

INSTITUTE OF CURRENT WORLD AFFAIRS

Yak and cattle management in Jigme Dorji National Park*

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Thimphu, Bhutan

Mr. Peter B. Martin
Institute of Current World Affairs
4 West Wheelock Street
Hanover, New Hampshire 03755 USA

Dear Peter,

The yak (*Bos grunniens*) is found throughout the Himalaya, the mountainous regions along the Chinese border, and in Mongolia (See Figure I). The residents of Jigme Dorji National Park (JDNP) heavily rely on this domesticated ungulate. It ploughs fields, carries loads, provides nourishment, clothes with its wool, enhances the soil with its manure, and generates income. It is valued at its birth for its mere existence. It is valued at its death for its meat and hide. It is sacrificed at religious festivals, and is a reminder that wealth and status comes in many other forms than money.

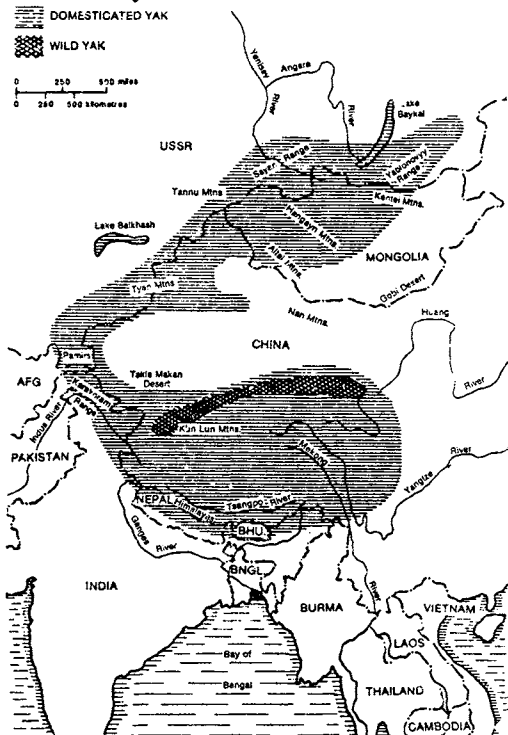


Figure I: Distribution of wild and domesticated yaks. [1]

This past June, two conservation officers from the government's Nature Conservation Section, three student interns, and I conducted socio-economic surveys in the western regions of Jigme Dorji National Park (CMC-4). The purpose of the field trip, to assess natural resource utilization patterns and the living standards of the park's resident population, was financially supported by the WWF-Bhutan Program. In July, another field team conducted the same survey in the Laya and Lunana regions of the park (See Figure II). While I was unable to accompany this second team, I trained the interns and the team leader in survey techniques. I stressed that knowing why people manage natural resources in the ways that they do is just as important as knowing how people are managing resources now, or were in the past. People do things for specific reasons. Why, I explained, gives insight to the internal regulations surrounding natural resource use.

Cynthia Caron is a John M. Musser Memorial Fellow of the Institute studying forest conservation in South Asia

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Why also enables policy makers and park planners to think about how future park policies, external regulations, might affect the internal ones.

During June and July 1994, 80 households were surveyed using a formal questionnaire. An additional 21 households were informally interviewed about certain household topics ranging from energy use to animal husbandry practices to income-generating activities. Figure II shows the survey region. Unless specifically stated, all of information in this newsletter is based on field research conducted in 1994.²

Ownership patterns of yak and cattle in JDNP indicate their importance. Figures III - V show yak and cattle figures for selected villages based on 1993 and 1994 surveys.

Fig. III: Number of cattle and yaks
Selected Villages in Lunana Gewog

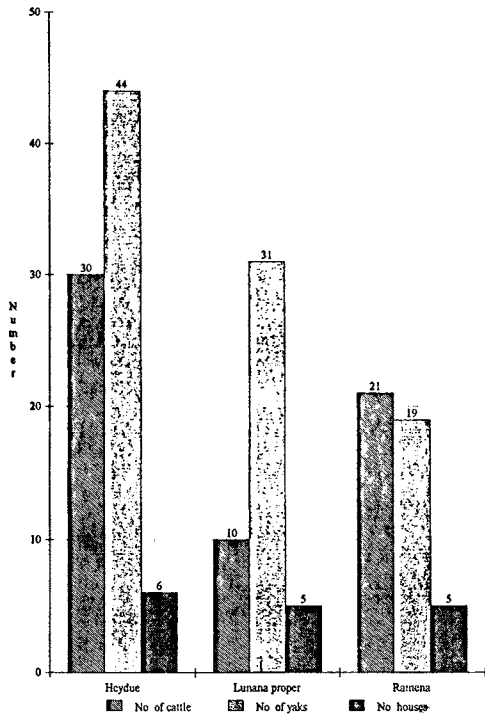


Fig IV: Number of cattle and yaks
Selected Villages in Laya Gewog

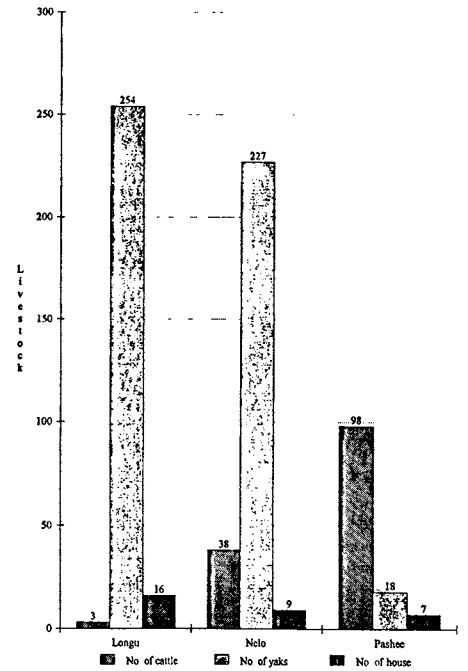
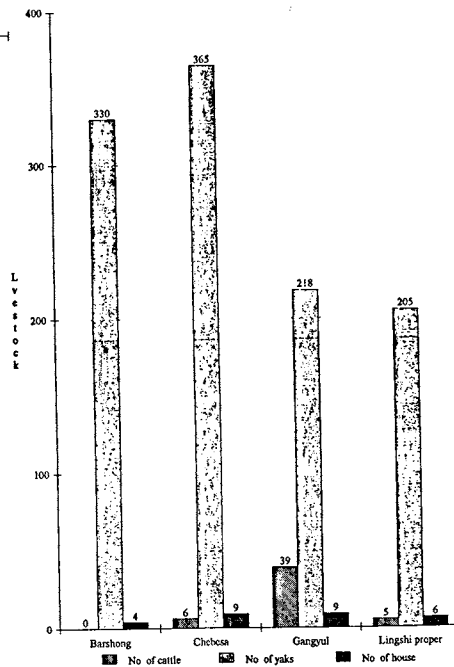


