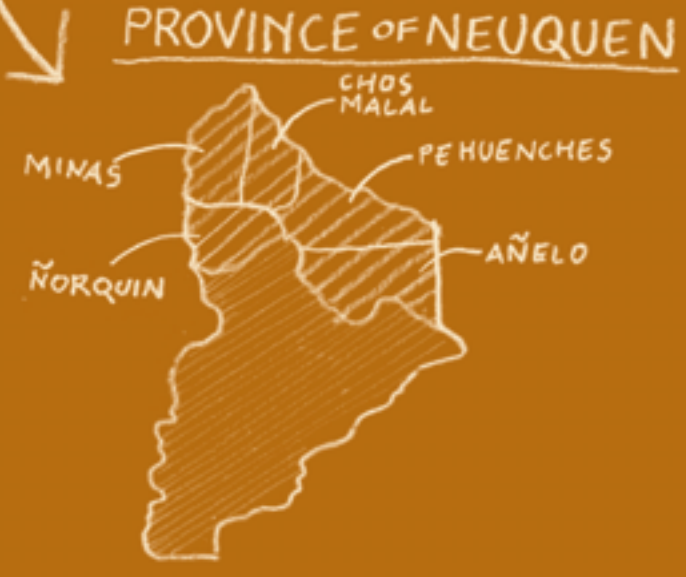
1. The Neuquén criollo goat and its production system in **PATAGONIA**, **ARGENTINA**
2. Community-managed yak genetic resources and breeding system in **LAYA**, **BHUTAN**
3. Revitalization of the Basotho pony mare camps: a step towards increasing populations of the Basotho pony in **LESOTHO**
4. Managing lowland buffaloes in the hills of **NEPAL**

CHAPTER 1
COPING STRATEGIES IN **SUBTROPICAL MOUNTAIN ECOSYSTEMS**

Case studies were collected in subtropical mountain ecosystems in Argentina, Bhutan, Lesotho and Nepal to better understand how communities manage their local goat, yak, pony and buffalo genetic resources.

While the climate and topography of the three subtropical mountain ecosystems differ in detail, despite some variation in rainfall, climate and altitude, there are significant similarities between them. All areas are characterized by the presence of extensive grasslands. Temperatures vary greatly and environmental threats include soil erosion, overgrazing (often a result of inappropriate grassland management policies) and invasion of exotic plants. The extremely harsh and often unpredictable climate favours livestock keeping rather than crop growing. Large farming communities still depend entirely on livestock for income and livelihoods. Some governments acknowledge that livestock alone cannot provide a sustainable income for herders and are therefore actively promoting alternative income sources such as ecotourism.



Maps below:

Location of
Neuquén criollo goats in
Neuquén, Argentina

THE NEUQUÉN CRIOLLO GOAT AND ITS PRODUCTION SYSTEM IN PATAGONIA, ARGENTINA

M.R. Lanari, M.J. Pérez Centeno, E. Domingo

SUMMARY

Neuquén are small, hardy goats raised by small-scale herders in a transhumance system under cold, semi-arid conditions. Their area is contiguous with Chile which, until border closure, was a source of genetic exchange as well as a major market for goat products. Herder families are now settled while herds continue to migrate on their transhumance circuit although land development and forestry now hamper transit routes and resting sites. Neuquén genetic resources are doubly threatened: development projects push larger, exotic breeds although crossbreeds do not thrive under transhumance; exchange of breeding stock with Chile is no longer possible. A conservation programme is in place, within the production system, using selection criteria proposed by the producers.

Argentina has about four million goats, mostly in amorphous herds. Neuquén Province has around 640 000 goats, of which 53 percent are criollos (INDEC, 2002). The production system has its roots in aboriginal societies: livestock brought by the Spaniards had far-reaching changes in these societies' habits and organizational patterns. *Crianceros'* (small-stock producers) economic activity centres around goat-keeping. Their production system incorporates elements from indigenous cultures, such as transhumance and *castronerías* (sites where groups of owners keep their males out of season). This goat/transhumance/*criancero* triad is a core component of the culture and identity of the north of Neuquén Province. This study was conducted between 1997 and 2003.

Neuquén Province, in the north of Argentine Patagonia between 71° and 68° West and 36° and 38° South, encompasses over 30 000 km². The terrain in the north is broken. The Andes are paralleled by the Cordillera del Viento, a natural barrier averaging 3 300 metres. The main watercourses form the Neuquén river basin (Méndez Casariego, 2002).

Bran (2002) defines six ecological units in Neuquén; three are in the study area: the northern mountain range, the sierras and northern highlands, and monte austral. The traditional system is structured around seasonal pasture use. Summer pastures are in the northern mountains between 1 500 and 2 000 metres; the vegetation is gramineous, with variable proportions of subshrubs and shrubs. The main grasses are: *Festuca pallescens*, *Poa ligularis* and *Stipa speciosa*. The most common shrubs and subshrubs are *Mulinum spinosum*, *Acaena splendens* and *Adesmia* spp. The *mallines*, (humid meadows in valleys with humic soils) are a good forage resource: the predominant species are *Poa pratensis*, *Juncus balticus*, *Trifolium repens* and *Carex* spp.

