Small Ruminant Production and Pastoral Development in the Dry Mountains of Pakistan

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Introduction

Mountain areas constitute 60-65 per cent of Pakistan's total area, with high mountains accounting for 22-25 per cent and low mountains covering 38-40 per cent of the country's land mass (Siddiqui 1995). Rugged mountainous terrain, narrow valleys, and foothills total approximately 0.4 million sq. km. (Abbasi 1987). These mountainous zones may be divided into two categories: dry mountains and wet mountains. The dry mountains can further be classified into the following two geographical sub-divisions: northern dry mountains and western dry mountains. This paper mainly addresses small ruminant production and pastoral development in these dry mountain regions.

Northern Dry Mountains

The federally-administered Northern Areas (Gilgit and Baltistan) now include five districts and comprise the largest part of the northern dry mountains. These mountains are located between 35°-37°N and 72°-75°E, with a total area extending over 72,500 sq. km. (Mohammad 1995). Land use is dominated by mountains (34%) and rangeland (52%) with a small area of natural forest (4%). Less than one per cent of the land is cultivated (Archer 1992). The entire region receives an average of 100-200mm precipitation annually, though precipitation generally exceeds 400mm at elevations above 3,000 metres (Mohammad 1995). Native vegetation can be grouped into four distinct types: foothill ranges, dry temperate ranges, valley grazing lands, and alpine pastures.

Western Dry Mountains

Balochistan, the largest province of Pakistan, is one of the best examples of the western Dry Mountains. This region covers an area of 0.35 million sq. km. (Archer 1992) and extends between the northern latitudes of 24°-32° and the tropics. The climate is Mediterranean. Annual precipitation ranges from 200-300mm with 60-80 per cent occurring during winter and early spring (Khan 1988). However, the precipitation gradient increases from 50mm in the west to 400mm in the eastern mountains bordering the Punjab. Rangelands account for the majority of this land, about 93 per cent of the total area. Vegetation is divided between shrublands in the south and grasslands in the north.

The Role of Small Ruminants

Livestock grazing is the most important activity undertaken by the subsistence farming and pastoralist communities of these regions. In Pakistan, almost 50 per cent of

Table 1: Small Ruminant Populations in Pakistan (million head)

Province	1955	1960	1972	1976	1986	1993	*
Punjab							
Sheep	4.19	5.58	6.28	8.04	6.69	7.03	1.8
Goats	2.60	2.97	2.97	7.77	0.76	15.47	13.0
Sindh							
Sheep	1.05	1.59	0.84	1.83	2.62	3.09	5.1
Goats	1.98	2.20	2.28	4.24	6.76	9.33	9.7
NWFP							
Sheep	1.56	2.43	2.46	3.68	2.23	2.28	1.2
Goats	2.10	3.04	3.74	4.69	4.20	4.49	2.9
Balochistan							
Sheep	1.16	2.56	3.86	5.08	11.11	15.10	31.6
Goats	0.70	1.60	3.24	4.44	7.30	11.28	39.7
Northern Areas							
Sheep	0.14	0.21	0.23	0.32	0.64	0.86	13.5
Goats	0.19	0.24	0.39	0.56	0.94	1.39	16.6
Pakistan							
Sheep	8.10	12.38	13.67	18.94	23.29	28.36	6.6
Goats	7.56	10.05	15.58	21.69	29.95	41.96	11.9

* Per cent annual increase over 38 years (Nawaz and Khan 1995)

the meat supply comes from small ruminants (Nawaz and Khan 1995). The majority of small ruminants are raised by flock owners with little or no land resources.

According to recent statistical estimates, Balochistan has 37.5 per cent of Pakistan's total sheep and goats, while the Northern Areas account for only three per cent. Presumably, Balochistan would soon be supporting as much as 50 per cent of the total small ruminant populations. Goats have increased tremendously in the last few years, indicating significant shifts in the structures of native plant communities (e.g., shrubs etc).