Fig V: Number of cattle and yaks
Selected Villages in Lingshi gewog



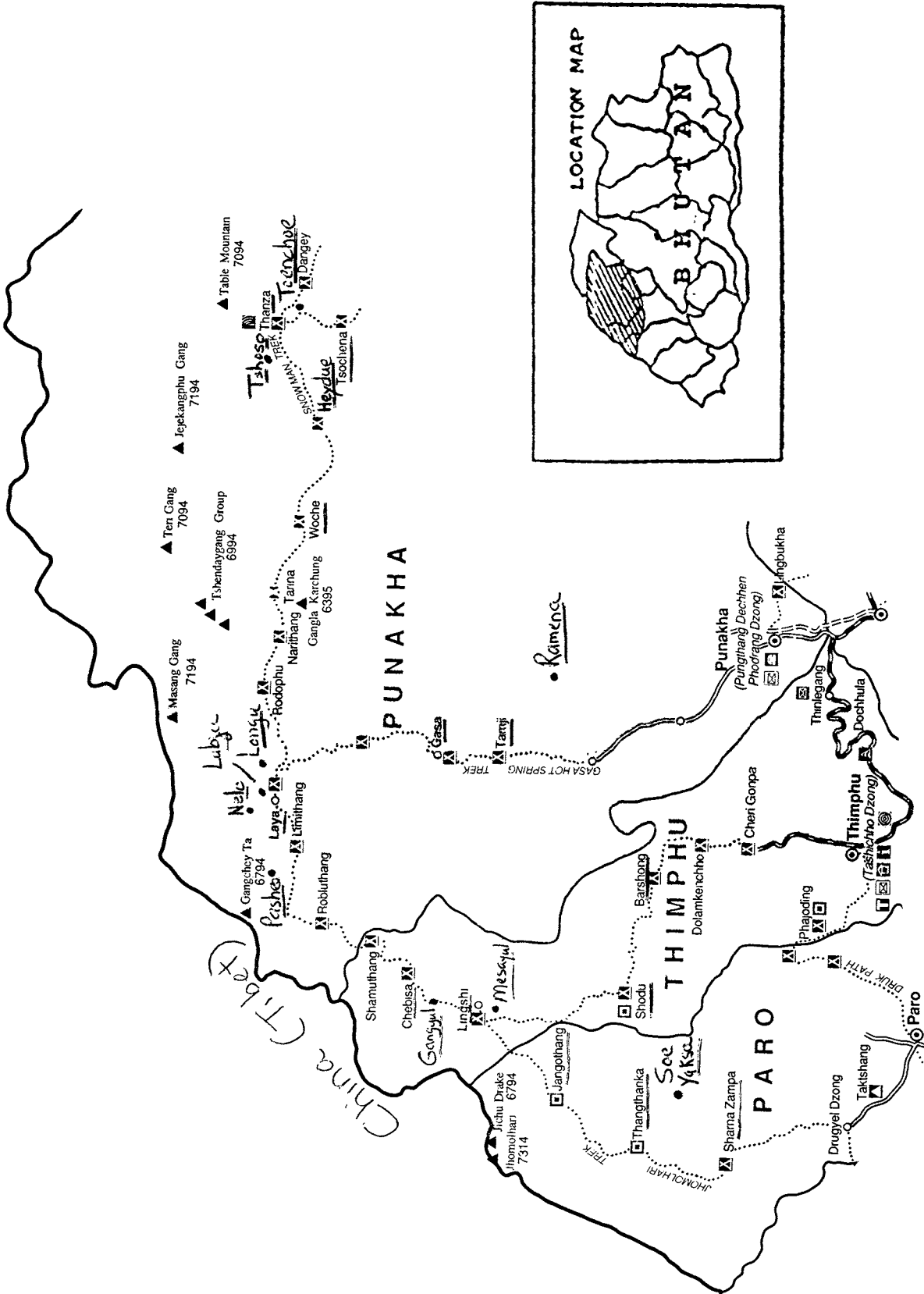


Figure II: Underlined village names indicate survey sites in Jigme Dorji National Park. Lunana and Thanza are interchangeable names for both the gewog, and the village proper. From: Services of various departments under Ministry of Communication & Tourism. RGoB, 1988.

Seventy-six percent of park residents own either cattle or yaks. Of this number, 56% own only yaks, 24% own only cattle and 18% own both cattle and yaks. Six percent of the individuals surveyed own neither.³ There is no pattern among the latter. Some are elderly or widowed. Others are young couples or single women who live alone. Young single women living alone is prominent in some villages of Lunana, in the northeastern region of the park. It is the practice among some families in Lunana that all daughters must leave the house, whether they are married or not, once the eldest brother is married. ("Only a kind and thoughtful brother will wait for his sisters to marry before he does," a Lunana native disclosed). These women receive no assistance from their families, and have a difficult time making ends meet. One characteristic, common to the latter six percent though, is that they are afraid to take out a bank loan to buy livestock. They all fear that they will not be able to pay it back, with interest, within the allotted period of time.

Families, with the financial stability provided by livestock ownership, are able to take out loans ranging from Nu. 5,000 - Nu. 20,000 to buy more yaks, and the supplies, like salt and oil, that are necessary to maintain them.⁴ Families can purchase four or five yaks for Nu. 20,000.

Livestock products

Goods produced from yaks and cattle include: dairy products like butter, datsi, soft cheese made from both yak's and cow's milk, chugo, a hard-as-a-rock cheese, commonly referred to as the Bhutanese version of the jawbreaker, and phuelo, a different type of dried cheese that is creamy when cooked. The latter are both made from yak's milk. Fresh and dried yak meat is sold and traded. Yak fat, scraped off of hides, is used for cooking. The hide itself is slept or sat upon. Yak bones and hooves are saved for making soup. An inflated yak diaphragm serves as a carrying vessel. Boiled yak skin is fried or roasted, and is eaten as a curry with rice. The water the yak skin is boiled in is saved, and is boiled again, until it is reduced to a glue. Even yak tongue is eaten. Boiled, it is considered a delicacy - eaten only on special occasions.⁵

Products made from yak's hair include, rope, clothes, tents, sacks, feed bags and handicrafts, like tablecloths and shoulder bags. Grain is stored in yak hair sacks. Only the hair of the male yak is used for weaving tents. A cloak, called "chakab", is woven from yak calf's hair. Yak skin is used for mats and twisted into rope for tying beams under house roofs. If a villager has an extra yak skin in storage, he or she will gladly sell it for Nu.100.

