

RANGE MANAGEMENT IN NORTHERN AREAS

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The Northern Areas comprise of three administrative districts—Gilgit, Diamar and Baltistan. Its area is 70,236 km², human population about 530,000 cattle population about 1,121,000 (about 401,000 animal units). Most of the scanty and erratic rainfall is received in spring. Based on 40 years record, the average annual rainfall of Gilgit and Skardu is 130 and 160 mm respectively (App. 1). Most of the area is mountainous and is used for grazing. Agriculture is confined to about 10% of the area, in the narrow valleys. Land holdings are very small, about 0.1 to 0.4 ha. The main crops grown are cereals which supply about half the food grain requirement of the tract. Apricot, almond, peach, mulberry, pomegranate, and grapes are grown on field boundaries, as small graves, or in courtyards.

The Forest. Forests cover about 943,700 hectares, out of which 284,900 are coniferous, 800 irrigated and 658,000 scrub forests. Main species in the coniferous forests are: deodar (*Cedrus deodara*) mixed with blue pine (*Pinus wallichiana*). Along the higher reaches fir (*Abies pindrow*), and spruce (*Picea smithiana*) are present. Chilgoza pine (*Pinus gerardiana*) and juniper (*Juniperus excelsa*) are found mixed in various proportions. Ash (*Fraxinus xanthoxyloides*) is the main broad leaved associate. *Betula utilis*, *Populus ciliata* and *Salix* spp. are found towards higher elevations in the subalpine zone. Irrigated plantations cover a very small area (800 ha), the species commonly raised are poplars, Russian olive (*Eleagnus angustifolium*), black locust (*Robinia pseudoacacia*) and tree of heaven (*Ailanthus altissima*). *Quercus ilex* is the main species in scrub forests mainly located only in Diamar district. At lower elevations *Olea cuspidata* has been severely lopped and the areas taken over by *Dodonaea viscosa*. *Pistacia* spp. and *Monothea buxifolia* also show their appearance on depleted sites.

Deodar and kail are the main species in productive forests, (deodar, the main species present only in Diamar district) which are privately owned. Forest Department does not have any control over their sale but the harvest is done under the supervision of Forest Department staff after the sale proceeds (negotiated between the owners and contractors) have been sanctioned by the Resident/Commissioner Northern areas and the Conservator of Forests Northern areas. Forest Department receives a royalty and organizational charges on the timber extracted from the forests.

The Government owned forests are located in Gilgit and Baltistan districts and Astore sub-division of Diamar district. These forests are mainly protection forests and only Government Departments and the local inhabitants of the area are allowed to fell trees in a limited number after taking proper permission from the Forest Department.

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Range lands. Northern areas being situated in the north and north west of great Himalayan ridge, which checks the southern summer monsoons and modifies the precipitation regime, have been termed as Trans—Himalayan Range zone by Khan (1973).^{*} Based on the physiographic, climatic and vegetation characteristics the range areas can be further classified into the following ecological zones:

- (i) Sub tropical sub humid
- (ii) Dry temperate
- (iii) Sub alpine
- (iv) Alpine

A brief description of the eco-zones and their range characteristics is given below:

(i) Sub tropical sub humid zone: The zone lies between 800-1500 m elevation and characteristic vegetation type is the foothill scrub of *Olea cuspidata*, *Dodonaea viscosa*. Due to proximity to the populated areas, the forest cover has largely been eliminated and the areas converted into degenerated rangelands.

The type extends over all the areas under the scrub forests (mainly in Diamar district) where the major component of scrub vegetation, i.e., kao (*Olea cuspidata*) still exists in varying degrees of density and has not been totally eliminated. The tree cover may vary between 5 to 25% while the shrubs may comprise 10 to 30% of the vegetation. A large area of the sub-tropical sub-humid zone is covered by this type but its extent is decreasing due to extermination of the tree cover. The vegetation composition is as follows:

- II. *Olea cuspidata*, *Monothea buxifolia*, *Pistacia* spp.
- III. *Dodonaea viscosa*, *Berberis lycium*, *Ribes alpestre*, *Rosa muschata*, *Cousinia* sp., *Cotoneaster nummularia*, *Artemisia maritima*, *Artemisia brevifolia*.
- IV. *Heliotropium dasycarpum*, *Lactuca viminea*, *Medicago sativa*, *Nepeta podostachys*, *Geranium himalayensis*.
- IVa. *Agrostis* spp., *Apluda* spp., *Aristida* spp., *Cenchrus* spp., *Chrysopogon aucheri*, *Chrysopogon montanus*, *Cymbopogon* spp., *Digitaria* spp., *Heteropogon contortus*, *Pennisetum* spp., *Themeda* spp.

