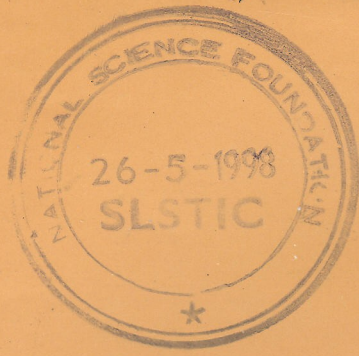
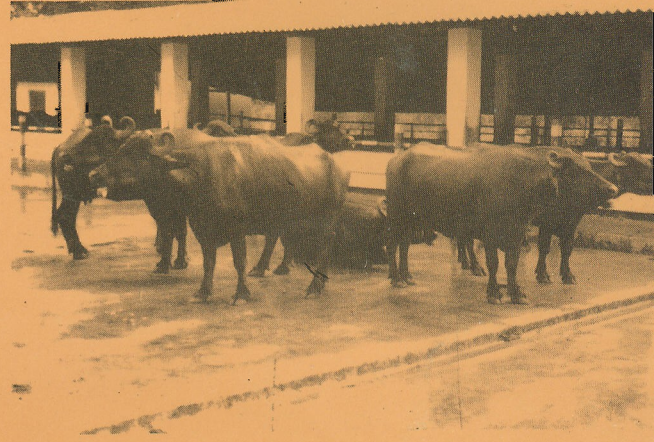


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# BREEDING OF BUFFALOES AND CATTLE

*A Farmers' Guide to Improve  
Production Potential of  
Dairy Animals*



**SAREC/NARESA Buffalo Research  
and Development Programme  
Peradeniya, Sri Lanka**

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*What are the desirable and undesirable characteristics of indigenous cattle and buffaloes as dairy animals ?*

The indigenous buffaloes (Lanka buffalo, Plate 1) and zebu cattle ("batu harak", Plate 2) of Sri Lanka are well adapted to tropical, often harsh climatic conditions and are resistant to many tropical diseases. But they are small in body size and low in milk production compared to their counterparts in the Indian subcontinent or in temperate countries. However, they are highly fertile, provided they are well fed, and they reproduce efficiently even under the harsh climatic conditions.



Plate 1. Lanka Buffalo



Plate 2. Zebu cattle

The smaller body size and low milk production have been the result of in-breeding in closed herds over several centuries, and the absence of selection for production traits by man. These animals are predominantly found in the dry and intermediate zones of the country. In the wet

zone, however, indigenous cattle have been replaced gradually by more European dairy type animals ("cape" cows). Similarly indigenous buffaloes have also been bred without selection for production traits for centuries. Though crossbreeding with improved dairy breeds from the Indian sub-continent has been promoted, its impact on the genetic composition of the local population has been very limited, due to its very limited application.

*Why are improved breeds important ?*

In most parts of the country, particularly in dry and dry intermediate zones of the country, cattle and buffaloes have traditionally been managed extensively on communal grazing lands, with minimum inputs. But with increasing land use for irrigated agriculture, the continuation of the traditional free grazing or tethered grazing systems on communal land is becoming difficult. The objectives of livestock farming, which were mainly draught and meat, have now changed to include milk as the primary commodity. In view of this change, farmers have to adopt new management practices, keep fewer animals with higher production potential and also restrict their movements. This requires the adoption of more intensified rearing methods and the feeding of non-conventional fibrous feeds available in the homesteads and in the vicinity. In the wet zone areas too the productivity of "cape" cows has gradually declined due to nutritional limitations and inappropriate breeding practices.

*How can breed improvement be done ?*

As a method of improving the genetic potential of indigenous buffaloes for milk production, crossbreeding with imported river type buffaloes (from India and Pakistan) can be done through natural breeding or artificial insemination (AI). Similarly, indigenous as well as "cape" cattle can be improved by crossbreeding with imported tropical breeds (from India, Pakistan and Australia) or temperate breeds (from Europe, America and Canada).

Bulls for natural breeding can be obtained from Government Farms managed by the National Livestock Development Board (NLDB) and the

Livestock Development Division of the Mahaweli Authority of Sri Lanka (LDD/MASL). Semen for AI is produced in Sri Lanka at three centres (Kundasale, Polonnaruwa and Tinnevely) but is also imported as required. The field AI services are operated under the supervision of your Government Veterinary Surgeon, and is available through Government as well as private AI technicians.