Brower (1991) found during her work with the Sherpa communities near Mount Everest that the wool yaks shed in the spring, called "pu", is saved for spinning [1]. No one in Jigme Dorji uses this wool from the inner coat for anything - they claim they don't like the quality. Otherwise, wool is wool, they say. There are no differences in quality.

Sacks and bags are often striped, interwoven with wool, dyed in either red or yellow, or with yak's tail, left a natural white or dyed black. To dye wool and tails, weavers use natural dyes. The red color comes from the stem of *Rubia manjith* (Local name: tsoe; Family: Rubiaceae). The yellow dye comes from a plant called "shunkee". In the dyeing process, the plant part is submerged in boiling water. Next, once the water has turned into a deep rich color, the material to be dyed is placed in the vessel. Tails are often dyed black with parts of the plant called "tsueyey". This is not

available in the northern regions of the park. People in Chebesa acquire this dye in Punakha. When bartering for it, one kilogram of "tsueyey" is equivalent to one kilogram of butter.

Residents in the western regions of Jigme Dorji burn yak dung for cooking and heating. The ash from the fire is spread on agricultural fields. They do not incorporate yak manure directly into the soil because it causes weeds to grow in thicker and faster. In the northeastern regions of Jigme Dorji, yak dung is piled on agricultural fields, burned, and then spread throughout the field.

A house might have two or three sets of yak horns hanging outside over the entrance way. Next to a set of horns, one might find a suspended wooden penis - there to ward off evil spirits.

Dairy products and meat, while consumed at home, are produced primarily for sale or trade. In the sub-alpine and alpine regions of high altitude zones (above 2,800 meters), very little agricultural produce grows. Many villages in JDNP are far away from trading centers (In the winter, it takes 17 days to get from Chebesa to Thimphu due to heavy snow). Butter, cheese, and dried meat store well, favoring one or two trading trips to urban centers a year - the normal practice of the people from the northern regions. People engage in trade and sale of yak products in exchange for rice, chilis, salt, tea leaves, sugar and clothing. Trips usually last between two and three weeks.

People from Laya and Thanza (Lunana) market their goods in Punakha. Families to the west do their business in Thimphu or Paro. Traders are sensible. Before beginning any transaction, they first find out how much their products are worth in cash and in exchange for other goods. On a recent trading trip to Punakha, butter was worth Nu. 120 per Kg or 10 Kg of rice. Based on the type of and price of rice, and the needs of the family, the trader decides which transactions is best. In this particular case, the trader felt it was more profitable to sell the butter, and use the money to purchase other goods.

If a family feels that they can spare a yak or two, they bring one yak to Paro, where it is slaughtered, and the meat traded for rice. Another yak is brought to Thimphu, slaughtered, and the meat is sold for cash. Rice is less expensive in Paro than it is in Thimphu. In Thimphu last year, fresh boneless yak meat sold for Nu. 75 per Kg and meat on the bone for Nu. 35 - 45 per Kg. Depending on the size of the yak, a family can earn between Nu. 8,000 and Nu. 12,000 by driving a yak down to the slaughter.

Dried cheese, chugo, is sold by the "shey", or necklace. A necklace consists of 20 pieces of dry, hard white cheese strung on a string. A necklace sells for Nu. 20, in urban areas, or a trade of two kilograms of rice. During our research, we found that migratory herders and farmers closer to the trekking routes tended to be more enterprising than those further away by selling their chugo necklaces for Nu. 18 each, while those further in, sold necklaces for Nu. 15 or Nu. 16. When selling large quantities of chugo, the unit of measurement is the mon. A mon is equivalent to 40 Kg. Each mon, sells for approximately Nu. 3,500. Some families earn more than Nu. 10,000 a year from dried cheese sales alone.

Phuelo is another type of cheese made from yak's milk. The first step in producing phuelo is to line a bamboo basket with thin twigs of taap shing (birch; *Betula utilis*), balu shing or sulu shing (both *Rhododendron sp.*). Next, fresh milk is poured into the basket and allowed to settle. During the

settling time, some of the milk will coagulate onto the branches. At the end of the day, the remaining milk is poured into a churn for making butter. This process is repeated daily. After 20 or 30 days, the twigs are thickly coated with cheese. The cheese is scraped off the twigs, compressed, and dried. The finished product is used to make curries. It normally takes one month to produce one kilogram of phuelo. Phuelo is usually used for home consumption, but when traded, one kilogram is equivalent to one kilogram of butter.

Meat is dried in thin, sometimes translucent, strips edged with fat. One kilogram of dried meat is traded for nine kilograms of rice or is sold for Nu. 100.



Chugo necklaces (in the center and on the right) for sale in the Thimphu weekend market.

Dairy product's yields

It is difficult to accurately assess the production level of dairy products like butter and cheese. To my knowledge, this survey was the first time that anyone had specifically asked park residents about their dairy production levels and changes in milk yields. Since the income generated from dairy products for the majority of the park's residents is indispensable, dairy production cannot be ignored.

Many respondents could not recall how many buckets of milk they obtain daily from each milking cow during the milking season. One woman in Barshong, though, keeps careful track of her production levels. Currently she is milking five cows. She churns butter every two days making one sang (1/3 of a Kg) of butter. At this same time last year, she was producing three to five sangs of butter every two days. She milks each yak once a day, yielding about two liters of milk from

each one. Her milk yields are lower this year, than last, because she is waiting for three calves to be born.

Regressions of the number of milking cows against the amounts (in Kg) of dried cheese and butter yield the following. There is a strong correlation between the number of milking cows and the amount of butter produced annually ($R^2 = .75$; no. of observations (n) = 42). The correlation between the number of milking cows and kilograms of dried cheese does not manifest such certainty ($R^2 = .30$; n = 42).

The strong correlation between the number of milking cows and the production of butter is a function of the fact that butter production is the only means of milk storage. Butter is consumed daily in the form of suja (butter tea) and with zao (roasted rice). The fact that there is not a one to one correlation between these two variables is probably due to two factors. First, differences in per capita yield per milking cow. Second, some milk may be taken fresh, removed from the churn, and consumed as buttermilk or used to make phuelo.