Sheep and goat-raising contribute 25 per cent of Balochistan's Gross Agricultural Product. Small ruminants directly or indirectly aid the income of about 80 per cent of the population of this province (Nagy et al. 1987).

Fiduciary Pastoral Development

Based on statistical indicators, it may be concluded that pastoralism in dry and cold mountainous regions of Pakistan is heading in a positive direction. The following sections examine the fallacy of such pastoral development claims and addresses pertinent rangeland issues.

Nutrition

Small ruminant production has always adhered to traditional systems of pastoral manangement. However, this reality is changing. Sheep and goats used to obtain 90-95 per cent of their nutritional requirements from grazing resources in Balochistan (FAO 1983). Buzdar (1989) concluded that traditional small ruminant production was suffering from severe pressures due to overstocking and declining fodder supplies which, in turn, hinder production. Estimates by Archer (1992) reflect the magnitude of nutritional stress upon sheep and goats (Table 2). For example, in both Balochistan and the Northern Areas, feed supplies and grazing resources have dropped to about 60 per cent of their previous levels. These examples illustrate that feed deficits are perhaps the biggest issue facing sustain-

Table 2: **Feed Budget Deficits in Dry Mountainous Regions** (million tons)

	TDN	DCP
Balochistan		
Total availability	2.58	0.234
Total required	4.16	0.504
Per cent deficit	38.0	54.0
Northern Areas		
Total availability	0.49	0.042
Total required	0.71	0.077
Per cent deficit	31.0	45.0

TDN: Total Digestible Nutrients (Archer 1992)
DCP: Digestible Crude Protein

able small ruminant pastoral development in Pakistan. All other issues are connected to this basic lack of feed.

Wahid (1990) determined the mechanism by which sheep and goat nutritional deficiencies were operating on grasslands and shrublands of Balochistan. His explanation places emphasis on understanding this lambing/kidding calendar in order to mitigate nutritional deficits. According to this lambing/kidding calendar (Table 3) the year is divided into four periods and explains a flock's nutrient requirements based on the physiological state of females. The first period begins in the late summer and early fall and includes all months when the females are dry and their nutrient needs remain at a maintenance level. Breeding is normally included in this first period and begins during the second half of September. The second period lasts from October through December when females are in early to mid-gestation. After December, ewes/does enter the most critical third period, when 70-80 per cent of the foetal growth occurs. Nutritional requirements are high at this time. Since sheep and goats depend entirely upon rangelands to meet their nutrient requirements, winters are always difficult for them, as vegetation becomes coarse, dry, and dormant until the first week of March. Females experience severe nutritional stress at this time. Productivity, conception rates, lambing percentages, birth weights, and live weights are significantly affected by the harsh conditions during this period.

Management interventions which improve winter feed availability would increase overall production benefits at least two-fold (Rafique *et al.* 1990). Wahid (1990) concluded that small ruminants are se-

Table 3: **Lambing/Kidding Calendar and Nutrient Requirements of Sheep and Goats on Balochi Rangeland**

Month	Physiological state	DM (%)	TDN (%)	CP (%)	P (%)
June	Maintenance	2.0	55	9.4	0.2
July	Maintenance	2.0	55	9.4	0.2
August	Maintenance	2.0	55	9.4	0.2
September	Maintenance	2.0	55	9.4	0.2
October	Early gestation	2.4	55	9.4	0.2
November	Early gestation	2.4	55	9.4	0.2
December	Mid gestation	2.4	55	9.4	0.2
January	Late gestation	3.2	59	10.7	0.23
February	Late gestation	3.2	59	10.7	0.23
March	Lactation	4.2	65	13.4	0.26
April	Lactation	4.2	65	13.4	0.26
May	Lactation	4.2	65	13.4	0.26

Note: **DM**: DryMatter-per cent of bodyweight (Wahid 1990)
TDN: Total Digestible Nutrients - per cent of ration
CP: Crude Protein - per cent of ration
P: Phosphorus - per cent of ration

verely phosporus deficient year round throughout both the shrublands and grasslands of Balochistan. The crude protein availability on rangelands does not meet nutritional requirements during fall and winter.