The sierras and northern highlands between 750

and 1 400 metres are arid to semi-arid. Degradation of ground cover is serious to very serious. The vegetation includes *Grindelia chiloensis*, *Senecio filaginoides*, *Haplopappus pectinatus* and *Schinus polygamus*. The monte austral has mid-height shrubby vegetation of *Larrea divaricata*, *Atriplex lampa* and *Prosopis alpataco*. Oil drilling and livestock are the main economic activities (Bran, 2002). Winter forage production is 35 to 100 kg DM/ha on degraded slopes and up to 2 000 kg DM/ha in the *mallines*; in summer grazing lands *mallines* may produce 2 500 kg DM/ha. (Ayesa *et al.*, 2002)

In the north there are two longitudinal zones: one between the mountain ranges; the other east of the Viento range (Méndez Casariego, 2002). In summer grazing above 1 500 metres, precipitation is 800 mm to 1 200 mm as one moves from east to west and falls entirely as snow. Annual mean temperature is 11 °C, with monthly means between 18 °C in January and 3 °C in July. In the winter pastures temperatures are less extreme and it snows less. The precipitation pattern is Mediterranean, with the wet season from May to September. Precipitation is from 150 mm in the east to 400 mm in the west. Annual mean temperature is 14 ºC, with monthly means between 19 ºC in January and 6 ºC in July and August (Pérez Centeno, 2001).

The first inhabitants were hunters-gatherers (Mendez and Ivanow, 2001) and movements between winter and summer settlements predate the introduction of livestock. The region was colonized in the late nineteenth century, but had been subject to strong European influence (Bandieri *et al.*, 1993): by the seventeenth century the Mapuche had become horsemen, stockmen and traders (Bandieri *et al.*, 1993).

Criollo settlers who supplanted the indigenous population continued livestock exchanges and transhumance; the agrarian system took in territory in Chile. Deterioration in relations with Chile closed the border (Pérez Centeno, 2001), interrupting the flow of livestock and gradually isolating herds from their source of genetic exchange.

Northern Neuquén has a population of around 32 000 (Méndez Casariego, 2002). Some 1 600 are subsistence producers of goats and other livestock. A typical *criancero* has 240 goats, 30 sheep, 18 cattle and 11 horses; mostly on government land. Domestic consumption of goat meat rose from 20 to 57 percent over the past 20 years (Bendini *et al.* 2002). The authors' estimates, based on goat production indices, puts on-farm consumption at 60 percent. Health indicators point to less malnourishment among the rural population than in urban centres.

The whole family went on transhumance; social ties were formed along the route and near grazing lands. Increased school enrolment and improvement of housing near winter pastures altered this, and the household no longer migrates. As more and more grazing lands (especially winter pastures) have been fenced, herding routes and the distribution of resting places have been altered. This has had a serious effect on people who herd animals over more than 100 km. Since 1995 more and more stock are trucked, particularly cattle. Goats are usually trekked (Photo 1).

Livestock are supplemented by irrigated forage crops (especially *Medicago sativa*) and vegetables are grown for home consumption. Cereals used to be grown, but after integration with cereal-producing zones, were replaced by forage. Forestry, which began about 20 years ago, competes with summer grazing and restricts herding routes as more and more land is fenced.

Marketing of goat products which had centred on Chile (Bandieri, 1991) was redirected within the province after border closure. Traditionally, kids were marketed by merchants, bartered or paid for by merchandise bought on credit. This asymmetrical relationship was reinforced by border closure (Pérez Centeno, 2001).

In the nineteen-eighties, the provincial government promoted cooperatives (in which *crianceros* played a role) to market kid meat. Financial difficulties forced these to close and marketing is back in the hands of merchants. The scattered locations of the *puestos* (where *crianceros* live), low population density and remoteness put constraints on associative marketing. Transhumance is an obstacle because not all kids are ready for market when the time comes to move to

K. Tempelman

PHOTO 1. Goat herder migrating with his animals from summer to winter pasture in northern Neuquén Province

summer pastures (November–December).

CHANGES AND CONSTRAINTS AFFECTING THE TRADITIONAL PRODUCTION SYSTEM

Criancero households are now settled; the head of the household or some older children travel to the summer pastures, so it is more difficult for one generation to pass on know-how to the next. Other factors which impact on the traditional system include:

- restrictions on movements of producers in Chile and Mendoza, who used to pass the summer in Neuquén;
- the ban on cross-border transactions involving stock on the hoof;
- constraints limiting transhumance such as fencing, privatization of government land, restrictions on passage in or out of a given area, forestry; and
- deterioration of natural resources, particularly winter pastures and paths used by herders.

NEUQUÉN CRIOLLO GOATS

Cashmere was found in 89 percent of Neuquén criollo goats (Scaraffía, 1993), so they were regarded as an important genetic resource. Phenotypic and genetic research (Lanari *et al.*, 2000 and Lanari *et al.*, 2003b), along with a health survey confirmed the absence of Brucellosis and of Caprine Arthritis-encephalitis (CAEV) (Robles *et al.*, 1999).

There are two ecotypes: the short-haired Pelada often has different layers of colour; and the long-haired Chilluda, whose coat is usually white and layered. The fleece of both contains an outer coat of thick medullary hair shafts and a fine, non-medullary undercoat. Their distribution follows a geographic pattern: the southeast is populated by Chilluda (Photo 2); the Pelada is found in the north (Photo 3); in the central eastern part there is a mixture of types; in the west the influence of Angora


M. Pérez Centeno

PHOTO 2. Neuquén criollo goat: Chilluda (long-haired) ecotype


M.R. Lanari

PHOTO 3. Neuquén criollo goat: Pelada (short-haired) ecotype

goats is evident (Lanari *et al.*, 2003b).

They have rapid daily weight gain to weaning at 60 days, with an average of 150 grams/day (Lanari, 2003). Milk production between 30 and 60 days was 1.5 litres per doe, with 5 percent protein 40 days after birth (Cueto and Lanari, personal communication, 2003). The prolificity ratio was 1.4 kids per doe. Neuquén criollo herds have higher prolificity than Angora crossbreeds. Genetic studies confirm the marked variability and differentiation of these ecotypes. Evidence of the isolation of the Chilluda ecotype in the southeast from the rest of the population is particularly strong. These studies confirm the influence of the Angora in the west. The occurrence of rare alleles and of genotypes not described in the literature help to differentiate and define this population (Lanari, 2003). Their number is estimated at 340 000 (INDEC, 2002). Herds average 240 goats, but range from 150 to over 1 000; on average, they are composed of 144 dams, 48 replacement stock, 30 kids, 14 wethers and 4 bucks.