**Why is it important to select the correct type of bull or semen ?**

The selection of the correct type of bull or semen for breeding your cow is very important, because the calf that is produced must be able to survive, grow, produce and reproduce under the climatic conditions and available feed resources in your area. Thus you must be aware of the principles used in selecting a bull or semen to suit your animal, the region and the management system.

This leaflet outlines the recommendations made by the National Breeding Committee, which consists of experts in the fields of animal genetics and breeding, for improving the milk production potential of buffaloes and cattle in the different agro-climatic zones of Sri Lanka. Please read carefully the recommendations for your particular area and for the type of animal you have at present. Your Veterinary Surgeon and the AI technician will advise you further on the appropriate breeds to use.

**Breeding of Buffaloes**

In order to upgrade the production potential of Lanka buffaloes, river type breeds such as Murrah, Surti and Nili-Ravi have been imported from India and Pakistan. Since they have been bred in their native countries for higher milk yields, they also have the ability to perform well under tropical conditions.

The characteristics of these breeds, their genetic potential for milk production and the locations where purebred herds are found in Sri Lanka are given below (Plates 3-5).

Cross-breeding of Lanka buffalo cows with exotic river type buffalo bulls produce calves which in the first generation have the potential to produce more milk than the local mothers but less than the pure exotic buffalo. But by continuous cross-breeding with genetically superior pure-bred exotic males, the productivity of successive generations will gradually improve and ultimately reach levels as high as that of pure-bred exotic animals, provided they are managed and fed well.

**Breeding Recommendations for Buffaloes**

The recommended breeding programme for buffaloes is given in table below. In all three major regions of Sri Lanka (wet, dry and intermediate zones), cross-breeding of indigenous (Lanka) buffaloes by continuous upgrading to the exotic river type has been recommended. However, the up-graded progeny need better management and feeding depending on the level of up-grading, to enable them to express their full genetic potential. The recommendations for up-grading Lanka buffaloes and the breeding procedure to be adopted has to be determined on the level of management and feeding which the farmer is able to provide his animals. Therefore, up-grading to 100% is recommended in areas such as the wet and wet intermediate zones. But in other areas such as the dry and dry intermediate zones, where improvement of feeding and management practices would not be possible in the foreseeable future, up-grading of indigenous buffaloes or the crosses up to 50% exotic breed is recommended.

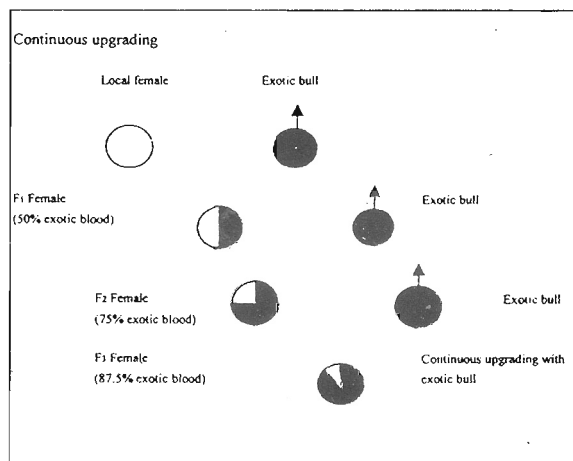


Fig. 1. Breeding chart for Intensive System

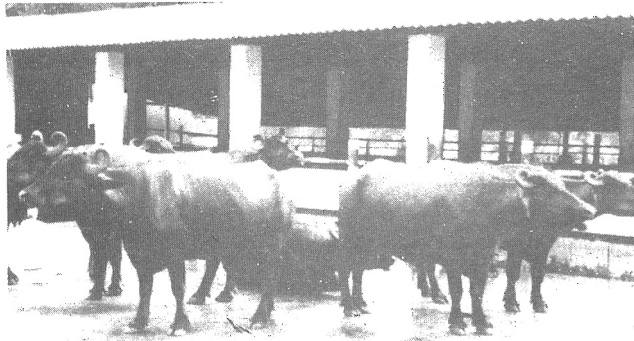


Plate 3 - Murrah buffalo

Murrah animals have been bred for high milk yield. They are large, with jet black skin and tightly curved horns. They are able to survive, reproduce and produce under hot and humid conditions. They have the potential to produce 3000-5000 kg of milk during one lactation (10-16 litres/day), provided they are well fed. Murrah herds are reared in at the NLDB Farms at Polonnaruwa and Ridiyagama.



