

CATTLE BREEDING IN BHUTAN

CRIA DE VACUNO EN BUTAN

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The traditional mating procedures for cattle breeding in Bhutan are much more advanced than in most other developing countries. For at least a century there has been a systematic crossbreeding and backcrossing system designed to supply efficient milking animals for migratory herds and draught animals for the cultivation of grain crops. Recognizing the importance of this breeding system and the contribution to it by the native breed, the Siri, the Government has forbidden crossbreeding in the western part of the country where there is a concentration of high quality Siri herds. Also the Government has established a constructive Livestock Act which calls for using only superior breeding bulls and for maintaining effective upgrading in the crossbreeding sector by introducing Jersey genes. This is to achieve a much higher level of milk production and at the same time maintain a high total solids content of the milk, which, in the crossbreeding tradition, is among the highest in the world.

The traditional crossbreeding involves the use of Mithun bulls which are imported from India where the only population of Mithun exists. The Mithun is taxonomically classified as a separate species known as *Bos frontalis*. Common cattle and all the well known cattle breeds belong to the species *Bos taurus* or *Bos indicus*, the latter being the humped breeds or types. The Mithun is characterized by its enormous size; an average mature cow weighs approximately one tonne, and also by a large dorsal, thoracic protrusion. Body measurements taken on Mithun and crossbreeds are shown in Table 2. This species is confined entirely in its distribution to the Indian province of Aranchal where the total population size is estimated to be 50,000. It is regarded as a semi-domesticated animal with some religious connotations by the local population. The owners are wealthy people in the native community who use these animals as an investment and as a source of meat. Being able to look after themselves in small herds of 6 to 10 head in the dense jungle, they are very seldom observed in the settled part of the region. They are obviously adapted to tropical or subtropical environments and thus are an unknown and unexploited genetic resource. The Bhutan Government has established two pure Mithun herds in the foothill area of Bhutan under domesticated management conditions. Keeping the Mithun as a domesticated animal was previously regarded as impossible because of the timidness of the animal. The reproduction rates in the Mithun herds in Bhutan are sufficient to maintain herd size with the regular attention of herdsmen and the use of a normal cattle handling production regime. These Bhutan herds are essentially an attempt to offset the ever increasing price of Mithun bulls and to make good breeding bulls available to breeders throughout the country. However, these herds are also important for providing for the

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first time an opportunity to study the Mithun and learn about its performance characteristics. Despite the great emphasis on the traditional breeding system, there are serious weaknesses in it which have to do with the demography of cattle populations and the proportion of crossbreds that can be produced without seriously decreasing the size of the population of native cows.

To understand the present cattle resource situation and to devise solutions to certain constraints the traditional mating plans have been thoroughly studied and can be explained as follows: the Mithun bull is crossed with Siri cows for the purpose of increasing not only milk yield, but also increasing the total solids content of the Siri milk (unfortunately, there are no accurate figures on the level of milk production on pure Mithun cows or on the growth rate of their calves when being nursed). The crossbred offspring or the F1 has a native name which do all other subsequent backcrosses. This first cross is known as a Jatshum for the female and a Jatsha for the male. The breeding of the Jatshum is biologically limited because when bred back to a Mithun or being bred to a Jatsha it gives an unreliable offspring referred to as a Menchi. This is known to have, at least in many cases, a high mortality rate during calfhood. Thus the present mating plan was designed not entirely by choice because the only alternative mate for the Jatshum was the Siri bull. Breeders have learned by experience that a good Siri bull should be used for this cross and selection on appearance has resulted in a particular kind of bull from the top Siri herds and is given the name Nublang. These animals can be seen in some of the migrating herds that are mainly Jatshum and Siri; whereas those herds that are mainly Siri usually have with them a Mithun bull. In this way, the mating plan can be controlled. The offspring of the Jatshum mated to the Nublang (special Siri bull) is known as a Yankum for the female and a Yanka for the male. The Yankum is generally mated to a Siri bull giving a Doebum or a Doeb. The most ardent classical breeders have another backcross to the Siri to produce a Datum or Data; the final animal in the backcrossing sequence being a Thrabum. This animal is regarded as a superior Siri and is treated as such, being mated to a Mithun bull to start another series of backcrosses as described above.

There are some deviations practiced from this traditional system of mating, for example the Yankum is sometimes mated to a Mithun bull by design or by accident, but this and other deviation matings do not produce as high quality offspring as do the backcrosses to the Siri. Thus, inter se matings do not offset the shortage or demand for pure Mithun bulls and the shortage in supply of good Siri cows. The design of a better mating plan to meet the needs of the livestock producers and the consumers must take into account that not only are the Jatshum and the Yankum outstanding milk cows, but also their male contemporaries, the Jatsha and the Yanka, are prized draught animals.