Herds are managed by the family. Does are re-bred within the herd; bucks are traded between neighbours. Re-mating of bucks only occurs partially in very large herds. Sometimes bucks of exotic breeds are bought from merchants, or provided by development programmes, particularly Angoras in the southwest. There is no marketing system for replacement stock; *crianceros* indicate this as a serious problem (Domingo, 2002).

Production is seasonal, with mating in autumn and kidding in spring. Weather, forage availability, transhumance and the timing of peaks in market demand all combine to determine the production cycle. Goats' reproductive behaviour is not strictly seasonal (Cueto, 2002), so *crianceros* have developed strategies to ensure seasonality, notably the *castronerías* system.

CASTRONERÍAS

Castronerías are usually in remote locations (Photo 4). *Crianceros*, who look after bucks during the off-season (called *castroneros*), are paid one doe kid per buck. *Castroneros* and the location of their sites vary from year to year. The Provincial Land Act expressly prohibits them since it states that *crianceros* may run only their own stock on public land. No records are kept of the number of *castronerías* nor where they are. Introduction of bucks to herds causes the does to go into heat – the "buck effect". The health and genetic implications of this reproductive system are discussed in Lanari (2003).

CRIANCEROS AND STOCK SELECTION

Selection of stock by *crianceros* is a major factor of differentiation. A study of 242 producers and more than 600 goats found a correlation of 0.82 between selection criteria and the phenotypes observed in various areas (Lanari *et al.*, 2003a). *Crianceros* prefer large, compact animals which is related to meat yield and having goats

capable of withstanding extreme conditions. Preferences for an ecotype depends on the area. Preference for white goats is related to selling the fleece, but coloured goats are easier to manage in snow-covered pastures where snow lasts longest and prolificity ratios are the highest. *Crianceros* pay attention to does' suitability as breeders and how they kid.

GENETIC RESOURCE CONSERVATION

A programme for conservation and improvement of the Neuquén criollo goat, in place in northern Neuquén Province since 2001, aims to forestall the breed's genetic dilution and preserve the traditional production system. It focuses on both the goats and the production system. Breed improvement aims to conserve genetic variability, hardiness and productive efficiency within the traditional system. Work on the production system entails evaluation of natural resources, identification of cut-off points and the development of technologies. *Crianceros'* organizations support the implementation and dissemination of technologies. The programme is developing a system for supplying improved strains of the two ecotypes, based on selection criteria proposed by the *crianceros*.

CRIANCEROS, THEIR FAMILIES AND HERD MANAGEMENT

Members of this social group have strong ties to the land and livestock, and want to continue with stock-rearing (Pérez Centeno, 2001 and Bendini *et al.*, 2002), which paves the way for transmission of knowledge from one generation to the next.

Family roles are well defined; all take part during the first 30 days of kidding. Women milk goats and make cheese. Men shear, helped by women and children (Photo 5). Herding is done by teenage boys and men. Increase in school enrolment since the 1980s and access to secondary schools is breaking down the rural family structure. The reduced availability of family labour, and access to other jobs, set the stage for a progressive reduction in the transmission of

K. Tempelman

PHOTO 4. A Criollo Pelada *castroneria*, Neuquén Province

M.R. Lanari

PHOTO 5. *Criancero*'s son helping with goats

knowledge.

CRIANCEROS' RELATIONS WITH THE STATE AND NON-GOVERNMENTAL ORGANIZATIONS

The 1958 development policy encouraged growth of towns in the northern region, formation of producer organizations and establishment of Asociaciones de Fomento Rural (AFRs) and marketing cooperatives. AFRs are an organizational centre for the community, train rural leaders and are a channel for services provided by provincial government (Pérez Centeno, 2001). Informal training was boosted in the 1990s with the establishment of rural training stations.

THE LEGAL FRAMEWORK FOR GOAT PRODUCTION

The lack of clear legal title to land discourages investment in infrastructure and makes it difficult to obtain finance. Absence of legal recognition renders *castronerías* ineligible for subsidies. The failure of tax legislation to take account of the specific features of small-scale producers' economic activities is a severe constraint on their marketing.

STATE PROMOTION OF EXOTIC BREEDS

The strongest State impact on genetic resources is the promotion of exotic breeds. In the 1980s development agencies considered Neuquén criollo goats mixed-breeds of little value and that efficiency and productivity could be attained by introducing specialized breeds. Crosses of Neuquén criollo with Angora showed good adaptability, but crossbred fibre was of low quantity and quality. In the late 1980s INTA and the provincial government launched the Programme for the Improvement and Dissemination of the Angora Breed, which has had a very considerable impact on the goat population. The Angora is not adapted to the north of the province nor to its production system. Despite pressure, *crianceros* prefer Neuquén criollo goats. Angoras had difficulty in surviving in an extensive system. Initially *crianceros* were attracted by their size, but have rejected them because of lack of hardiness and high nutritional needs.

STATE VALUATION OF LOCAL GENETIC RESOURCES

The concerns of *crianceros* on social affairs, production, natural resource conservation and forestry have given rise to conflicts of interest which have usually resulted in contradictory public policies. Aid programmes aim to improve the situation of producers and rural households, but many are unfamiliar with the traditional system's production potential and give producers and their economic activities a passive role in the larger economy.