The weaker correlation between the number of milking cows and chugo production may be due to a family's preference to fulfill their cheese needs for home consumption (datsi) over producing cheese for the market (chugo). Chugo and datsi are both produced from the dairy by-product, whey. Milk is first churned into butter. When the churning is finished, what is not incorporated, the whey, is boiled and used to make either datsi or chugo. When making chugo, the cheese is compressed and dried. To produce datsi, the softer type, it is fermented. While both cheeses are consumed at home, datsi is consumed in curries, and as such, it is consumed more frequently. Chugo is chewed occasionally between meals. Information that would further this production analysis is the proportion of whey used to make chugo and datsi and the amount of datsi produced each year.

Not all families produce dried yak meat. Several respondents said that they do not kill yaks for meat for their own consumption. Instead, they wait for them to die. Others said that they would kill yaks for meat, if they had larger herds. Individuals with small yak herds normally purchase dried meat from someone else in their village.

A detailed yak product yield study would lend insight to the pastoral economy of Bhutan. Such a study would begin to uncover information about the quality of grassland, the productivity of each individual head of livestock, and the amount of income (or potential income) herders could generate from dairy and other yak products. For rural development planners, the information would foster an understanding of the yak keepers' economic strategy focusing on cultural preferences or decision-making processes.

Family incomes from the sale of yak products range widely. Incomes depend not only on how many milking yaks (cows) a family owns, but also on how many male yaks are available to carry loads for tourists and government officials.

One farmer, with 102 milking cows, produces 300 Kg of chugo and 400 Kg of butter a year. He sells approximately 75% of this. Using the current unit prices for butter (Nu. 120 / Kg) and chugo (Nu. 87.5 / Kg), his potential earnings total Nu. 55,690.00 (US \$18,000.00). Another farmer

asserts earnings of Nu. 12,500 for butter and chugo sales and another Nu. 2000 from the sale of dried meat. When calculating the actual amounts of products she said she sold, using the above unit prices, the figure works out to Nu. 10,250 for the dairy products and Nu. 900 for the dried meat. Having calculations work out so closely, when one is remembering transactions from the previous year, is quite impressive.

There is great variability between Jigme Dorji households regarding the percentage of dairy products they sell. In the greater Laya region (no. of observations = 34), 30% of the farmers sold 75% of their butter and chugo, 20% sold one-third, 15% sold one-half, and 3% sold two-thirds of their butter and chugo. Thirty-two percent of the farmers consumed all of their dairy products at home. These families either have only one or two milking cows, or the milking cows they have are very young, and do not produce a large quantity of milk yet.

The average amount of money that people earn from contracting out their yaks for carrying provisions is Nu.10,000 - Nu. 20,000 (US \$325.00 - US \$350.00) annually. The tourist rate is Nu. 70 per animal per day. The government rate is Nu. 30 per day. Owners of these "pack" animals rent them out for two or three "business" trips a year.

Families without yaks face economic hardship. Take Kinley of Laya, for example. He has one cow and three horses. He has no pasture lands, so even if he took a loan to buy a yak, he would have a limited, and probably, insufficient grazing area. He keeps his cow close to the village, and primarily stall-feeds his animals with grasses cut from the forest. As his cow is male, his family receives no money from selling dairy products. The family income comes solely from tourism, performing a dance program for tourists, and renting horses to carry trekkers' provisions. Last year, he said his family income was Nu. 2,000 (\$65.00).

In Chebesa, I interviewed a 72-year-old widowed Bhutanese woman. Her only family is one son, who also lives in the village, with his family. While she does not own any yaks, she owns six cows and seven horses. Her son tends to her cattle, grazing them on the villages' communal pasture with his yaks. Once a year, she rents out her horses to carry tourists' provisions. She has a small kitchen garden where she plants potato, radish and turnip, and one acre of dryland, where she cultivates barley. The crop residue from the barley is her winter fodder. She uses one-half of her barley crop to make a barley flour paste - an additional cattle feed. Her son markets her dairy products, datsi only, in Paro. Last year, datsi sales generated Nu. 1,500.

Like Kinley, her income comes primarily from tourism. She makes a local wine from barley, which she sells to other villagers for Nu. 15 per bottle and to tourists for Nu. 20 per bottle. Last year, she sold approximately 21 bottles. She sells potatoes to tourists at Nu. 4 per Kg, and sold about 20 Kg last year. With her low income (roughly Nu. 1945.00 or \$63.00), she cannot afford to feed herself for the entire year, and shares most of son's family's food. Firewood collection is difficult in Chebesa, demanding a three-kilometer walk to find a suitable firewood-collection spot. Even then, all of the wood is wet. She is too old to set off on such journeys. Therefore, she burns only the cow dung that she collects during the winter, when her cattle are grazing closer to the village.

The residents of Chebesa kill a yak to honor the local dieties, Penden Lham and Pel Yeshey Goern, during the New Year holiday. The New Year occurs during the first month of the

Bhutanese calendar (mid-February to mid-March in the Roman calendar). The New Year is a two-day festival. The first day is a religious ceremony. People light butter lamps and make pujas (religious offerings). On the second day, the villagers visit from house-to-house, and feast. The morning meal consists of yak meat and dried cheese, tea in the afternoon, and rice and pork in the evening.

Tending male and female yaks

Male and female yaks contribute to the household economy in distinct, but equally important, ways. Herders care for their male and female yaks differently. Male yaks are driven into high altitudes areas in the summer months, where they are normally left to graze unattended. In the summer months, female yaks are brought up to higher elevations and grazed under the watchful eye of a family member. They are brought close to the camp in the evening, tethered, and given fodder. This special attention enhances their milk production.

Male yaks are castrated and trained to plough fields. They are considered sure-footed animals and are also trained to carry loads. In the winter, males are brought to lower altitudes. They carry back the coming year's provisions that are bartered for and bought in towns like Thimphu, Paro and Punakha. In the winter, female yaks are kept in the village to graze.

The usual practice among herders is to give yaks salt once a month. Some farmers administer the ration once every 10 days or two weeks. In the summer time, male yaks grazing in the higher elevations, may be visited once a month; solely for the purpose of giving them their salt ration. In the winter time, female yaks are given oil. During the milking season, which lasts for five to six months, (June and July are considered the best months for milking), females are given salt once a week.

Land tenure

Grazing lands are government-classified, within each district, as registered native (natural) pasture or improved pasture. Natural pasture cannot be privately owned. Improved pastures are lands held by individuals, and registered in their thram, or land registry. An improved pasture may be an old wheat or barley field.

