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# A case study of Buffalo recording and breeding management in Nepal

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## Introduction

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Buffaloes are the multi-purpose and most valued livestock species in the smallholder mixed farming system of Nepal. The country has a population of 3.3 million heads of buffalo, The seventh largest number in the world, contributing in excess of 8 percent of the country's overall gross domestic products and they are distributed throughout the country (Table 1) except in the high Trans-Himalayan mountain zone. However, the use of the buffalo recording system is at the introductory stage, while the breeding systems for their genetic improvement are still traditional except for some efforts of cross-breeding with Indian Murrah breed. The current buffalo recording systems are characterised by the activities that are carried out in a few institutional herds as a part of routine farm operation and for research purposes and in a few farmer herds mainly for comparison of the performance of the indigenous stocks and Murrah cross-breds.

*Table 1. Buffalo population distribution across the physiographic agro-ecological zones and development regions in Nepal (figures in '000).*

Agro-eco zones	Development Regions					Total
	Far-western	Mid-western	Western	Central	Eastern	
Mountains	89.3	31.8	0.2	96.5	86.6	304.5
Hills	184.3	265.7	756.1	410.0	302.9	1 918.7
Terai	136.0	192.8	193.2	311.2	306.0	1 139.2
Total	3 409.6	490.3	949.6	817.5	695.4	3 362.4

Source: CBS (1997).

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## **Characteristics of current buffalo recording**

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### **Production environment and input levels**

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The buffaloes are reared mostly by the smallholder farmers at a very low input level in the mixed farming systems in Nepal and their production systems vary greatly across the agro-eco zones. In the Southern Terai belt, inner Terai and mid-hill river valleys, buffaloes are mainly kept under complete stall feeding during seasons of crop cultivation and are occasionally tethered or allowed to graze freely in the crop fields whenever there are no standing crops. Stall feeding is more permanent for the higher yielding animals. In the Himalayan foot hills, grazing of buffalo in the village pasture, forests and recently harvested crop fields is more frequently seen, although there is a tendency to keep the milking buffalo within the fence of the homesteads. In the high hills and mountains, they are even reared under migratory herds which are taken up to the high altitude of alpine pasture, sometimes beyond 3 500 m, crossing the tree line in the southern face of the Himalayas. Thus, environments, in which buffalo are reared, are diverse depending upon their physiographic locations.

Buffaloes in Nepal are well known for their ability to thrive on low quality forage, as they utilise crop residues, straws of rice, millet, wheat and legumes across all agro-eco zones, but are also fed on green forage. It is usually the milking buffalo which is offered high quality green fodder and some supplemental grains on a regular basis.

In Terai, inner Terai and the lower hills, buffalo are usually given permanent housing either separate from or attached to the house of the owner farmers. As the altitude increases towards North, the buffalo housing tends to be increasingly temporary and poorly built, exposing the animals to an increasingly cold climate.

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### **Herds involved**

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There are three institutional herds currently being milk recorded in the country. The Department of Livestock Services (DLS) owned a Livestock Development Farm at Lampatan, Pokhara maintains a breeding herd of about 100 Murrah cows and five to ten Murrah bulls which provide young bulls for dispersal under the cross-breeding programme throughout the country. The Agricultural Research Station, Lumle of the Nepal Agricultural Research Council (NARC) has recently acquired 30 hill buffalo cows and their followers and the Regional Agricultural Research Station, Tarahara of NARC ikeeps about 20 Terai buffalo cows and their followers. Both these latter herds are used primarily to assess the performance of indigenous stocks on station production environments.

In addition, the Agricultural Research Station, Lumle has been carrying out the milk recording activity in farmer buffaloes in its research command area of western hills for the past ten years.

The number of milking buffaloes in Nepal was estimated at 821 000 in 1995-96 (Karki, 1997). In proportion to the size of the population, the number of recorded buffaloes (Table 2) is negligible.

**Approximate number of recorded buffaloes**

In the institutional herds, records of milking buffaloes with their offspring, mates and pedigree are maintained. However, due to the lack of the past breeding history of farmer herds, only individual animals owning records are available from the farmer herd recording. Some of the farmers' animals may not even be recorded for the full term of lactation due to selling of the animal to another farmer during lactation.

**Animal categories involved in the recording process**

The purpose of recording in institutional herds is mainly for farm management decisions which include revenue accounting, feeding, health care and farm level breeding decisions and research purposes. In farmer herds, recording is solely for research purposes to assess and compare the level of performance between Murrah cross-breds and indigenous buffaloes.