CRIANCEROS' VALUATION OF LOCAL GENETIC RESOURCES AND THE TRADITIONAL PRODUCTION SYSTEM

The *crianceros'* relationship with their animals is typical of pastoral societies. There is an implicit valuation of the genetic resources and this social group's ability to manage them. *Crianceros* value Neuquén criollo goats' hardiness, their herding behaviour, that the does are good mothers and their resistance to disease. Given the changes in interrelationships within this system, producers are more vulnerable to the adverse effects of the introduction of exotic breeds, practices or technologies. An example is the formation of herds of exotic or crossbred milk goats near urban centres.

LIMITATIONS OF THE SYSTEM

Crianceros express concern about storms in the kidding season and predators. Factors that have deteriorated in recent decades include desertification, shortage of forage and marketing problems. Destabilization of the transhumant system by these constraints is clearly

described by the producers, but they are reluctant to take action to palliate them. Some individuals are working out solutions, such as building kidding sheds or shelters (Photo 6).

OUTLOOK FOR NEUQUÉN CRIOLLO GOATS

Traditional goat raising is complex; research on relationships within the system and on the sensitivity of the natural resource/social agent/genetic resource cluster is needed. The transhumant system was sustainable when land use was unrestricted (Photo 7) and the region open to cross-border exchanges. The deterioration of natural resources is the outcome of modifications to the system. These processes should be identified and assessed to help the system attain a new equilibrium. The interdependence between genetic resources, the people who use them, the way this social group is evolving, urban/rural integration, new forms of land use that are emerging (non-agricultural production, tourism), the nature of households and the changeover from one generation to the next all impact on this system, and need to be understood.

The levels of on-farm and local consumption and potential supply for marketing in the region or beyond must be determined. Identification of factors that may alter the end use of output would contribute to an understanding of productive and social behaviours and decisions for which a straightforward production model does not explain.

M.R. Lanari

PHOTO 6. A kidding shelter for Neuquén criollo does

An analysis which tracks the gene flows generated by the cultural practices of this system and the area's isolation, would help understand the differentiation processes in this goat population and to assess their influence on the breed's genetic structure. Since utilization of genetic resources by *crianceros* is the best way to conserve them, other production options should be investigated, existing ones improved and the revival

K. Tempelman

PHOTO 7. *Criancero* gathering his goats at the end of the day

of those that have been lost promoted. The production of cashmere and milk is also promising.

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PHOTO 8. Winter pasture in Neuquén Province

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PHOTO 9. Criollo goats being driven back to their corral

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PHOTO 10. Neuquén criollo goat: Chilluda ecotype

K. Tempelman

PHOTO 11. Criollo Pelada *castroneria*, Neuquén Province

Map below:

Location of Laya, a cluster of six yak herding villages, Bhutan

COMMUNITY-MANAGED YAK GENETIC RESOURCES AND BREEDING SYSTEMS IN LAYA, BHUTAN

Pema Gyamtsho

SUMMARY

Subsistence, transhumant yak herding is the main livelihood in the higher areas of Bhutan. Traditionally herds were in contact with China, but since border closure, they no longer have access to that breeding material. Poor winter feed, high calf mortality and gid disease are serious problems. Pasture quality is exacerbated by a ban on the use of fire as a management tool. Herders exchange or purchase sires, and government support is available for acquisition of superior bulls, but a widening of genetic diversity and introduction of new blood-lines is desirable.

The yak (*Bos grunniens*) is the main source of livelihood for the high-altitude communities of Bhutan; it provides a way of life for approximately one-tenth of the country's population. Yak milk and dairy products fetch premium prices. Yaks were the main vehicle for trade with China until the border was closed in the late 1950s. In northern Bhutan yaks provide the vital and often only link between herders and their neighbours. Age-old traditions and a lifestyle worthy of preservation have evolved around them. Yaks can utilize alpine grasslands where low temperatures and difficult terrain limit expansion into cattle or crops (Photo 1); there is tremendous potential for ecotourism in which yaks could play a central role.

Laya, in northern Bhutan, is a cluster of six villages with about 800 inhabitants. Altitude ranges from 3 000 to over 7 000 metres. The area experiences wet summers from June to September and cold winters from December to March. Spring (April–May) and autumn (October–November) are relatively short. Mean temperatures range from -8 °C in January to 15 °C in July, while annual rainfall varies between 500 and 750 mm.

P. Gyamtsho

PHOTO 1. The yak is a multi-purpose animal particularly valued for its milk in Laya

Mixed conifers dominate the vegetation up to 3 500 metres, with scrub forests up to the permanent snow line at around 4 700 m on shady slopes and 5 500 m on sunny ones. Alpine meadows are found within forests, but mainly dominate the area between 3 500 and 5 000

m. Snow and glaciers account for over 30 percent of the area.

Most households own a few yaks; yak products contribute up to 49 percent of their income with another 14 percent from hiring pack animals (Gyamtsho, 1996). Most trade is with the lower valleys. Yaks provide household necessities, ranging from food and fibre to draught and manure for cultivating barley and mustard (Photo 2).

Highly resilient herd management and breeding systems have evolved over many years but external factors now pose serious challenges to their sustainability.

YAK HERD SIZES AND HERD COMPOSITION

Laya has about 2 800 yaks (Dorji, 2000). Household herds range from under ten to over 300. From a sample survey of 24 herds, 48 percent of the animals were above eight years and only 15 percent were between two and four years (Gyamtsho, 1996), indicating a high mortality among young animals. The number of females was only marginally higher than males, as male yaks provide transport and draught; they are also savings which can easily be sold. The proportion of milking to dry cows was practically 1:1, indicating that herders manage to ensure even milk distribution throughout the year.