Under the 1980 Land Act, an individual cannot have more than 25 acres registered in his/her thram [2]. Registered lands include agricultural land or orchards, but not native pasture land, or forest. Individuals cannot privately own native pasture land. Instead, persons are given private grazing rights to native pasture in a tsamdros.⁶ The government retains legal ownership of the tsamdros. Herders are under strict regulation to use their tsamdros only for grazing. They have no authority to use the land for any other purpose [2, 3]. Thus, the act forbids pasture improvement. Planting a leguminous cover crop to enhance soil nitrogen, burning, to enhance grass production, or sowing improved grass seed is considered using the land for reasons other than grazing.

Unfortunately, such a policy encourages the environmental degradation caused by overgrazing. In 1985, the Department of Animal Husbandry put forth a policy proposal to allow and encourage farmers to improve their tsamdros with cover crops. Another part of the proposal was to

redistribute natural pasture lands to more "progressive" farmers, those interested in adopting pasture improvement practices. Today, these are still proposals - tabled by the National Assembly in 1986 [2].

Much of the country's registered native pasture occurs in sub-alpine and alpine regions. Thimphu district has the largest amount of registered native pasture of the country's 18 districts. In 1992, it totaled 169,338 acres [3]. A large portion of Jigme Dorji National Park falls within Thimphu district.

With respect to forest conservation, much of the land classified as registered native pasture, falls within vast tracts of forest. Whether or not grazing adversely affects forest regeneration is a popular discussion topic among foresters in Bhutan. Grazing seems to have more devastating effects on high-altitude alpine vegetation, like that found in Jigme Dorji, than in the broadleaved forests found in lower elevations [2].

In higher elevations, where fir (*Abies densa*) is a dominant species, vegetation sampling found less than 50% of forest regeneration to be fir seedlings. Studies in low elevation broadleaved forest, found regeneration rates to be proportional with the dominant cover types, but with retarded growth rates [2]. Foresters may consider this latter finding an adverse effect. Regeneration is not prevented, but since growth rates are altered, the probability of a change in the species composition increases. Species, not normally found in the forest stand, because they are outcompeted under the normal regeneration rates, suddenly have a new advantage in the forest environment altered by grazing. With continued grazing over time, the entire forest type could change. To check the adverse effects of browsing and grazing on forest regeneration, Dorji (1993a) suggests that all registered native pasture be ground-truthed, and pasture lands relocated and reallocated [2] out of the forest. This is a substantial and daunting task.

Herder and yak migration

Seasonal migration is a practice among yak herders in the Himalaya. In the winter time, before the heavy snowfall, yaks are driven down from the higher altitudes where they graze in the summer. In the summer time, they are brought up again to the same pastures. In some areas of Bhutan, this seasonal migration crosses district boundaries, but in Jigme Dorji, migration occurs within the same district. Most herders have grazing rights to two pasture lands, one for the summer, and one for the winter. These pasture lands may be communally- managed by a few families, collectively by an entire village, or they may be individual tsamdro.

Owing to their different locations, summer and winter pastures have individual names. Two of the summer grasslands around Thanza include Yarithockchu and Sarishongshing. Some herders graze their yaks in these two pastures for eight months out of the year, moving between them, based on grass availability. One of the Thanza wintering grounds is called Guenrithangpakhar, where the same herders tend their yaks for the remaining four months of the year.

One of the summer grazing lands near Laya is called Yarithang. One woman, the owner of 80 yaks, lets her animals graze there, unattended, in a one acre tsamdro for four to five months. In the fall and winter, they graze in communal pasture, closer to Laya for six or seven months.

Some herders divide their time evenly between summer and winter pastures. Others, spend four to five months in the summer pasture, and the remainder of the year in either village land or winter pasture. Herders stop along their migrating routes between pastures for a few days or a few weeks, depending on the availability of grass and forage.

Whether or not male yaks are watched in summer pasture is a matter of preference and man power. Some people with five or 10 males stay with them, whereas others, with only two yaks or as many as 80, let them graze unattended. With male yaks, grazing unattended for the majority of the summer, how can an individual enforce his or her rights to a tsamdro and keep yaks from crossing between different rights-holders' allotments? Herders throughout Jigme Dorji say that yaks roam to wherever the grass is. Often times, this means that they end up being where they should not be. Yet, no conflicts arise. Unless all herders agree to supervise their yaks in the summer months, nothing can be done. Delinquent yaks are absolved under a "mutual understanding."

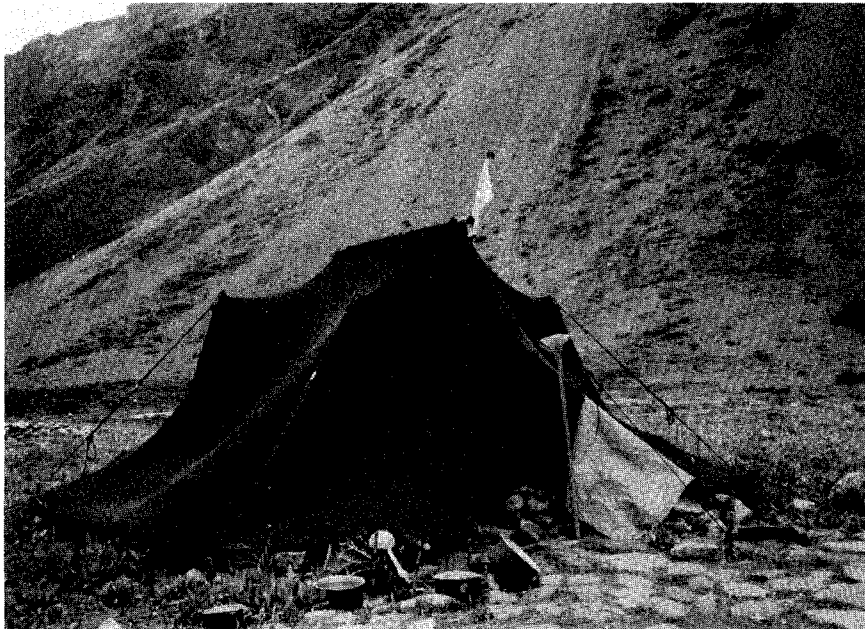
Unattended grazing has critical implications for conservation planning within Jigme Dorji National Park. If the park is zoned, as many national parks are, two of the zones in JDNP will be core zones (areas managed strictly for conservation purposes free (hopefully) from all unnatural and external disturbance) and grazing zones (areas for domesticated animals) (John MacKinnon, personal communication, July 1994). A sincere conservation effort in Jigme Dorji must distance core zones from grazing zones. Unattended yaks cannot distinguish the difference between core zones and grazing zones. Park planners need to know the location of all registered summer and winter pastures (Miller 1988, [9] voices similar concerns). While pasture names should be obtainable from the government ministry responsible for awarding grazing rights, this cannot replace the accuracy of ground-truthing (field verification).