Lambing/kidding commonly occurs in early spring on Balochi ranges. Rapid spring growth commences as the climate grows warmer. Forage is generally considered nutritionally adequate for all ruminants at this time. Lactation may end in May as offspring are weaned, though this process is often delayed so that milk production levels remain high. After lactation ends, animals exist at maintenance nutrition levels until breeding begins again in September.

Meanwhile, considerable production losses occur in young stock. Range vegetation reaches maturity in July when newly-weaned young stock are only 3-5 months old. Young lambs/kids must survive seven months of nutritional stress (August through February). During this period, grazing resources fail to meet their growing nutritional needs. Results of such nutritional deficits include death, poor weight gain, and delayed puberty — all of which have negative effects on the herding economy.

As illustrated above, the traditional lambing/kidding calendar does not correspond with existing seasonal feed supplies. Thoughtful breeding plans that coincide with seasonal vegetation cycles are required to increase the productivity of small ruminant pastoralism. The role of small ruminants in pastoral development can be greatly improved and intensified by introducing management interventions that improve feed availability, particularly during winter.

Diet

It is imperative to understand the current modified structures of vegetation and their relationship to grazing livestock. Not all forage species on rangelands are equally palatable. Similarly, the quantities of various available forage do not indicate the amounts of each in animal diets. In general, most of the rangelands in dry mountains have been overstocked. Consequently, many of the highly desirable plant species are becoming rare. For example, retrogression of climax plant communities, such as *Chrysopogon aucheri*, is widespread throughout Balochistan's grasslands. Presently, *Cymbopogon shoenanthus* constitutes 75 per cent of all plant biomass on grasslands (Wahid 1990), whereas *Artemisia* spp and *Haloxylon* spp dominate on shrublands, averaging 54 per cent and 60 per cent of the total plant composition, respectively.

Dietary preferences of sheep and goats on grasslands and shrublands of Balochistan were determined by Wahid (1990). Sheep diets were consistently low in *C. shoenanthus* — ironically the most abundant plant species on the grasslands. Goats also neglected this grass species throughout the year. Similarly, even though *Artemisia* spp and *Halaxylon* spp are abundant on shrublands, *Convolvulus iexocalycinus* appeared to be the most preferred species by both sheep and goats. Wahid concludes that special management techniques are required to bring basic changes into plant communities, introducing preferred, palatable species. If this is not made a pastoral development priority, small ruminants productivity will continue to decline.

The results of Wahid's study (1990) are equally valuable for both individual farmers and pastoral development policy-mak-