PHYSICAL CHARACTERISTICS

P. Gyamtsho

PHOTO 2. Laya villages depend upon yaks for a variety of common household necessities

P. Gyamtsho

PHOTO 3. Laya yak herders

Laya yaks are slightly bigger than average and appear bulky because of long hair on their flanks and a heavy and wide forehead with long, narrow and slightly dished faces and short ears. A striking feature is their symmetrical arc-shaped horns which taper in elaborate curves to pin-sized sharp tips. Their legs are short and their bodies compact with well-developed forequarters and 15 thoracic ribs that are long and arched. Coat colour varies from black, brown and greyish-golden to a mixture of black and white or white and brown (Tshering, 1994).

REPRODUCTIVE CHARACTERISTICS

Oestrus is seasonal; females in Laya improve in body condition in spring and attain peak condition towards August when they come into heat. Mating takes place in July and August. Signs of oestrus are not as marked as in cattle, but herders can detect them. Laya herders (Photo 3) have an intimate knowledge of the time and sites where best mating results can be obtained and can time the season in such a way that it coincides with the best summer pastures.

Bulls are put to service at three to four years. Their sexual function decreases from seven to eight years, but performance often depends on factors other than their inherent character. The presence of stronger and older bulls usually discourages a stud bull from mating and affects his performance as a sire.

Females are mated for the first time at three years and most have calved by their fourth or fifth year. Most conceive after being served several times. Conception

rate in a herd is around 80 percent or more, although herders report achievements of 100 percent. The gestation period is eight to nine months. Since mating is at pasture, monitoring the time of conception is difficult and it is hard to keep records of individual animals. Abortion is reported to be area-specific and often related to disturbance by other animals or predators rather than to reproductive disorders. Calving rates depend as much on feeding and management as on genetic factors. Most females (81 percent) calve in alternate years, while about 18 percent calve yearly. Females have a long reproductive life extending to over 15 years. When a dam is due to calve she is kept under constant watch. Survival rates of calves are very low. Herders repeatedly reported losing more than 5 percent of the previous year's calf crop due to infection by gid, weakness over winter, or predation. Calf survival is improved by not milking the dams for several days to weeks following parturition and allowing the calves to suckle. Once-a-day milking is practised as a strategy to improve the survival rate. In winter, supplementary feed is given to calves using buckwheat dough, porridge and brewing by-products.

BREEDING SYSTEM

There is no cross-breeding with other species in Laya, although herders know of the higher milk yields from hybrids, but prefer pure yaks since hybrids carry the stigma of inferior quality milk and meat and infertile males.

Mating is by the herd's own sire or by a more dominant bull from neighbouring herds. Bulls roam freely among herds, challenging rivals. Herders are generally unsure of the male pedigree of progenies. Bulls do not reach peak performance before seven or eight years. As a selection criterion, meat and draught are equally important. Bulls are selected from within the herd or bought. They should have the following characteristics.

- *Body size;* bigger than bulls of the same age.
- *Body conformation;* well proportioned without deformities.
- *Colour;* a black coat, a white tail and a white spot on the face are preferred.
- *Horns* should be large and symmetric as they are highly correlated with fighting ability (Photo 4).
- *Temperament;* a bull should be dominating and aggressive.

Breeding bulls are given concentrates at the end of the mating season. The productive life of a sire is up to 12 years after which it is castrated or culled. Non-breeding males are castrated at three to four years.

Herders exchange bulls or procure them permanently. Exchanges are normally between families with established connections. For purchases, buyers rely on information on the pedigree of the bull and its physical characteristics. A bull's performance is judged on its reproductive traits and the survival rate of its progeny. If conception rates are poor and calf mortality high, the bull is a source of bad luck and replaced in the following year. If good results are obtained, the bull is given extra care and recognized as a Norbu (precious gem).

MAJOR CONSTRAINTS TO YAK PRODUCTION IN LAYA

Inbreeding. Bhutanese herders used to have access to breeding stock from China, but now depend on local sources which has resulted in degradation through inbreeding. The pool of genetic material is small and gains from selective breeding are often marginal.

Nutrition and health. A major constraint to yak productivity is lack of winter fodder (Miller, 1987;

P. Gyamtsho

PHOTO 4. A typical yak bull in Laya

Harris, 1987; Gibson, 1991; Johari, 1993; Caron, 1994; and Gyamtsho, 1996). Weakness as a result of malnutrition causes high mortality (Gyamtsho, 1996). Gid disease continues to be a major problem.

Inappropriate pasture policy. The Bhutan Forest Act of 1969 banned fire as a means of managing pastures. Herders used to burn to control scrub and encourage palatable plants. Thereafter many sites were invaded by scrub that inhibits the growth of herbs and restricts the movement of yaks. Gyamtsho (1996) found that scrub cover was as high as 60 percent of the registered grazing lands in Laya and Lunana. This has forced many herders in central Bhutan to give up yak rearing.

POLICIES TO SUPPORT YAK PRODUCTION AND BREEDING

Genetic improvement. The Government supports the procurement and supply of superior yak bulls. Initially, it covered the whole cost, later only transport was subsidized. Artificial insemination with semen from China was tried recently with little success. Import of breeding stock is considered a more viable option.

Veterinary cover. The Government has provided free veterinary services since 1961. Gid only occurs sporadically. Regular vaccination against foot-and-mouth disease, anthrax and other diseases is provided annually.

Feed and fodder development. Since the late 1970s, attempts have been made to improve high altitude pastures and introduce more efficient ways of haymaking. Seeds and fertilizers were supplied free to encourage herders. Success has been modest as a result of unfavourable land tenure. The Government is aware of the negative effects of banning the burning of alpine pastures and has plans to amend the Forest Act to accommodate this.