Heading south from Lingshi towards Thimphu, we crossed Yalela Pass at 15,800 feet (4,790 m). After several hours walking on the downhill side of this pass, in a valley scraped away by migrating glaciers, we happened upon three tents in a yak herder's camp. This camp, outside Shodu, is the winter grazing grounds for some of the families we met in Gangyul, a day long walk (approximately 10 hours) to the north. Families return to this same site for grazing every year. They stay in this camp for two months before moving north at the beginning of summer.

The tents, which shelter herders and their families during their migration, are made out of the male yak's black hair. They specifically use the dark hair from the underside of the male. The black color is significant. It protects families in the open meadows, from things falling from the sky - thunderbolts and meteorites. On average, it takes three years to shear and to spin enough wool to weave a tent. The actual weaving of the tent takes only a few weeks. Tents vary in size, but all are spacious to accommodate family, friends, and surprise visitors, like ourselves. The tents that I chatted and drank suja (butter tea) in were between 10 - 15 feet in length, 6 - 7 feet in height and 10 feet in width. The floors are lined with a combination of hay, dried ferns and juniper branches. Foot-high walls, built up with stones, surround the inside perimeter of the tent. Blankets, firewood, and other supplies, are stacked on top of these stones. A stone fire place, constructed directly in front of the entrance, allows smoke to easily billow out. Strips of yak meat and dried cheese hang

over the fire. What I find most remarkable about these tents is that they are woven so tightly as to be waterproof.⁷

There is a woman living in Barshong who is the daughter of nomadic yak herders. She grew-up in these tents. When her parents were younger, they tended the yaks of the central monastic body and Thimphu residents. Not until three years ago, when she married, had she ever lived in a permanent settlement.



Yak herder's tent in Shodu (3800 m).

Yak tenure and absentee ownership

In the western regions of Jigme Dorji, several families care for yaks owned by the monastic body or residents of Thimphu and Paro. In many instances, if individuals did not care for the yaks of absentee owners, they would not have enough pasture land, or any grazing rights for their own animals. In exchange for yak tending, they are allowed to use the grazing rights to the pastures registered to the absentee owner. Some villagers do not own any cattle or yaks at all. This yak-tending opportunity gives them the dairy products that they otherwise would have to purchase or trade for. Absentee ownership arrangements are not found in the regions of Laya and Thanza (Lunana).

Usufruct rights to the yak owner's registered native pasture is understood. But herders must negotiate another agreement with yak owners. The agreements, called "kayme chime" literally meaning, no birth, no death, and "pu-yig chapni" literally meaning recording birth and death, determine the payment for tending in the amount of animal products (butter or meat) that the herder must annually give the yak owner. In the Lingshi area, herders are giving the monastic body and absentee owners either four sangs (one sang = 1/3 Kg) of butter per yak or 30 sangs (10 Kg) of butter for each milking yak.

Under the "kayme chime" agreement, where births and deaths are not recorded, the herder suffers either good luck or bad luck depending on the fluctuations within the herd. Therefore, if a herder is given 80 yaks to tend, the payment in butter will always be for 80 yaks, even if the herd size changes to 75 or 85. The herder is allowed to keep any butter that remains left over after the payment, as well as any cheese produced. If a yak dies, the herder keeps the meat and the skin.

Under the "pu-yig chapni" agreement, the payment fluctuates with the number of yaks in the tended herd. If 10 yaks were originally given and one dies, the payment is reduced to that of nine yaks. In the case of death, the meat and the skin must be given to the owner. If a dead yak begins to decay before the herder discovers the carcass (this often happens in the summer when male yaks are grazing unattended in high altitudes), the owner is given the hide. What some herders prefer about this latter agreement is the yak owner provides the herders' daily ration which includes rice, chilis, salt and tea. Like "kayme chime", the herder still gets to keep any butter left over after the payment, and all of the cheese produced.

Most herders, who tend the yaks of monks and outside owners, say that no matter what the payment arrangement, in the end, payment tends to be the same under each arrangement and that either is preferable.

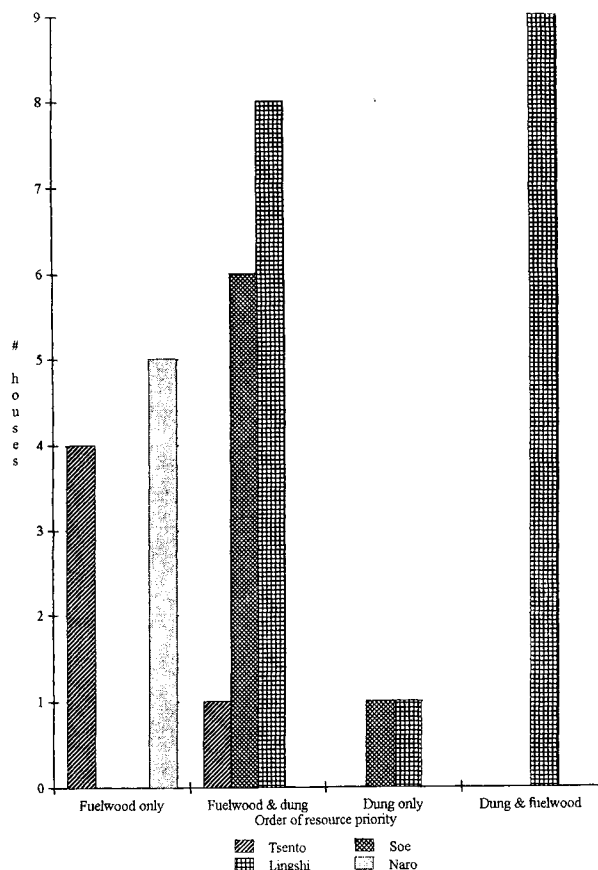
Animal residue as energy

Figure VI shows the energy use priorities for households surveyed in the Jigme Dorji gewogs falling within Paro and Thimphu districts.⁸ Six households (18%) do not use animal residue (yak or cow dung) for fuel. Five percent of the households rely solely on animal residue. Eighty-two percent burn dung to various degrees.

