes found across three agro-ecozones i.e. High hills, Mid-hills and Terai plains of the country could have contributed to diverse populations with varying productivity (Joshi and Rasali, 1998; Rasali, 2000a). Despite more than 40 years of crossbreeding with the Murrah and Niliravi breeds, 64% of the total buffalo population consists of indigenous populations and the crosses among themselves (Sherchand, 2001). A National Recording Program for maintaining performance and pedigree records was proposed by Shrestha and Shrestha (1998), but has not materialized. In this review, the characterization and productivity of the indigenous buffaloes and opportunity for conservation with utilization has been elaborated.

2. Characterization

Indigenous buffaloes are locally known as Pahadi (Hill buffaloes: Limé, Parkote and Gaddi) and Madheshi (Terai buffalo) found across agro-ecozones in the country. The evaluation of morphological characteristics and production performance of buffaloes in the Western hills confirmed two distinct clusters corresponding to the Limé and Parkote) buffaloes (Rasali et al., 1998a; Amatya et al., 2000), while the intermediate clusters found between them suggest indiscriminate breeding of the two types. Furthermore, karyotyping confirmed that the Limé buffaloes are of the Riverine type with 50 chromosomes (Rasali et al., 1998a and b). Previously, these animals were thought to be of the Swamp type. On the other hand, there are not many crossbred populations except those localized in the proximity of cities and towns.

Figure 1. Limé (left) and Parkote (right) buffaloes in the western hills.

Table 1. Standard lactation yield (305 d) of Limé and Parkote buffaloes across agro-eco zones in the western hills of Nepal

Agro-eco zone	Lactation yield, litres					
	Limé		Parkote		Total	
	No.	Mean	No.	Mean	No.	Mean
High hills	48	991	12	864	60	965
Mid hills	78	1129	93	1068	171	1096
Low hills	40	1006	36	965	76	987
River basin	54	999	32	1077	86	1031
Average	220	1048	173	1031	393	1040

Source: Amatya et al. (2000).

The buffalo population in the Terai appears to have features and productivity similar with those in India. Possibly, the long stretched unfortified border provides crossborder traffic between the two countries. Again, compared to the hills and mountains, a higher proportion of crossbreds with Indian breeds were found in the Terai region. The indigenous buffalo populations found in the various agro-ecozones need to be characterized in

order to identify genetically distinct populations.

3. Productivity

Earlier studies reported that in the premises of smallholders milk production of indigenous buffaloes for a 305-d lactation was 800-950 litres with 6-7 % fat (Rasali et al, 1997). At the same time, crossbreds with Indian breed produced about 50% more milk. These studies also revealed that the indigenous buffaloes raised in the western hills have somewhat delayed age of first calving (53 mo) and longer calving interval (545 days). Possibly, husbandry practices have contributed to this. Buffaloes are seasonal breeders with most calvings occurring between the months of July and September in the hilly and mountain regions when the pasture is lush, and abundant forage is available. Consequently, calves are weaned in winter when the feed is sparse resulting in lower growth and exposure to diseases. Rasali et al. (1998c) reported that about 20% of the hill buffaloes suffer from infertility arising from repeat breeding (9.8%), anoestrus (9.5%), silent heat (7.2%) and endometritis (2.7%). The Limé buffaloes produced significantly more milk compared to the Parkote in the higher altitude than in the hilly areas (Table 1), while the milk yield of Parkote buffaloes exceeded the Limé in river basin (Amatya et al., 2000). In contrast, there was no significant difference between Limé and Parkote buffaloes in their reproductive efficiency.

4. Constraints to production

Rasali (2000a) discussed a number of constraints to buffalo production in the hills and mountains of Nepal. The smallholders raising buffaloes make use of bulls in the neighborhood for breeding with no choice for selection. Again, the slaughter of bulls in good physique may contribute to negative selection. There are a fewer number of breeding bulls than necessary in each village area due to increasing costs for their maintenance. On the other hand, the Department of Livestock Services provides graded Murrah bulls for crossbreeding. Although the number of bulls used for crossbreeding is minimal compared to indigenous bulls, a larger number of crossbred bulls are being

utilized. Crossbreeding has been promoted since the 1970s, and the absence of policy to encourage conservation of indigenous buffaloes crossbreeding could lead to the development of composite populations that may not be suitable for the region.

Young calves are disposed early in their life by farmers to save the milk, which fetches immediate cash value. This leaves no opportunity for selection of better animals for future genetic improvement or for meat production. Almost all of male calves and many of female calves are disposed off in this manner that might have been continually a cause of erosion in the genetic resources of buffaloes.

The crossbreeding of indigenous buffaloes with Indian Murrah has failed to demonstrate potential merit in the hills and mountain zones (Floyd et al. 1999). However, indigenous buffaloes of superior genetic merit are not available. Therefore the success of conservation activities in areas where crossbreeding has not been successful would depend on the availability of indigenous breeding bulls.

Although feeding of buffaloes in Nepal is largely dependent on the use of crop residues and fodder trees in the hills, the use of Berseem and Oats as winter forage crops have also shown encouraging results in the Terai and river basins. Again, feed supply has been recognized for a long time as a limiting factor for buffalo production in Nepal. While the expansion of green and concentrate feed production can partially fulfill the gap, ways and means of efficient utilization and conservation of available feed resources including non-conventional feedstuffs would be beneficial.