Diversification of economic opportunities for yak herders. Yak rearing alone cannot provide a viable livelihood for herders. The Government is actively promoting ecotourism and nature treks as alternative sources of income. Efforts are being made to promote the cultivation of medicinal and incense plants in yak-rearing areas.

CONCLUSION AND RECOMMENDATIONS

In Laya, yak rearing will continue to be the main source of livelihood, but the following priority actions are recommended:

> Improve genetic diversity and selection characteristics in yak populations and introduce bloodlines.
> Study the physiological and management factors influencing the reproductive performance of yaks.
> Study the production characteristics of yaks, i.e. growth rate, body weight, milk yield and milk composition, fibre production and draught performance.
> Amend the Forest and Nature Conservation Act to allow controlled burning of pastures.
> Improve the economic condition of yak herders by actively engaging them in modern avenues of income generation, such as tourism and the commercial cultivation of medicinal plants.

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P. Gyamtsho

PHOTO 5. Yaks: perfect pack animals for northern Bhutan

Map below

Habitat of Basotho ponies, Lesotho

REVITALIZATION OF THE BASOTHO PONY MARE CAMPS: A STEP TOWARDS INCREASING POPULATIONS OF THE BASOTHO PONY IN LESOTHO

Jinny Martin

SUMMARY

Basotho ponies developed from Cape stock, under natural selection in a mountain environment. They are hardy, have thick-walled hooves suited to rough ground and are mainly used for transport, now also for trekking. Large numbers were exported as remounts during the Anglo-Boer war; thereafter indiscriminate crossing with exotic breeds was the norm. The creation of a national stud failed to remedy the situation. Farmer-centred mare camps, which provide for pony breeding under controlled conditions, have been developed to assure the breed's survival and expansion. Farmers manage the camps with assistance from extensionists; they form breeding associations and now control their breeding programmes. Further assistance is desirable in disease testing and training in record keeping. Stock-theft is a problem.

The Basotho pony is descended from horses sent to the Cape in 1652 which were of a strong Persian and Arab strain. After decades of natural selection, it was recognized as a breed in the mid-nineteenth century.

At the end of the nineteenth century Lesotho was depleted of its best breeding stock. In 1894, 519 horses were sold and the export trade grew until 1900 when 4 419 horses were relinquished during the Anglo-Boer War. The resident Commissioner said in August 1900,

R. Cardellino

PHOTO 1. Community gathering of Basotho pony breeders


R. Cardellino

PHOTO 2. Basotho ponies and their owners


R. Cardellino

PHOTO 3. Ecological tourism: trekking through the hills of Lesotho on a Basotho pony

"Though the possession of horses by individuals is a feudal condition imposed by the chiefs for national defence, no bar was placed upon free sale and export of these for Imperial purposes, and it is probable that no less than 10 000 remounts went to the army". By 1901 the Acting Resident Commissioner said, "15 000 horses have been sent out, making a total of 20 000 horses from Basutoland for the use of the army".

Unstructured management strategies were widespread. Breeding and trading were unregulated and indiscriminate cross-breeding with exotic breeds became the norm. In 1975 a study revealed the severe loss of the pony's true characteristics, dating back more than half a century.

WHY CONSERVATION OF THE BASOTHO PONY IS IMPERATIVE

In 2001, the Basotho pony population was about 100 000 head and is probably much lower today, especially purebreds. Most ponies are in the foothills and mountain areas. The pony is primarily used for transport, but has become popular for trekking. The breed is well adapted to the environment, endures extreme temperatures and is able to survive on pastures of variable quality. Because of its thick-walled hooves the pony can easily negotiate mountain terrain and does so by tripling (a gait slightly faster than the trot).

CONSERVATION EFFORTS THROUGH THE BASOTHO PONY PROJECT

After the 1975 study, the Government, in conjunction with the Government of Ireland, initiated the Basotho Pony Project. Two systems were established: an intensive National Stud, and associated, more extensive community-based managed "mare camps". Both had the goal of conserving the Basotho pony.

The National Stud was to produce top-quality breeding stock; it set up a marketing centre, but did not achieve its goals; many stock were lost through *Senecio* poisoning and snakebite. In 2004 FAO bought the Stud's last stallions and distributed them among 18 mare camps

Mare camps provide for pony breeding under controlled conditions; stock are inspected and registered, as are their progeny. These farmer-centred production camps are in Lesotho's mountain district. Large grazing areas are at their disposal. Farmers are responsible for the success of the camps, while the extension programme allows them to strengthen their management knowledge. Farmers have grouped to form breeding associations and now control breeding programmes. As explained by McCormack (1986), camps are the key to extension in breeding management and to encouraging teamwork and cooperation among farmers.

The most important advantages of pasture breeding are:

> Low labour requirement. Ponies graze freely and the system is based on natural mating; the herd hardly

needs to be supervised.

> Heat detection by stallions. Natural mating leads to high conception rates.

> Strong cooperation among farmers, because they are in control of the production centres.

The mare camp has disadvantages. While a social hierarchy is rapidly established among stallions, young ones are exposed to injuries because there is little supervision. Since pastures are not fenced, other stallions can intrude, disrupting the herd's social structure and affecting the quality of the progeny. All mares are grouped together and are therefore vulnerable to theft.

CURRENT POLICIES AND SUGGESTIONS FOR THE FUTURE

The main objectives of the Equine Section of the Department of Livestock Services are to:

> ensure that the rural population, particularly in remote areas, has continuous access to Basotho ponies for transport;

> conserve and develop the breed's genetic and phenotypic characteristics according to the selection criteria of the farming communities;

> develop domestic and export markets for the breed.