Despite the usefulness of the traditional breeding procedure, the breeding structure in Bhutan is faced with two problems: 1) how to increase the frequency of the Jatshum and the Jatsha type of animal and 2) how best is the Jersey breeding to be used in a long-term breeding operation. The problems associated with the present population can be well understood by studying Table 1. Here the number of crossbreds and backcrosses from the original MithunXSiri crosses are shown for different levels of lifetime reproduction. The average number of calves produced in a lifetime determines that proportion of the replacement heifers that can be bred to a bull of a different breed without affecting the size of the parental female population. This is the same as saying that a certain proportion of

Table 1

Approximate Number of Crossbreds and Backcrosses from a Siri Cow Population Maintained at 60,000 = N with Different P = Averages of Reproductive Life and n Siri Cows Available for Crossbreeding per Year.

P	n	Jatshum	Yankum	Doebum	Thrabum ¹
5	12,000	7,500	4,692	2,928	1,836
6	20,000	15,000	11,200	8,400	6,400
8	30,000	30,000	30,000	30,000	30,000

¹See text for nomenclature, numbers given are based on four calvings required for one mature female replacement.

Table 2

Body Size of Mithun and Crossbreds with Siri (cm)

	Wither Height	Heart Girth	Shoulder to Hook	Rump Length	Metacarpas Circumference	Radius Length	Between Eyes
Mithun Cow	144.0	203.0	102.8	44.5			
Jatshum	122.5	162.9	86.8	38.3	16.2	32.3	16.6
Sechen	120.5	177.3	96.4	39.9	16.5	33.1	18.5
Siri Cows	117.3	153.6	88.9	37.2	14.6	31.5	16.1
Jersey Siri Bulls	121.6	151.0	96.5	35.0	17.0	34.0	18.0
Indian Zebu ²	97.6	130.4	71.6	30.0	11.8	27.2	
Mithun Calves (7.6 months)	89.3	109.5	54.2	25.8	12.8	24.2	14.6

²Serious temperament problem, small native cattle imported from India.

a purebred population must be reserved for breeding to bulls of the same breed in order to preserve the breed and to avoid extinction by uncontrolled crossbreeding. The lowest level of lifetime reproduction shown in the Table is five calves per average lifetime which is probably much higher than the actual value. However, even with this high estimate the percentage of crossbred offspring possible, without decreasing the pure Siri population, is only 22 or approximately four times as many purebreds must exist as do crossbreds, with a prolificacy level of five calves per lifetime. Very high reproduction levels are needed to obtain high proportions of crossbred or hybrid animals with the highly reproductive species such as pigs, chickens and the prolific breeds of sheep. Therefore, the number of the most prized milk cows, namely the Jatshum, cannot be very large in relation to the total cow population.

To form an alternate breeding scheme to overcome this basic genetic resource problem it must be kept in mind that one of the major objectives for a cattle breeding program in Bhutan is a high total solids content for enabling a high yield of cheese and butter from the total herd milk production. If transportation and refrigeration improve in some areas of the country, it may become possible to promote a fluid milk trade, but generally the present market conditions require the condensation of milk into cheese and butter at the point of production for sale in nearby villages and communities. As a general guide, the present milk content of fat is given in Table 3 which contains values which were calculated from data collected recently from herds in the mountainous region surrounding Thimph, the capital of the country, and in the villages of Ha and Paro which are in the more isolated western areas of the country. There are no dairy breeds that have as high milk fat content as shown in the Table except certain breeds of Asiatic buffalo. The buffalo is not a suitable choice to introduce to Bhutan because it does not breed with cattle, has too large body size and, thus, too large a maintenance requirement for the scarce feed conditions of Bhutan and would not be able to graze in the extremely steep hill and rough terrain areas that are used for cattle rearing. Consequently, special breeding procedures are needed to solve the present demographic constraints to crossbreeding. Fortunately, Bhutan has a temperate climate throughout most of the area where the majority of cattle are raised which makes possible the survival of temperate zone breeds. There is an endemic problem with tick-borne diseases, numerous internal parasites and a total lack of concentrated feed supplements for the practical milk producer. Thus the introduction of exotic genes must be done cautiously, as in most developing countries, where oftentimes the importance of the native genotypes for survival and disease resistance is carelessly ignored.

The Government of Bhutan wisely chose the Jersey breed among many other possible introductions, for breeding to the local Siri cows, in order to increase the level of herd production and thus realize greater returns from labour and feed inputs. It is well known that the Jersey has the highest butterfat content of all specialized dairy breeds, although it comes not even close to that of the Mithun. The Jersey also has the attribute of being high among comparable breeds in resistance to ticks and in actual tests it is adapted to harsh environments in many developing countries. It is also known to have a low incidence of dystocia (calving problems). Although the Jersey breed originates in the Jersey Islands, it is very popular in European and American countries and, in consequence, is bred scientifically by the use of artificial insemination which