5. Future considerations

The Nepalese farmers who rely on traditional technologies cannot satisfy the demand for more food due to ever increasing human population. Rasali et al. (2000a) suggested that the farmers have to increase the productivity of buffaloes in order to alleviate poverty and improve their livelihood. Unfortunately, current programs and services are inadequate to address the issues. The introduction of an integrated action plan directed towards smallholders with buffalo is warranted. This proposition calls for a program for

performance recording, genetic evaluation, maintenance of pedigree records, production and supply of breeding stock including indigenous breeds, appropriate breeding strategies (Rasali, 2000b) for the smallholders with buffaloes, manipulation of reproduction, veterinary care, milk collection and quality assurance, and feeding according to nutrient requirements. Although some of these suggestions have been included in the already existing programs, re-orienting them towards conservation and genetic improvement of indigenous buffalo will be necessary.

The identification of breeding stock, recording and monitoring of their performance followed by selection of superior animals for future breeding stock are important. However, the formation of Herdbooks by breed societies may not be necessary. This is because smallholders that raise buffaloes have no direct advantage in the absence of a breeding program. Farmers are to be made aware of the importance of recording and selection in the breeding program.

To remedy this situation, a recording system based at village level, in which all buffaloes within a buffalo farmers' group can be considered as one herd so that individual farmers can clearly visualize their comparative advantage in accordance with the International Committee for Animal Recording (Moioli et al., 2000). A simple institutional mechanism to ensure the participation of smallholders with buffaloes in the genetic evaluation could be feasible.

All stakeholders including relevant government departments, institutions of higher education and research, farmers, international agencies and donors will have an important role in the conservation and utilization of buffaloes. The participation of the farmers from the planning stage will be crucial for the success and sustainability of the program. Demonstrating opportunities for improvement of milk, meat and byproducts from buffalo could help in import replacement, enhanced export potential, conservation of natural resources, maintenance of genetic diversity in buffalo population and consequently alleviate poverty for the small holders in agriculture.

6. Conclusion

The indigenous buffalo populations in Nepal are facing a number of issues that could contribute to their eventual extinction. These issues could be resolved by developing and implementing an integrated plan of action based on application of new technologies that have achieved success in a number of countries. All stakeholders including government departments, institutions of higher education and research, international agencies and donors, field level organizations and farmers themselves have a role to play.

References

Amatya, N., Rasali, D. P., and Rana, R. S., 2000. Evaluation of phenotypic and production characteristics of indigenous buffalo types in the western hills of Nepal. Lumle Technical Paper No. 2000/1, Lumle, Nepal, 25 pp.

Floyd, C.N., Harding, A.H., Paddle, K.C., Rasali, D.P., Subedi, K.D. and Subedi, P.P. 2000. The adoption and associated impact of technologies in the western hills of Nepal. Overseas Development Institute, Agricultural Research & Extension Network. AgREN Network Paper Np. 90, pp. 16.

Joshi, B.R., and Rasali, D.P., 1998. Unique livestock resources of mountain farmers and the compatibility of on-farm conservation efforts with livestock development approaches. In: Partap, T, Sthapit, B. (Editors). Managing agro-biodiversity: farmers' changing perspectives and institutional responses in the HKH region. ICIMOD, Kathmandu, pp. 265-291.

Moioli, B., Maki-Hokkonen, J., Galal, S., and Zjalic, M., 2000. Animal Recording for improved breeding and management strategies for buffaloes. Proc. Workshop on Animal Recording for improved breeding and management strategies for buffaloes, Bled, Slovenia, 130 pp.

Rasali, D.P. 2000a. Recent trends in buffalo production in Nepal: A review. Buffalo Newletter. Bulletin of the FAO Inter-Regional Cooperative Research Network on Buffalo, Europe – Near East, 14:6-10.

Rasali, D. P., 2000b. A case study of buffalo recording and breeding management in Nepal. Proc. Workshop on Animal Recording for improved breeding and management strategies for buffaloes, Bled, Slovenia, pp. 25-32.

Rasali, D. P., Gurung, D. B., and Yadav, E. R. 1997. Performance of monsoon

calver buffaloes across genotypic and non-genotypic factors under farmers management in the western hill districts of Nepal. Vet. Rev., Nepal, 12, 17-20.

Rasali, D. P., Joshi, H. D., Patel, R. K., Harding, A. H., 1998a. Phenotypic clusters and karyotypes of indigenous buffaloes in the Western Hills of Nepal. Lumle Agriculture Research Centre Paper No. 98/2, 24 pp.

Rasali, D. P., Patel, R. K., and Joshi, H. D., 1998b. Initial chromosomal analysis of indigenous buffaloes in the Western Hills of Nepal. Vet. Rev., Nepal, 13, 30-34.

Rasali, D.P., Joshi, H.D., Shrestha, H.K. and Gautam, D.C. 1998c. Assessment of the infertility in cows and buffaloes in the western hills of Nepal. Lumle Agricultural Research Centre, Kaskii, Nepal. Lumle Working Paper No. 98/40, 16 pp.

Sherchand, L., 2001. Herd Composition of Cattle, Buffalo, Goat and Sheep in Nepal. Proceeding of the 4th National Animal Science Convention. Nepal Animal Science Association.

Shrestha, S. K., and Shrestha, N. P., 1998. Genetic improvement of buffalo. In: Proc. First Nat. Workshop on Anim. Genet. Resources Conserv. Genet. Improvement of Domest. Anim. in Nepal, NARC, Kathmandu, Nepal, pp. 98-102