The Equine Section has facilitated the formation of breeding associations; inspected and tested breeding stock for disease; supported the organization of races and shows to promote the breed; and enhanced commercialization of the ponies throughout the country. Despite Government efforts to conserve the Basotho pony, some activities could be improved at a relatively low cost:

> Testing for disease is insufficient. A survey could identify camps with disease problems.

> Mare camps require little supervision, but herders need training in record-keeping and should be selected carefully.

> Some mare camps do not have access to good stallions.

> Characterization activities need to be continued on all breeding stock.

> More guidance should be given to the farming communities that manage the mare camps.

> There has been little commitment by the government to combat stock-theft. Fencing, in combination with more supervision, could be a more costly but more realistic option.

The Basotho Pony Project has demonstrated that breeds on the verge of extinction can be revitalized. For such initiatives to be sustainable, commitment, planning and continuity are vital.

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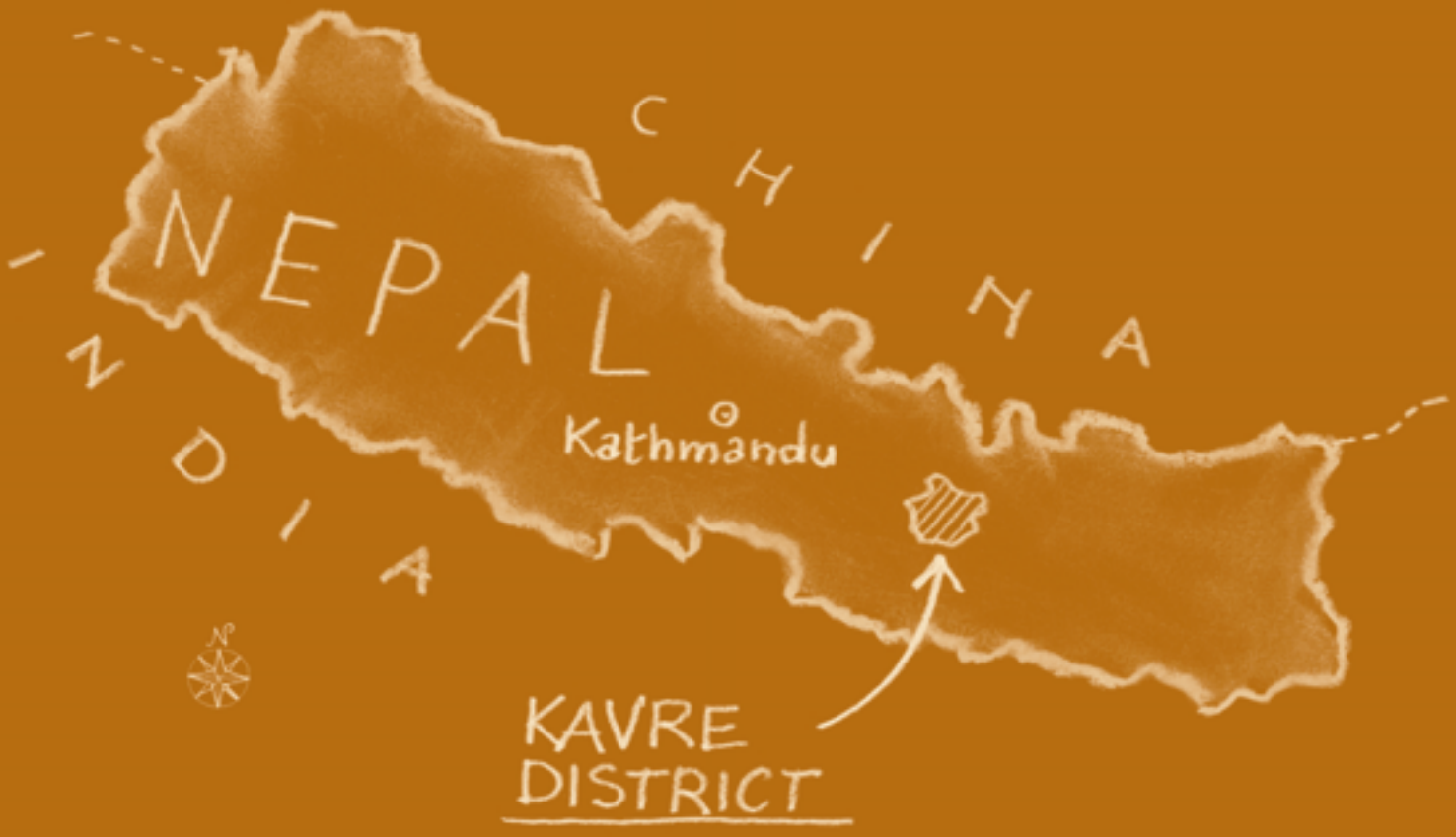
Map below:

Kavre district, new home to exotic Murrah buffaloes, Nepal



MANAGING LOWLAND BUFFALOES IN THE HILLS OF NEPAL

Kamala Gurung and Pradeep Tulachan

SUMMARY

Traditionally, farmers in the Hills of Nepal kept Lime buffaloes which grazed freely and were the predominant breed, but they are now only 5 percent of the buffalo herd. Population pressure has almost eliminated the grazing land and buffaloes are mostly stall-fed on crop residues and forest fodder. Murrah buffaloes, from India, which are far better milkers have replaced the local breed; sires and pregnant females are bought from neighbouring Bihar. Farmers have upgraded their management systems to accommodate these more demanding but profitable animals. Much of the trading is through middle-men so there is a need for more information on breeding methods and selection criteria in Bihar to ensure that these accommodate Nepalese needs.