Plate 4 - Surti buffalo

Surti animals have been bred for high milk yield and butter fat content. Smaller in body size than Murrah, their horns are flat, sickle shaped and directed downwards. Skin is greyish and the hair is grey to brown in colour. They resemble Lanka buffaloes, but are better milk producers and are docile. They have the potential to produce 2000-4000 kg of milk per lactation (7-12 litres/day), provided they are well fed. Surti herds are reared at the NLDB Farm at Melsiripura.



Plate 5 - Nili-Ravi buffalo

Nili-Ravi animals have been bred for high milk yield and butter fat content. They are large, stocky animals with black skin and white markings on forehead, face, muzzle, legs and tail switch. Horns are short and broad at the base and closely curled back. Introduced to Sri Lanka only recently. They have the potential to produce 3000-6000 kg of milk per lactation (10-20 litres/day). They are found on NLDB Farm at Nikaweratiya and Mahaweli Farms at Kalankuttiya and Girandurukotte.

Agro-climatic zone	Management System	Breeding Recommendation
Wet zone	Intensive system	Grading up of local buffaloes by cross-breeding with bulls of exotic river type buffaloes. (e.g. Murrah, Nili Ravi) to near 100% exotic blood level (Fig. 1).
Intermediate zone	Extensive system	Crossing with exotic river type breeds (e.g. Murrah, Nili Ravi) to produce first generation (F1) with 50% of exotic blood level. Stabilize exotic blood level at 50% by interse mating to F1 bulls (Fig. 2).
Dry zone		

In the wet zone hill country region, buffalo rearing is not encouraged since the resources available are more suitable for high producing dairy cattle.

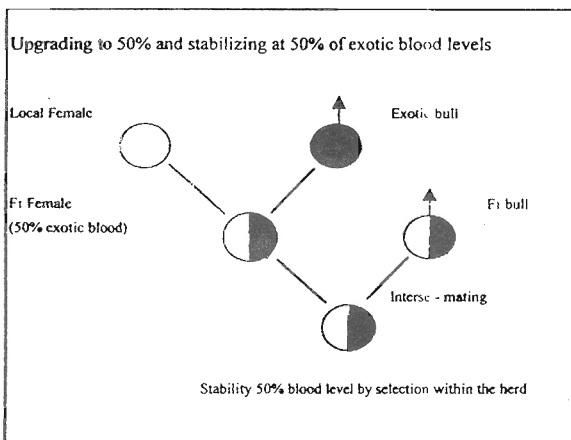


Fig. 2. Breeding chart for Extensive system

### Breeding of Cattle

As a result of the introduction of temperate dairy breeds during the colonial era and the availability of widespread AI services, the cattle population found in the country is very diverse and heterogenous. In general, indigenous zebu animals and "up-graded" zebus are primarily found in the dry and dry-intermediate zones while more temperate dairy types, pure and "up-graded" cows are found in the wet and wet-intermediate zones. Within these regions too, there may be variations in the genotypes of animals found. The ability of the various genotypes to adopt to the different ecological conditions in each region has had a bearing on the distribution pattern of the genotypes seen

across the country. For example, a temperate dairy type cow may not be able to produce and reproduce satisfactorily or even survive under harsh climatic conditions prevailing in the dry and dry-intermediate zones.

Similarly, rearing indigenous or "up-graded" zebu animals may not be economical in the wet and wet-intermediate zones, where climatic conditions are more conducive to the rearing of better temperate dairy type animals.

### What are the cattle breeds recommended ?

The Department of Animal Production and Health now recommends 4 breed types for genetic up-grading programmes across the country: Friesian, Jersey, AFS (Australian Friesian Sahiwal), and Sahiwal. The characteristics of these breeds, production potentials, suitable climatic conditions and where they are to be found in Sri Lanka are given below (Plates 6 to 9).