Tsento households are located at lower elevations (2875 m) where both hardwoods and conifers grow in the neighboring forests. While fuelwood is plentiful, residents state that the travel-time to collect it, has increased in the past ten years. There are only five households in Barshong (3600 m), the village surveyed in Naro gewog. Perhaps, due to the spatial scattering of households in this village, the fir (*Abies densa*) forest is well intact. Family members from these five households said it was not difficult to collect fuelwood. Settlements in Lingshi gewog are found at elevations ranging between 3951 meters at Lingshi proper, and 4200 meters in Chebesa. The elevation of villages in Soe gewog range between 3,700 meters and 3,850 meters. In both these apline areas, residents complained that it was difficult to collected fuelwood in the stunted juniper-dominated forests. Most people have to walk two to three kilometers to find a suitable place to collect it.

Yak dung is burned, mostly during the winter months, and is collected between the 10th and 12th months of the Bhutanese calendar (mid-November through mid-February in the English calendar). It is exceptionally cold at 4,000 meters in the winter, and yak dung burns better than firewood because it is warmer.

Figure VI: Energy resource combinations
Western gewogs of JDNP



Residents of the Laya and Lunana gewogs do not burn dung as an energy source. The elevation of settlements in Laya is approximately 3800 m, and in Lunana, the elevations range between 3720 m and 4120 m. Dung is not burned in these two areas for religious reasons. To burn dung in the hearth, would offend the local deities guarding the villages. This custom does not exist in the Lingshi region. This may be due to the fact that Lingshipas ('pa' means people), being closer to and having a permeable border with Tibet, have had a greater influence from their Tibetan neighbors. It is customary among Tibetans to burn dung as fuel. Furthermore, there are many second- and third-generation Tibetan immigrants in Lingshi gewog. Their forefathers settled in Bhutan when the Dalai Lama was expelled by the Chinese in the 1950's. Whether or not Layapas and Lunanapas burn yak dung when they are in higher elevations, or in migratory camps, away from their native places, is unknown.

Herders carry fuelwood with them when they travel to alpine meadows in the summer. The number of bundles that a herder brings depends on several variables: the number of accompanying family members, the availability of firewood in the summer grazing site, and the number of yaks in the herd. The amount of firewood transported ranges between 40 and 60 bundles or 10-20 yak loads. One woman specifically distinguishes between bundles of dry wood and bundles of wet wood. Last year, she transported 20 bundles of dry wood and 40 bundles of wet wood to her summer pasture. Dry wood is used for cooking. Wet wood is used for making cheese. If cheese is not made over a fire burning from wet wood (usually *Rhododendron sp.*), the cheese will stick to the bottom of the pot, damaging it.

Profile of a village

In the shadow of the Lingshi dzong, the local administrative center, is the small village of Mesayul, a hamlet of seven households. Their village economy relies primarily on the yak. They trade animal products in Thimphu, exchanging dried cheese, dried meat, and butter for wheat, rice, and chilis. Everyone cultivates barley, and uses the crop residue as yak fodder. Together, the villagers own

between 200 and 300 yaks. All yaks graze together on communally-managed tsamdro, consisting of two winter pastures and two summer pastures. The winter pastures are near the village, while the summer pastures are further north. The quality of the pasture's grasses is good enough to allow for four to five continuous months of milking. The tax on yaks changes with the number in the herd. Collectively, the villagers pay approximately Nu. 100 in annual livestock tax.

Lack of fodder is the primary problem in raising livestock. Residents claim that blue sheep (*Pseudois nayaur*) eat the pasture grasses before yaks reach the summer grazing grounds. An extension agent from Animal Husbandry comes every October to immunize yaks against disease. Foot and mouth disease is no longer a problem for their animals. Yet, even with this health care, each household loses two or three yaks a year. Most yaks die from diarrheal problems caused by an insect they call "councela". They have heard residents in neighboring villages talk about increases in wildlife predation, yak losses to snow leopard and wolf, but they have not experienced such misfortune. Villagers plant fodder grass, distributed by animal husbandry agents, on communal land. They attempt to harvest this grass crop twice a year. The yields are not promising. Grass yields are low, even when more seed is sown. The grass only grows well in an area the first year it is planted. After that, it does not grow well, if it grows at all.



Yak crossing en route to Chebesa

Grasses and winter fodder

Studies by Miller (1987a) in the greater Laya region (3,770 m) found nine dominant grasses in the pasture lands surrounding its various villages. These grasses include *Anthoxanthum hookeri*,

Bromus himalaicus, *Calamagrostis pulchella*, *Danthonia schneideri*, *Elymus schrenkianus*, *Festuca ovina*, *Helictotrichon virescens*, *Stipa consanquinea* and *Trisetum spicatum* [4]. In these same pasture lands, cattle graze throughout the year, and yaks graze during the winter months. Some of these same grass species are also found in areas south of Laya, along the Mo Chhu River. Here, *Anthoxanthum hookeri*, is common in fir forests, *Calamagrostis pulchella*, in rocky, eroded sites and *Calamagrostis epigeois* on the river's steep gravel banks [4].

Yak herders in Laya and Thanza (Lunana) collect fodder grasses and weeds to supplement crop residues and limited winter grassland resources. In regions where the elevations approaches 4,000 meters, only barley, mustard, onion, garlic, and turnip grow. People are unable to take advantage of the fodder cultivar seeds distributed by extension agents. Fodder grasses, weeds, and tender leaves and branches are collected from the forest, degraded areas along trails, and from lands surrounding villages beginning at the end of August through October. During these months, it takes family members between five and fourteen days to collect enough fodder to last through the winter. Villagers identified 13 fodder species that they regularly collect to feed livestock. Of the 13, six are dried before feeding and seven are eaten fresh. Local botanical experts currently are identifying the species that primarily belong to the Graminae, Solanaceae, Leguminosae, and Urticaceae plant families.

During the winter, yaks must search for grass beneath the snow. This foraging is supplemented with grass hay, and occasionally, yaks will consume dried stalks of barley. Cattle and horses, though, would not survive the winter without crop residues. Stalks (the local name is 'suma' meaning straw) from the harvested barley and, the less frequently grown, mustard crop, are dried, and stored under the roof of the house until the onset of winter. Crop residues comprise between 5 - 50% of the fodder requirements for domesticated animals. Fodder needs from crop residue and from the forest increase dramatically when villagers do not have any grazing rights, or do not have enough grazing land. For herders without grazing rights to a tsamdro, the percentage of fodder that comes from crop residue ranges between 50% and 85%.