**Purpose of the recording system**

*Table 2. Number of milking buffaloes being recorded across the areas/locations in the past and present.*

Locations (type of herds)	No. of buffalo recorded before 1998	No. of buffalo recorded after 1998
1. Lampatan Livestock Development Farm (on-station)	60-85 per year	90
2. Lumle Agricultural Research Station (on-station)	20 per year	30
3. Lumle Agricultural Research Station (farmer herds)	500 in three rounds of recording	~400
4. Tarahara Agricultural Research Station (on-station)	20 per year	20
5. Pakhribas Agricultural Research Station (farmer herds)	200 (only in 1989)	discontinued

Source: Annual Reports of the respective stations.

All animals both in institutional as well as farmer herds being recorded are usually identified using standard dairy cattle eartags. However, the animal identification is entirely an arrangement at the station level or the research project level and the identification numbers are not registered centrally.

**Type of animal identification employed**

**Traits measured and frequency**

The traits measured in milking buffaloes being recorded at the Lumle Station include yield from two time milkings on the test day, milk fat content on a mid lactation day, lactation length and their reproductive traits such as age at calving, calving interval, days to first service, etc. at a frequency as shown in table 3.

*Table 3. The frequency of recording in on-station and on-farm milking buffaloes in the western hills research command area of Lumle Station.*

Traits measured	Frequency in farmer herds (on-farm)	Frequency in institutional herds (on-station)
Milk yield and other lactational information	now monthly (fortnightly in the past)	daily
Milk fat content	once at 5-6 months of lactation	occasionally
Reproductive traits	retrospectively	regular on-farm records

**Other information collected**

Institutional herds have records of pedigree, feeding rations, health care and immunisation, mating or artificial insemination and day to day farm activities relating to the recorded animal. However, farmers' animals generally lack this information particularly of the past, although some feeding and health care information is collected during the lactation recording.

**Types of analyses of crude data**

The data available at Lumle Station from buffalo recording are processed for statistical analyses using software such as Harvey's Least-Squares, SAS, SPSS, Genstat, for reporting the results of breed blood level comparison of lactation and reproductive traits (Rasali *et al*, 1997b, 1998) and lactation curves (Rasali and Harding, 1998). On the Lampatan Farm and the Tarahara Station, recorded data are analysed in spreadsheets for reporting the simple statistics on the records of performance in their Annual Reports.

**Data computerisation and storage**

The data, recorded both on-station and on-farm by Lumle Station are entered into Lotus or Excel spreadsheets as well as farm registers and stored. On the Lampatan Farm, buffalo herd records including records of performance are computerised using University of Minnesota "Dairy Champ" software. At the Tarahara Station, the records are normally kept in farm registers.

**Government and farmer involvement**

Recording of all animals in the institutional herds is the responsibility of the respective government farms and research stations where the buffalo are kept. The Animal Breeding and Artificial Insemination Section and

Planning Division of the Department of Livestock Services may occasionally require reports of the progress made by the Departmental farms on farm operations and production figures.

Only in cases where recording in farmer herds is carried out are farmers involved. Such a case is organized by Lumle Agricultural Research Station, as a part of its buffalo research programme. Four agro-ecological research (AER) sites and eight other outreach research (OR) sites of Lumle Station are designated where buffalo recording work is currently on-going in farmer herds. Buffalo farmers in each site are given clear orientation on the recording and their involvement in the activity. There is provision of some incentives to the farmers in terms of support services such as parasitic drenching and vaccination of animals being recorded for ensuring full cooperation from the farmers in the activity.

All expenses (such as staff costs and recurrent expenses for recording and incentives) for buffalo recording currently undertaken at Lumle Station come out of a research project funded by the Hill Agricultural Research Project (HARP) and NARC budgets. In other farms and stations, such expenses are part of their regular budgets.

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**Recording expenses and incentives**

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Cross-breeding of indigenous buffalo with Indian breeds such as Murrah has been the national policy for their genetic improvement programme. Both natural service and artificial insemination are the methods used for implementing the programme. In the past, unrestricted grading up of indigenous buffalo with Murrah buffalo blood has been the policy throughout the country. Limiting the Murrah blood to 62.5 percent in the cross-breds has been considered recently, particularly for the central hill areas (ABAIS, 1997), while low adaptability of the upgrades in the higher altitudes could be a major reason for low adoption of cross-bred buffalo in the western hills reported in a study (Floyd *et al*, 1999).

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**Genetic improvement programme for buffalo**

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Some kind of selection and culling is taking place in the Murrah herd maintained at Lampatan Farm, but is mainly on the basis of records of performance of the mother cows. However, systematic genetic analysis or progeny testing is non-existent in the buffalo herds in Nepal.

While no systematic programme is yet in place for the genetic improvement through selection in buffaloes, official recognition of any buffalo to select for breeding based on its higher genetic merit does not exist. However, every year the District Livestock Services Office in 75 districts organize a competition in which a number of milking buffaloes are selected for milk recording for a limited period (usually two to three months during lactation). Based on the milk records obtained from the competition, individual cows are selected for awarding the prize to the owner farmers.