Plate 6 - Friesian

Black and white animal, bred in temperate regions (North America, Europe), with large body frame. Has the potential to produce 5000-10000 kg of milk per lactation. However, they are able to survive, reproduce and produce well only in cool, wet climatic conditions (hill and mid-country) and on high quality feeds. Very susceptible to tick-borne diseases (Babesiosis, Ehrlichiosis) and metabolic disorders (milk fever, ketosis). Pure Friesians are maintained in NLDB Farms at New Zealand, Ambewela and Bopathalawa.

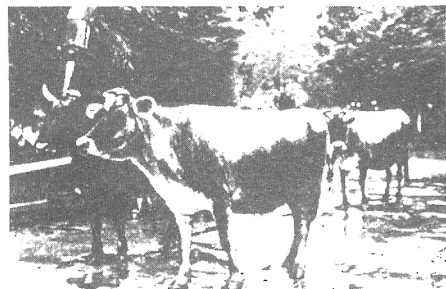


Plate 7 - Jersey

Light to dark brown animal, bred in temperate regions (Europe, N. America), with small body frame. Very docile and easy to handle. Has the potential to produce 3000-6000 kg of milk per lactation with high fat content. Performs well under cool, wet climatic conditions and on high quality feeds. In contrast to Friesians, can adapt to moderately hot and humid conditions (such as in the coconut triangle), provided they are fed well. Pure Jerseys are maintained in NLDB Farm at Dayagama.

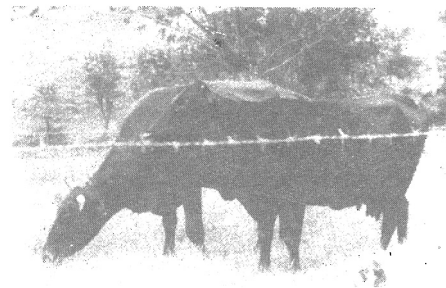


Plate 8 - AFS (Australian Friesian Sahiwal)

A synthetic breed, developed in Australia by cross-breeding Friesian and Sahiwal. Stocky animal, wide variety of skin colour (black, brown with or without white patches). Has the potential for moderately high milk production (4000-5000 kg of milk per lactation) with high butter fat content and ability to perform under a wide variety of climatic conditions (wet as well as intermediate zones), provided they are fed well. AFS semen is produced at the Central Semen Processing Centre at Kundasale and is available at VS offices. This breed is recommended for cross-breeding of extensively managed stock.



Plate 9 - Sahiwal

Brown to reddish in colour, bred in the Indo-Pakistan sub-continent. Medium sized body frame with well developed dewlap. Has the potential for moderately high milk production (2000-4000 kg milk per lactation) with high butter fat content. Able to survive, reproduce and perform under a wide variety of climatic conditions (wet, intermediate and dry zones). Resistant to tick borne diseases. Pure Sahiwals are maintained on NLDB farms at Nikaweratiya, Udubaddawa, Polonnaruwa and Melsiripura.

**What are the breeding schemes recommended for each Zone?**

National Breeding Committee has recommended breeding policies for different agro-ecological regions. The description below is a very simple guide prepared on the basis of these recommendations.

Taking into consideration the variation in agro-ecology and the potential resources available, the

Agro-climatic Zone	Management System	Breeding Recommendations
Wet zone-Hill country	Intensive system	Continuous grading up to temperate breeds (e.g. Friesian or Jersey) to raise temperate blood level to near 100%.
	Extensive system	Crossing with temperate breeds (Friesian or Jersey) to produce first generation (F1) with 50% temperate blood. F1 is then mated with another F1 (of the same breed or different breed) to maintain temperate blood level at 50%.
Wet zone-Mid country	Intensive system	Continuous grading up to temperate breeds, to raise temperate blood to near 100%.
	Extensive system	Crossing with temperate breeds to produce F1 with 50% temperate blood level. Thereafter cross to F1 cross-bred bulls or bulls of AFS or AMZ.
Wet zone-Low country	Intensive system	Crossing with temperate breeds to produce F1 with 50% temperate blood level. Thereafter cross to F1 cross-bred bulls or bulls of AFS or AMZ.
	Extensive system	Continuous grading up or crossing to Indian Zebu breeds (e.g. Sahiwal) to raise exotic zebu blood levels to near 100%.
Dry zone	Intensive system	Crossing with temperate breeds (e.g. Friesian or Jersey) to produce F1 with 50% temperate blood level. Stabilize temperate blood level at 50% by mating to F1 bulls or bulls of AFS or AMZ.
	Extensive system	Continuous grading up with Indian zebu bulls to raise exotic zebu blood level to near 100%.
Coconut Triangle	Intensive system	Crossing with temperate breeds (e.g. Jersey or Friesian) to produce F1 with 50% temperate blood level. Stabilize temperate blood level at 50% by mating to F1 bulls or bulls of AFS or AMZ.
	Extensive system	Continuous grading up with Indian zebu (e.g. Sahiwal) to raise exotic zebu blood level to near 100%.
Jaffna	Intensive system	Continuous grading up to temperate breeds (e.g. Friesian or Jersey) to raise temperate blood level up to 75% or more
	Extensive system	(a) Continuous upgrading with Indian zebu breeds to raise exotic zebu blood level to near 100%. (b) Stabilize blood levels of existing temperate cross-bred animals (i.e. at 50% or above) by mating to good bulls of same population or by mating to bulls of AFS or AMZ.