Where the tree cover has been removed, the vegetation has given way to poor shrub-growth—mainly *Dodonaea viscosa*. Such areas have low forage potential and the herbacious forage and grasses are negligible due to over use. The ground cover may vary between 10-30%.

(ii) Dry temperate zone: Above *Olea-Dodonaea* zone is situated the Dry temperate zone where climax vegetation is the coniferous mixed with *Quercus ilex*. Due to great socio-economic pressure, large scale conversion of these forests into agricultural fields or rangelands has taken place. The zone is represented into two range types.

^{*} Khan, Dr. M. Anwar. 1973. Rangelands of Pakistan,—A study. National Range Management Committee, Islamabad.

(a) *Quercus ilex* forests: The vegetation comprises of the following species:

- (i) *Quercus ilex*
- (ii) *Monothea buxifolia*, *Indigofera* sp., *Sorbaria tomentosa*
- (iii) *Daphne oleoides*, *Cotoneaster nummularia*, *Astragalus* sp., *Rosa* spp., *Artemisia maritima*, *Rumex hastatus*, *Rumex* sp., *Chenopodium album*, *Polygonum* sp.
- (iv) *Oxalis* sp., *Trifolium* sp., *Tribulus* sp., *Themeda* sp., *Lespedeza* sp.
- (iva) *Eragrostis* sp., *Aristida* sp., *Stipa* sp., *Pennisetum* sp., *Oryzopsis* sp.

The type provides forage for livestock during winter months. *Quercus* leaves provide forage and are stall fed in times of scarcity. Because of felling for fuelwood and lopping for feeding the livestock, *Quercus* trees have been badly damaged. The vegetation cover has been greatly reduced and the potentially good rangelands converted to low producing.

(b) Temperate coniferous forests: Identical to Himalayan forest zone, it lies above the sub-tropical zone. Coniferous species like kail (*Pinus wallichiana*), deodar (*Cedrus deodara*), silver fir (*Abies pindrow*) and spruce (*Picea smithiana*) are the climax vegetation, either pure or in mixtures. Broad-leaved trees are often mixed with conifers in mesic sites and may be available in pure patches of limited extent.

The climax vegetation gives way to mixed range types on degradation. Herbacious flora is usually abundant and produces good forage. Excessive openings or complete absence of trees encourages shrub growth which may cover more than 50% of the ground surface. The ground flora depends on the degree of openness of the canopy cover, soil depth and aspect. There is a rich representation of the mesophytic forbs as compared to the temperate grasses. The mixed dry temperate forests are grouped in this eco-zone. Besides forest tree species native vegetation is represented by the following species:

- II. *Viburnum* spp., *Lonicera* spp., *Berberis* spp., *Rosa* spp., *Cotoneaster nummularia*, *Sarcococca saligna*, *Parrotia* spp., *Desmodium* spp., *Strobilanthes* spp., *Impatiens* spp., *Skimmia laureola*, *Hippophae rhamnoides*.
- III. *Plantago ovata*, *Senecio* spp., *Rumex hastatus*, *R. nepalensis*, *Astragalus* spp., *Trifolium repens*, *Lotus corniculatus*, *Fragaria verna*, *Medicago* spp., *Geranium* spp., *Taraxacum officinale*, *Lactuca viminea*, *Thymus serpyllum*, *Polygonum* spp., *Phlomis* spp., *Iris* sp., *Tulipa* spp.
- IV. *Agropyron dentatum*, *Aristida* spp., *Bothriochloa* spp., *Bromus inermis*, *Chrysopogon* spp., *Dactylis glomerata*, *Dicanthium annulatum*, *Eragrostis* sp., *Oryzopsis* spp., *Pennisetum flaccidum*, *Poa* spp., *Setaria* spp., *Stipa siberica*, *Themeda anathera*.