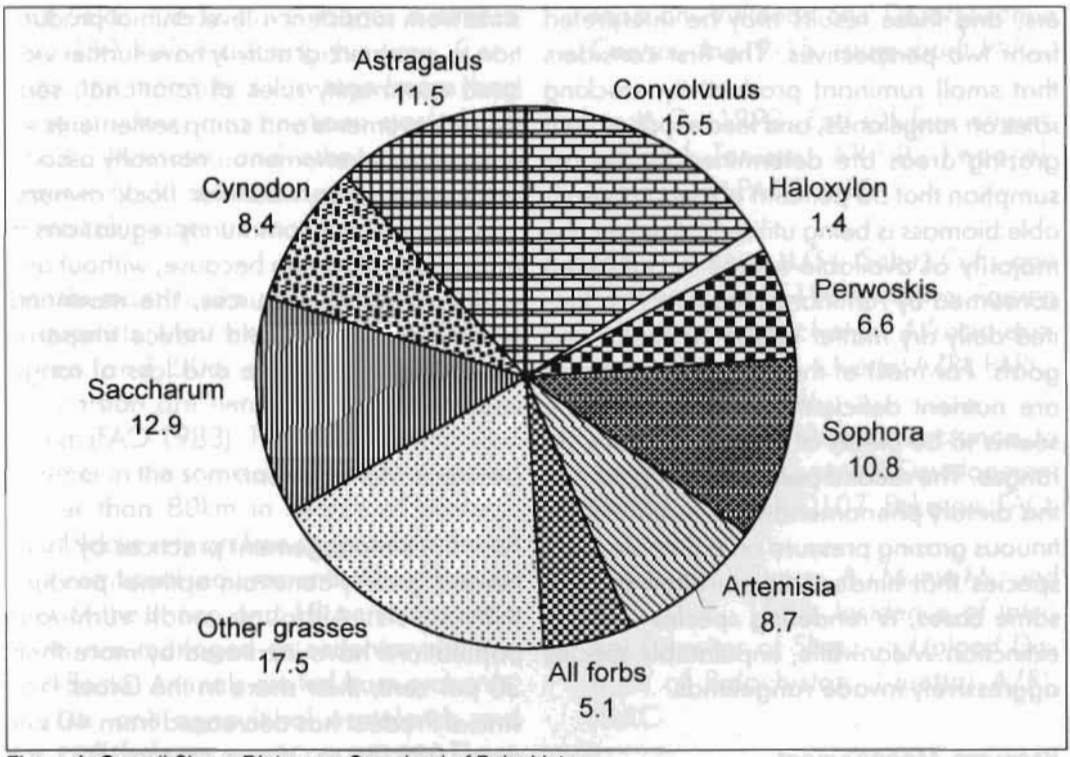

Figure 1: Overall Sheep Diets on a Grassland of Balochistan

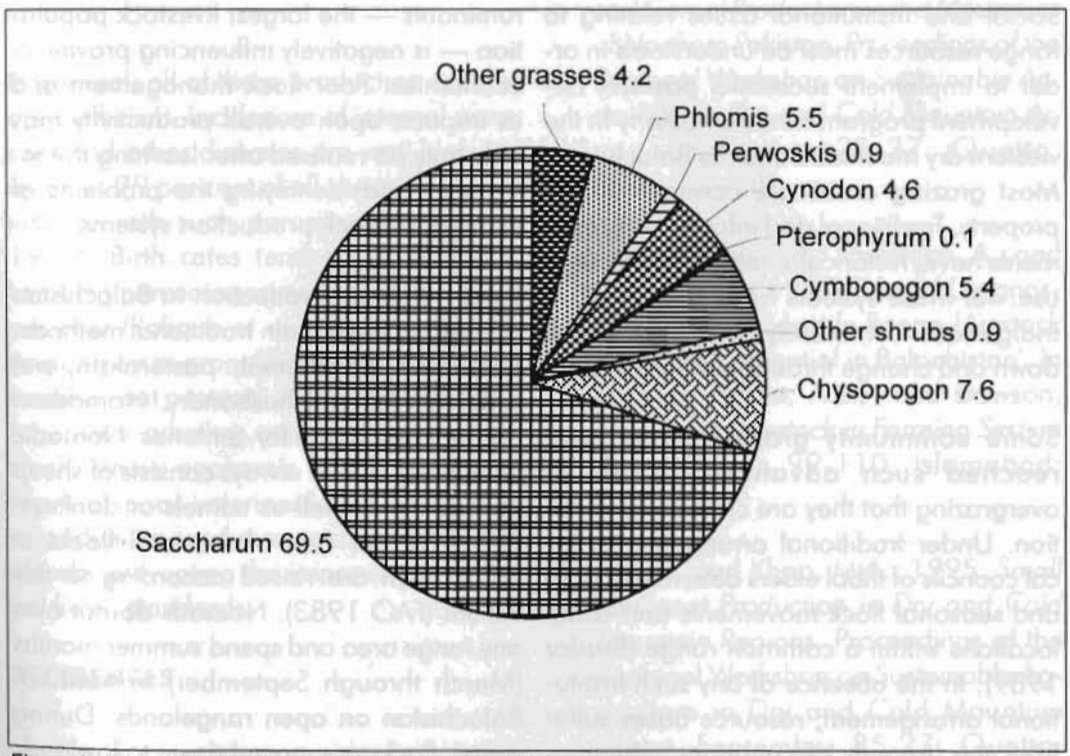

Figure 2: Overall Goat Diets on a Shrubland of Balochistan

ers, and these results may be interpreted from two perspectives. The first considers that small ruminant productivity, stocking rates on rangelands, and feed supplies from grazing areas are determined by the assumption that 50 per cent of the total available biomass is being utilised. However, the majority of available forage is not being consumed by ruminants, leading to a limited daily dry matter intake for sheep and goats. For most of the year, these animals are nutrient deficient, even though there seems to be plenty of forage available on ranges. The second perspective implies that this dietary phenomenon is a result of continuous grazing pressure on palatable plant species that hinders regeneration and, in some cases, is rendering species close to extinction. Meanwhile, unpalatable species aggressively invade rangelands.

Resource Management

Social and institutional issues relating to range resources must be understood in order to implement successful pastoral development programmes, particularly in the western dry mountains such as Balochistan. Most grazing areas are common, tribal property. Traditional and informal arrangements have, historically, regulated resource use. Yet these systems have weakened as indigenous community structures break down and change throughout Balochistan.

Some community grazing lands have reached such advanced stages of overgrazing that they are close to devastation. Under traditional arrangements, local councils of tribal elders determined daily and seasonal flock movements and camp locations within a common range (Buzdar 1989). In the absence of any such institutional arrangement, resource bases suffer from the 'tragedy of commons' phenomenon. Buzdar (1989) mentions that gradual shifts from subsistence-level animal production to commercial activity have further violated community rules of rotational, seasonal movements and camp settlements — a 'modern' phenomenon normally associated with larger, wealthier flock owners. This shift in local community regulations is particularly alarming because, without any additional feed resources, the mounting grazing pressures could induce irreparable biological damage and loss of range vegetation.

Livestock Management