The water buffalo (*Bubalus bubalis*) is the most important domestic animal in East Nepal. Until 30 years ago, farmers raised Lime buffaloes, which fed in grassland and forest areas. Recently, high-yielding Indian Murrah buffaloes have been introduced. The study took place in the Jaisythok Village Development Committee (VDC) in Kavre, at an altitude of 500–600 metres in a subtropical climate. More than a third of the Committee's 644 ha is used for crops.

INTERACTIONS BETWEEN PEOPLE, THEIR ANIMALS AND THE ENVIRONMENT

Only wealthy households can afford to raise two or three exotic buffaloes. Most milk is for home consumption. Milk products play a key role in Hindu religious ceremonies, as do male buffaloes, which are often sacrificed during social and cultural events. Exotic buffaloes produce more milk than Lime buffaloes. Men are responsible for marketing milk.

WHY AND HOW EXOTIC BUFFALOES WERE INTRODUCED

Parcelling out land as a result of population growth has had a large impact on buffalo farming. Households have sold local buffaloes and bank loans have encouraged the purchase of exotic ones that can be stall-fed. More than 95 percent of households have one to three exotic buffaloes. About 65 percent of households buy new animals in lactation yearly – at approximately US$ 320 per head – while selling dry ones

P. Tulachan

PHOTO 1. Exotic buffalo traders, local farmers and researchers

for meat. Private traders play a much more important part than the government in promoting exotic animals (Photo 1). For almost 20 years, two Indian traders monopolized the supply of Murrah buffaloes; now the number of traders has increased significantly.

MANAGING EXOTIC BUFFALOES

The Hills region is between 500 – 2 500 m; the terrain is very steep with narrow valleys. Livestock, although an integral part of agriculture, is secondary to crops. Climate varies from subtropical to warm-temperate; 80 percent of precipitation falls during June to October. Most of the eastern and central hilly areas receive 1 500 – 2 500 mm; the west gets 1 000 – 1 500 mm. Holdings are tiny. Grazing land is very scarce; livestock depend on feed from crop land and the forest.

Feeding. Residues such as paddy straw, maize stover, wheat and millet straws and vegetable wastes are fed. Manufactured feed and veterinary medicines are supplied by dairy cooperatives. With the growing use of high-yielding exotic dairy buffaloes, farmers have introduced stall-feeding (Photo 2). Collecting green fodder, feeding animals, cleaning sheds and milking are done by women; men assist during the harvesting season. Children take the buffaloes to graze. Women have learned to manage exotic buffaloes and know far more than men in recognizing high-quality local fodder, feeding and traditional veterinary practices. The community values knowledge on feeding, as it is the key element in improving milk production.

Selecting buffaloes. Local breeders buy male Murrah which are selected according to the milk yields of their offspring and the lactation history of their mothers. Other important selection traits are age, weight, body conformation and skin condition. Only female buffaloes that produce between 8 and 10 litres of milk per day are selected for breeding. They are preferred to higher-yielding animals, as they require less grass and concentrates. Male elders dictate breeding strategies and often consult animal traders to discuss the performance of buffaloes.

LOCAL BUFFALO GENETIC RESOURCE AT RISK OF EXTINCTION

The Lime buffalo, now raised in only 5 percent of households, is relatively small and generally has a light brown coat with chevrons of grey or white hair below the jaws and around the brisket. It has fairly small sickle-shaped horns curved towards the neck (see photo 3). It is severely threatened by the massive introduction of the Murrah and no measures are being taken to conserve it.

INVOLVEMENT OF THE GOVERNMENT AND OTHER PARTIES

The Government provides vaccination services and forage seeds on a regular basis. Livestock Services Centres train farmers.

NEEDS OF THE COMMUNITY

In Jaisythok VDC, the needs of the community dictate

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PHOTO 2. Private breeder with exotic breeding bull

that farmers' activities focus on improving the Murrah buffalo at the expense of conserving the Lime. Learning how to raise the Murrah has been long and difficult, especially in terms of feed and health. Farmers soon realized that chopped rice straw mixed with green fodder, homemade concentrate and manufactured feed suited the exotic breed and resulted in higher milk production. Traditional health and sanitation methods were replaced by modern veterinary ones.

Initial obstacles for managing the Murrah have been overcome and farmers do not wish to return to the past; their priority is to improve management to achieve even better production. Since the main problem farmers face today is the availability of high-quality feeds and medicine for their animals, they are lobbying strongly for the establishment of a government institution for quality control.

CONCLUSION

Economic factors can be a driving force for farmers to exchange traditional methods for new management strategies. Farmers' joint efforts have allowed them to keep exotic buffaloes successfully with higher economic returns and an improved standard of living. Farmers can now send their children to school. The sustainability of this system has come under threat since supply of buffaloes is endangered by possible trade restrictions from India and increasing transport costs. To maintain and sustain this economically beneficial genetic resource in the local community, the public sector needs to act and to develop and implement a participatory community breeding-policy strategy to make exotic buffaloes easily available and to eliminate the community's dependence on private traders. Government has a crucial role to play in monitoring the quality of manufactured animal feed and veterinary services offered by the private sector, since these are

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PHOTO 3. Local Lime buffalo grazing in an open area

essential for the sustainability and success of the livestock farming system.

SUGGESTIONS FOR THE FUTURE

All exotic buffaloes come from Sitamani, Bihar state, India. It would be of great value if support could be provided to study:

- on what criteria buffaloes are selected in their place of origin, how they are bred and how they are managed before entering their lactation period;
- what type of local knowledge is involved;
- whether there is any public or institutional support for buffalo breeding;
- what type of national breeding and trade policies in India directly affect the farming practices of the communities.

Analysis of data and information on the above issues will provide insights which could serve as a basis for the development of a breeding policy framework for farmers in the hills of Nepal. This framework, in turn, would ensure the sustainability of the farmers' stock rearing system and their livelihoods.