gives accurate transmitting abilities of superior bulls with regard to not only the milk producing level of their daughters, but also of the butterfat content of the milk of daughter groups. Therefore, the breeders using these imported Jersey bulls can benefit not only from the high butterfat content of Jersey milk, but also the Government can assure that only those bulls with high butterfat transmitting ability will be introduced. For Bhutan the small body size of the Jersey is also appropriate because, being Bhuddists, meat is very limited in the diet and the salvage value of surplus stock from dairy herds does not reward the extra feed requirement of large cows. Yet the Jersey is bigger than the Siri and so crossbred male offspring are good draught animals. However, livestock resource managers must recognize that in all Himalayan and similar countries the grazing of livestock in the extremely mountainous conditions requires special adaptive ability of solid footing and balance to avoid falling off steep hills and cliffs to death in grazing areas. The Jersey, of course, is no better than any other breed in this regard and, therefore, its genes must be mixed with native genes for them to be of use in practical grazing conditions. Jerseys can survive well in Bhutan with very special care involving the use of expensive crop land for grazing and of expensive labour to cut forage for stable feeding to milk cows and replacement stock. Even with this special care, the average herd owner, who depends on income from the sale of fresh butter and cheese, must have a higher butterfat content than that of Jersey milk to make efficient use of hand operated churns and small vats all made from local bamboo. This milk processing equipment must travel with the herds in their search for fresh pastures and, therefore, cannot be bulky or mechanical.

When the herds migrate south with the advance of winter in the northern pasture area or north with the arrival of spring, pack animals are used to carry the wooden milk processing equipment plus all tents, bedding and other living necessities. A favorite animal for this packing job is the Yanka, as described above, which is a large, strong animal with a very docile disposition. The Mithun Bull which usually grazes with most herds is also large and strong, but his owner is so proud of this animal and looks after it so well that it would never be used for packing. The Mithun's health and safety are protected in every way and during the breeding season is fed raw eggs and milk in an attempt to ensure a high conception rate from his breeding of cows in his own herd and in the herds of neighbors who pay for his use in the form of eggs and milk for his diet. In their native habitat they graze in a semi-domesticated condition in the jungles of North-East India.

The future of cattle breeding in Bhutan will depend on the joint use of the Jersey and Mithun imports with crossbreeding mixture of genes in the Siri population to make a favourable combination of production and adaptation traits to supply a suitable kind of milk in the maintenance of the present cheese and butter-making. This calls for new breed formation from crossbred foundations and the Government is now conducting test matings to advise private breeders on the best mating system to use. The mainstay of the cattle population has been the Siri breed and, as mentioned earlier, the Government is encouraging breeders in the dense Siri region of the western part of the country to maintain this important genetic resource in good genetic condition. Yet the Bhutanese milk producer is facing the economic squeeze of ever increasing labour costs and the demand for good grazing land. Increased production efficiencies are urgent with improved pasture and more returns from a unit of labour input.

Table 3

Butterfat Content of Milk Samples

Collected in Private Herds and at a Government Mithun Farm

<u>Breed Type</u>	<u>Butterfat %</u>
Pure Mithun	10.6 \pm 2.2
Jatshum	8.6 \pm 1.8
Yankum	6.7 \pm 0.9
Thrabum	5.9 \pm 0.9
Pure Siri (no Mithun)	4.3 \pm 0.8
Wangchatabba Government herd of mixed breeding	3.6 \pm 0.6

Fortunately, genetic techniques are available for combining breed genes such as from the Siri, Jersey and Mithun to answer the two main problems of providing a good supply of Jatshum-type cows and where best to use the Jersey genes for long-term improvement. Already the wealthier private breeders are making trial matings between the Jersey bulls and the Jatshum. No one knows what the outcome may be, but the answer will soon be evident from the birth of the first calves in history of *Bos taurus* X (*Bos frontalis* X *Bos indicus*). Very likely the offspring from this three-way mating will grow into too large an animal for the average practical farmer, so the Government is providing cross-bred JerseyXSiri bulls as well as pure Jersey bulls so that breeders can make the more cautious mating of (JerseyXSiri) X Jatshum. This preferred mating will avoid too rapid an introduction of unadapted (exotic) genes and avoid too large or inefficient type of milk and draught animals.

The prospects for using the Mithun species outside of Bhutan for specialized dairy and meat production has apparently been overlooked by livestock resource experts. Even in India, but also in the rest of the world, it has not been recognized that, unlike the buffalo, the Mithun will mate with cattle species. The possibilities of such a mating, with either the good milking breeds of India or the highly specialized breeds of the industrialized world, could provide a dream-come-true opportunity for a variety of kinds of superior milk animals adapted to different environmental and market conditions. Breeders who over the centuries have contemplated the advantages of the impossible crossing of buffalo with dairy cattle should have known about the Mithun because they could have already created new Indian milk breeds with high milk solids. Now that AI is possible and the Bhutan Government has Mithuns in captivity, semen could be made widely available to breed good Indian dairy cows and thus provide offspring with a much elevated milk fat and protein content. This is to say nothing of the phenomenal results that are likely to result from crossing the Mithun with the highest producing milking breeds, such as the Holstein-