The range types can be classified on the basis of altitude, aspect, slope, soil depth and parent material (slate, shale granite, limestone, etc.). Tree-savanna or shrub-savanna range types may result due to retrogression. The density of canopy cover determines the production capacity of the range both of the herbacious forage and the browse forage. Due to extensive overuse, the ranges are generally in the depleted conditions.

(iii) Sub-alpine zone: The zone lies between the temperate and the alpine zones and the vegetation has characteristics of the both. The tree canopy is often open, restricted usually to fir, spruce and birchwood. Open sites are good which are meadows currently being broken for subsistence agriculture and potatoes are introduced at places. The native vegetation is represented by the following:

I & II. *Pinus wallichiana*, *Abies pindrow*, *Juniperus excelsa*, *J. communis*, *Betula utilis*, *Populus ciliata*, *Salix* spp., and *Viburnum* spp.

III. *Plantago ovata*, *Trifolium repens*, *Fragaria verna*, *Medicago* spp., *Rumex* spp., *Polygonum alpinum*, *Thymus* spp., *Astragalus* spp., *Saxifraga jacquemontiana*, *Iris* sp., *Tulipa* sp.

IV. *Phleum alpinum*, *Agrostis gigantea*, *Poa* spp., *Trisetum* sp., *Agropyron* spp., *Festuca ovina*, *Dactylis glomerata*, *Pennisetum lanatum*, *Oryzopsis* spp. and *Carex* spp.

Sub-alpine meadows vary in character from sub-alpine shrub grasslands to subalpine forest rangelands. Range types are ecologically stable and climax vegetation can easily be maintained. However, due to heavy overgrazing by nomadic graziers during short summer periods these ranges have resulted in depleted condition.

(iv) Alpine zone: The alpine zone represents the climax rangeland vegetation with overall aspects of forbland or meadows. The zone is characterised by the dominance of alpine forbs and shrubs. The zone is usually situated below glacial fields and beyond subalpine meadows. There is no agriculture or permanent hutments in the zone which is used as summer ranges by migratory livestock.

The following are some of the important plant species of the zone: *Juniperus communis*, *Salix* spp., *Rosa* spp., *Berberis* spp., *Polygonum* spp., *Vicia* spp., *Trifolium repens*, *Plantago major*, *Plantago lanceolata*, *Saxifraga* spp., *Taraxacum officinale*, *Potentilla* spp., *Galium* spp., *Thymus serpyllum*, *Trisetum spicatum*, *Agropyron* spp., *Agrostis* spp., *Festuca ovina*, *Poa* spp.

Livestock. Grazing lands in the area are self maintaining under normal grazing pressure, but presumably grazing animals far exceed the grazing capacity of the area. The feed produced in the natural rangelands is not sufficient for the livestock and they have to depend on forage produced on croplands. The livestock dependence on forage can be of the following types:

- 100% dependent on croplands such as livestock belonging to the inhabitants of lowland regions where winter grazing grounds are scarce.
- 100% dependent on grazing grounds—Livestock belonging to nomads—visiting highland regions during summer and lowland regions during winter.
- Livestock belonging to local inhabitants visiting high land regions during summer and stall fed during winter.

The livestock is controlled by the herders who travel with the animals from summer to winter ranges and from winter to summer ranges. They are led to the feeding places daily in the morning and herded back to their corrals in the evening. Sometimes they have to travel long distances in search of water. Suitable utilization systems are not even known in the area and Open Range System is the rule. The livestock population* is as follows:

	<i>Number</i>	<i>Animal units</i>
Goats	561,771	95,501
Sheep	320,884	64,176
Cattle	208,731	208,731
Buffaloes	2,891	3,758
Asses	19,827	19,827
Other (Yak, horses, mules, camels)	7,310	9,137
TOTAL:	1,121,414	401,130

The class of animals, occupying the rangelands are described below:

Goats:—About 562,000 goats are kept in the area. They are hardy, mostly black or black-spotted in colour, having long hairy coat. Reared for milk as well as for meat, their hairs are also used for manufacture of carpets, mats and ropes. The average annual hairclip is 250 gm, the milk yield 1/4 to 1/2 kg per day per animal. Almost all the families in rural areas slaughter one or two animals and preserve meat under chilled conditions, 'NISSALU', and consume it from December 15 to February 15 every year.