### **Some Important Points to Remember**

1. Always adhere to the breeding recommendations applicable to your area. Discuss with the veterinarian and AI technician regarding the choice of semen to be used on your animals. If you use semen from a temperate breed which is not suitable to your environment, calves born to your cows, may become stunted and unproductive because of their inability to adopt to the environment.

2. For optimum results, always maintain records of events such as calving dates, service dates, type of semen used, milk production, etc. This will enable you, together with the Veterinarian and AI technician, to decide on the right type of semen to be used on your cows, and also attend to any breeding problems that may arise.

3. Cross-breeding must always be controlled through careful selection of both male and female for desirable productive traits. Keep only the progeny of high producing females as replacement heifers for breeding and always serve your heifers and cows with bulls or semen with higher breeding values.

### **How to select the right type of bull or semen?**

This can be done only if the farmer knows the production potentials of his cows and that of the bull he desires to use. The actual genetic potential of a cow or a bull for milk production or fat production is called the breeding value. This cannot be measured directly, but it can be estimated based on the performance of the animals and its relatives or offspring. The estimated breeding value (EBV) of an animal is the difference between the average milk production of the animal and the average milk production of animals of the same breed managed under similar conditions. Examples on how to calculate the EBV for a cow and the expected performance of the calf to be born is given below.

### **1. Calculation of the EBV of a buffalo cow**

For example, if the average milk production of your Murrah cow in the Coconut Triangle is 2200 litres in a 305 day lactation period and the average milk production of all Murrah cows in the Coconut Triangle is 1900 litres in a 305 lactation period, then the EBV for milk production of the cow is + 300 litres (i.e. 2200-1900).

The estimated breeding values of the dam and the bull could be used to predict the milk production potential of the expected offspring.

The predicted value of production potential of the calf is the half the sum of the EBV of the dam and of the sire, which is called the Expected Progeny Difference (EPD). An example for calculation of EBV value of the dam and the selected sire and the calf's expected production level is given below.

### **2. Calculation of the Expected Progeny Difference (EPD) and the expected production level of the calf**

The average milk production of all the Murrah cows in the Coconut Triangle = 1900 lits (a)

If the EBV (for milk) of your dam = + 300 lits

and the EBV (for milk) of the sire = + 800 lits

Then the contribution of the dam to the expected progeny difference of the calf =  $1/2 \times 300$   
= 150 lits (b)

The contribution of the sire to the expected progeny difference of the calf =  $1/2 \times 800$   
= 400 lits (c)

Then the EPD of the calf is (b+c) = 150+400 lits  
= 550 litres (d)

The expected actual performance of your calf will be the sum of the average milk production of all Murrah cows in the Coconut Triangle and the EPD of the calf (a+d), which is 1900 + 550 = 2450 for a 305 day lactation period, which is higher than the production potential of your dam.

Therefore in making the decision on the choice of a bull to mate your cow, you should select a bull which has a higher EBV than the cow. In doing so, you should bear in mind that you should not select a sire with a very much higher EBV than your cow. The reason for this is that

your low producing cow will not be able to produce sufficient milk to satisfy the higher milk requirement, necessary to support the higher growth rate of the superior calf.

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