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**Are there buffaloes that are officially recognised as being of higher genetic merit?**

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The replacement stock in the institutional herds are selected on the basis of physical appearance of the individual animals and the performance records of their sire and dams.

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**How many bulls?  
How many  
females?**

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The system of evaluating bulls and female buffaloes for future breeding based on their genetic merit is not common. Replacement breeding animals are chosen based on the direct observations of the individual animals and/or records of performance of the dams.

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**How is the genetic  
merit established?**

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Due to the lack of a programme for evaluation of bulls and formulation of selection criteria, the direct observations of the individual buffaloes and records of performance of their dams are the main criteria considered to assess a buffalo for replacement stock in both institutional and farmer herds. Large body capacity, attractive appearance, grey coat colour, long limbs, non-aggressiveness with good temperament, high yielding dams, good health and brightness are considered some of the important characteristics of desirable bulls (Rasali *et al.*, 1997a).

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**The organization  
responsible for  
the genetic  
evaluation and the  
number of staff  
involved in each  
phase of the  
programme**

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The national organizations responsible for the genetic evaluation of buffalo herds are the Animal Breeding Division of the Nepal Agricultural Research Council (NARC) and the Animal Breeding and Artificial Insemination Section of the Department of Livestock Services (DLS) both under the Ministry of Agriculture, but a national programme coordinating these two institutions for genetic evaluation of buffalo herds for a systematic buffalo breeding programme is lacking. However, the experience of cross-breeding efforts and their impact and a number of research results on both cross-bred and indigenous buffaloes accumulating in recent years are leading to the realisation for the need of a national buffalo genetic evaluation programme based on a buffalo recording system.

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**How is the genetic  
improvement  
distributed all  
over the country?**

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The district offices for livestock services are responsible for providing breeding services for the genetic improvement of buffalo. Most of the district offices have a number of Murrah bulls targeted for distribution to the farmers every year. In 43 accessible districts, AI service using frozen Murrah bull semen is also provided. Breeding bulls of indigenous breeds are raised by the farmers themselves and kept for future breeding.

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*AI stations*

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Presently, there is a total of 132 AI service centres in 43 accessible districts (ABAIS, 1997). The central Animal Breeding and Artificial Insemination Section located in Kathmandu valley and its three regional Semen Banks at Lahan, Bhairahawa and Nepalganj, supply frozen semen and liquid

nitrogen to these AI centres at monthly intervals. These AI service centres charge a nominal registration fee for AI service provided to the farmers' buffalo.

Natural service is the main method of buffalo breeding in Nepal. For cross-breeding, district level offices for livestock services procure a number of Murrah bulls either from the Government farms (such as Lampatan Farm), or from farmers or sometimes even from India and distribute them on a cost basis with a transportation subsidy, to the farmers through its network of service centres (9 to 25) throughout the district. Bulls of indigenous breeds are acquired by the needy farmers themselves from the local sources, as these are not provided from government agencies. The bull user farmers in a village community join together into a Village Buffalo Development Committee to raise money for the price of the bull, acquire the bull and maintain it as a "Bull Station" for the breeding service. One or two relatively more resourceful farmers in some villages may also maintain their own private bulls. The fee for the bull service is charged, usually once a season, to the owner of the buffalo bred. However, buffalo bulls of both exotic and indigenous breeds are in inadequate supply against the demand among the buffalo farmers due to constraints such as early disposal of locally born male calves to save their dams' milk for human consumption (Rasali and Crow, 1999) and the high cost of maintaining a breeding buffalo bull as compared to the return from the bull service charge (Rasali *et al.*, 1997a).

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*Natural breeding stations*

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Government farms sell buffalo bulls produced in the farms to the farmers for use in breeding, usually through District Livestock Services Offices or on their recommendation. Sales or exchange of bulls or breeding females among the buffalo farmers are also very common.

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*Sale of breeding animals (who buys them?)*

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The programme for cross-breeding of indigenous buffaloes with the Murrah breed has continually been a part of the livestock development programme in Nepal for more than four decades. The establishment of a Murrah herd in Lampatan Farm with the assistance of a German aided project in the 1970s, a buffalo improvement programme of various integrated rural development projects in the 1980s and a Livestock Development project (in three phases from 1980 to date) are the major investments which have introduced Murrah blood into the indigenous buffalo population and also created Murrah cross-bred pocket areas in various parts of the country. The cross-breeding programme is still continuing. However, there is a lack of programme for improving the indigenous breeds and a definite programme to stabilise cross-bred buffalo population.

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**It is very important to specify if some kind of genetic improvement programme was established in the past**

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