Poor flock management practices by local herders greatly constrain optimal productivity levels. Although small ruminant populations have increased by more than 30 per cent, their share in the Gross Provincial Product has decreased from 40 per cent 1973/74 to 25 per cent in 1982-83 (FAO 1983). The diminishing role of small ruminants — the largest livestock population — is negatively influencing provincial economies. Poor flock management and its impacts upon overall productivity may only truly be realised after learning the intricacies and identifying the problems of existing livestock production systems.

Small ruminant production in Balochistan still follows three main traditional methods: nomadism, transhumant pastoralism, and sedentary animal husbandry. Nomadism has been practised for centuries. Nomadic flock composition always consists of sheep and goats, as well as camels or donkeys. About 30 per cent of the total flocks in Balochistan are raised according to this system (FAO 1983). Nomads do not own any range area and spend summer months (March through September) in northern Balochistan on open rangelands. During winter, flocks are moved down to lowlands where they graze on abandoned agricul-

tural fields. Flocks travel longer distances (i.e., 150-400km) during this time. Consequently, mortality is very high (more than 30%) in young and newborn stock (FAO 1983). Mortality and other production losses in flocks are considerably high when rainfall levels are poor.

Transhumant flocks are owned by agro-pastoralists. Most small ruminants (65% of sheep and 50% of goats) raised in Balochistan are herded according to this system (FAO 1983). These flocks winter and summer in the same areas and never travel longer than 80km in search of pasture. Most flocks rely on free ranges to meet all their nutritional requirements. About five per cent of the sheep and 18 per cent of the goats are managed as sedentary household flocks. Animals are fed from orchards, stubble, and agricultural wastelands and are stall-fed, on some occasions. These flocks are generally found in cultivated valleys.

In general, all of these production systems are inefficient. Incidences of internal parasites and other diseases are very high. As much as 79 per cent of all sheep flocks are infested with such parasites (Khan et al. 1988). Birth rates tend to be very low. Lambing percentages may be as low as 23 per cent (Rafique et al. 1990). By definition of their migrant lifestyles, nomads and transhumant pastoralists are at a disadvantage for marketing and selling their livestock. Heavy economic losses occur as a result of poor veterinary care, marketing opportunities, and management practices, thereby preventing the improvement of local living standards.

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