Complaints about a lack of fodder, and a shortage of grass and leguminous forbs in the winter are highest in the Lingshi and Jangothang areas. This is a typical problem in many alpine regions: the growing season is short, there is a high potential for soil erosion, and the topography is steep and rocky [5]. Yaks and cattle from Laya and Lunana gewogs are distressed more by disease and wildlife predation.

A few years ago, the Department of Animal Husbandry sponsored a community project in Soe, not far from Jangothang, the Mt. Jumolhari base camp. The project, growing fodder grasses on village common property, failed. One woman commented that people involved in the project did not uphold their project responsibilities. Many farmers only came to the field the day the seed was planted, and the day it was harvested. In the end, when it came time to harvest the grasses, each participant procured only one-half a gummy bag of grass. Now, extension agents distribute fodder grass seeds to individuals who wish to plant them on privately-owned land. Grass yields are much higher.

Wildlife management and livestock grazing

If you ask a yak herder what his or her problems are in raising livestock, the overwhelming responses are: disease (foot and mouth disease and giddiness), predation by wildlife, such as the snow leopard and wolf, and poor quality pasture land. Herders attribute poor quality pasture land to encroachment by stunted vegetation, such as juniper or rhododendron, invasion by willow (*Salix sp.*), and foraging competition with other wildlife, particularly the blue sheep, or bharal.

"Government officials came here a year or two ago and told us that each family could only have 30 yaks in their herd," an elderly man, in Lingshi gewog told me, when we were discussing how to address the problem of overgrazing.

"Certainly that cannot be enough to survive on," I responded.

"Absolutely not!" he firmly replied. This grandfatherly figure, of Tibetan descent, keeps 100 yaks.

Never do villagers concede that overgrazing might be caused by expanding yak herd sizes. In fact, some persons commented that while the number of yaks in the area has increased, and the blue sheep population has remained constant in the area, herders have always had a problem with poor quality grass due to blue sheep competition.

Blue sheep are found throughout Jigme Dorji at elevations ranging between 3,800 and 4,400 meters. In Tibet, they inhabit areas above timberline to 18,000 feet (5480 m) [6]. William Moorcroft, a Tibetan explorer, wrote of his first encounter with a blue sheep in 1812; "were it not fanciful to suppose a chain between the works of nature, I should say that this animal was the link between the deer and the sheep." [7] ⁹ In Jigme Dorji, blue sheep population densities are higher in Lingshi gewog than in Laya gewog [8].

Wildlife ecologists and animal husbandry experts debate the contribution of yaks, blue sheep, and marmots (*Marmota himalayana*) to the overgrazing of alpine meadows. ¹⁰ Yaks, blue sheep and marmots have overlapping diets, thus competing for the same food resources. Schaller (1979) found in his studies of blue sheep in Tibet and Nepal that this ungulate favors grass, leguminous forbs, the leaves of *Cotoneaster sp.* and twigs of the *Ephedra sp.* shrub. With respect to yak/blue sheep competition, he found blue sheep to have a higher tolerance for foraging; reaching behind thorny shrubs to eat the grass that livestock overlook [6].

According to Yonzon (1992), overgrazing in Bhutan's alpine areas may be due more to wildlife than to domesticated livestock. Yaks occupy high altitude areas for three to five months of the year. Marmots and blue sheep inhabit these areas nearly year-round [8]. Controlled studies on winter pasture land, combined with accurate yak, marmot and blue sheep population figures, would begin to address the agents of overgrazing in many of the country's alpine regions.

Miller (1988) states that pastoralists and their livestock create some of the most difficult problems for wildlife management in the Himalaya [9]. Understanding the degree of competition between livestock and wildlife for grass and forage resources, needs a thorough investigation of: "the

similarity of diets, the kind and amount of forage present, the relative size and numbers of each animal species, the intensity of grazing, and the degree to which animals use the same part of the range" [9].

Jigme Dorji National Park presents an overwhelming number of research opportunities. Information gaps present a challenge to those national and ex-patriot scientists involved in the conservation of the park's biological diversity, and the improvement of the park resident's living standards and local economy.

Best regards,



Cynthia

NB: Change of address effective December 15, 1994
c/o College year in India
"RAJSRI"
9-C, Visalakshipuram
Madurai 625014 Tamilnadu
INDIA

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Endnotes

* A similar version of this newsletter was submitted to the Nature Conservation Section, Forestry Services Division, RGoB and the WWF-Bhutan Programme as, *Preliminary report on yak and cattle management in Jigme Dorji National Park: Implications for park planning and management*. August 1994.

² In July 1993, a similar type of socio-economic survey was conducted in Jigme Dorji National Park. While the structure of the survey technique has remained more or less the same, I have changed the depth and breadth of inquiry. As such, much of the information gathered in 1994 was not gathered in 1993.

³ Data compiled from 1993 and 1994 surveys. The total number of households surveyed is 121. 41 households were sampled in summer 1993.

⁴ Nu. stands for the Bhutanese currency, ngultrum, which has the same value as the Indian rupee. The two currencies are interchangeable in Bhutan. The current rate is Nu.31 = \$1.00.

⁵ During one interview, I was sitting around the kitchen fire with a family in Soe. A pot of water was boiling over the fire. The mother of the household lifted the cover to stir what was inside. I pointed inside the pot and asked, "Ani ga chee mo?", which means, "What is this?" The reply was, "Yak's tongue." Her son was leaving for pre-university the next day. They were having a special meal for his last evening at home.

⁶ Tsamdro is a generic term for a large, open space to which grazing rights have been allocated. Tsamdro may be registered to individuals or to communities.

⁷ We overnighted in this camp. The following morning, we exchanged one kilogram of red rice for the firewood to cook our meal the previous evening. People in the camp commented on how greedy we were for packing up and carrying away our trash, a few tins, with us.

⁸ There are 19 administrative districts in Bhutan. Each district, known as a dzongkhag, is subdivided into gewogs, or blocks. Several villages are found within each gewog.

⁹ The blue sheep is not a true sheep. It falls so intermediately between sheep and goats that taxonomists have a difficult time classifying the animal. It is primarily goatlike, with some sheeplike traits, and belongs to the subfamily *Caprinae*, Tribe *Caprini* [6].

¹⁰ Yak herders find the marmot to be a pest. A borroughing animal, the entrance and exit holes to and from the marmots' tunnels create a pot-hole effect. Yaks often step into these holes, and break a leg.