Sheep:—The number of sheep is about 321,000. They are of fine wool type, predominantly of light brown colour. The sheep mainly provide wool, mutton and skins. Their milk is hardly sufficient to feed the lambs. The average annual wool clip is 1/2 to 1 kg per sheep. The wool is totally consumed in the manufacture of coarse hand woven tweed like cloth (patoo), the yarn form which is hand spun. The 'patoo' cloth is used for the production of caps, and gowns and in remote parts also for shirts and trousers.

Cattle:—In towns, only a few people can afford to keep a cow or goat, because of high cost of feed. Town milk requirements are met by tinned imported milk. Small quantity of raw milk is received from the adjoining villages. In villages people keep two to four cows and bullocks for milk production and for power. The animals are small,

* Pakistan Census of Livestock. 1976, Agricultural Census Organization, Government of Pakistan, Lahore.

very hardy and capable of withstanding severe cold and malnutrition. Average milk yield of a cow is 1 to 2 kg per day.

Others:—Horses, donkeys, and yaks are the major transport animals, capable of moving on smaller up-hill track. The yak can carry loads upto 120 kg in areas above 2,000 m. Horses and donkeys provide transportation at lower elevation. Yaks are large beasts of massive body structure domesticated a few centuries ago. Possessing long sharp horns, they are usually black in colour but white yaks too are frequently met with. A thick hairy coat protects them from severe cold. They are kept in areas above 2500 m. The tuft of the tail is very large. The animal weighs upto 300 kg. Males are excellent animals for ploughing. Milk yield is low but it contains a very high fat percentage. Yak meat is nutritious, tasty and crisp and is used during winters.

Animal husbandry. The level of livestock husbandry is extremely primitive. Thousands of animals die each year due to various diseases, both contagious and parasitic, like-pleuro-pneumonia, foot-and mouth, black quarter, anthrax, liver fluke infestation and managanite, and other ectoparasitic infestations.¹ These diseases are preventable by mass scale vaccination and improved biologicals, and dosing and dipping with highly effective new pesticides. But very little effort has been made to take these medicines or drugs to the effected animals in the field.

Mortality figures alone do not measure the full toll of animal disease. Diseases and parasites reduce production and vigour and also lower the quality of the products.

Range utilization practices. Both work and milch animals are reared by farmers. The number of cattle maintained per family is always excessive² and without regard to the availability of forage and proper nutrition. This results in the gross overuse of range resource and the cattle thus reared are poor and weak. The efficiency of draught animals and production from milch animals is low and the returns are generally poor. Nomadic graziers rear goats and sheep for their sustenance. They move with their herds to alpine ranges in summer and foot-hill ranges in winter.

Free grazing: For two fall months, (October and November) when the maize crop has been harvested and the preparations are being made to grow wheat (winter crop), the livestock is let loose and no herding is done. The animals roam about freely and try to devour any forage available to them.

Crop rotations: Wheat is the main crop; sown in October and harvested in spring (March to June), depending on the elevation range. Maize is grown during summer season, the corn is used as a substitute of wheat whereas the stalk is used to stall feed the livestock during winter. Shaftal and riskha (*Trifolium* spp.) are grown on separate fields. Shaftal is sown in May and harvested in February/March next year whereas riskha is perennial and is grown as a crop for 6-7 years in the same fields.

Stall feeding: Few range areas are protected in summer for haymaking. The agricultural waste (wheat and maize stalk) is also used for supplementing the cattle feed,

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1. Abdul Bari-1977. Veterinary disease investigation in Northern Areas, Department of Animal Husbandry, Northern Areas Gilgit. Pakistan Science Foundation. Project No. FSF/RES/35/74.
 2. Pakistan Census of Livestock-1976. Agricultural Census Organization, Government of Pakistan, Lahore.

specially in winter when the forage is limited. The milch animals in early calving periods and in winter are stall fed. Oil-cakes are fed to milch animals at a minimum scale. Stall feeding of all livestock is not practised and the 'dry' cattle are left to graze in winter months and a limited quantity of green forage is raised in agricultural fields.

Marketing: Only old and weak cattle are culled and sold at local fairs and animal markets. Work and milch animals fetch high prices and currently the market prices have risen substantially. Marketing is not efficient and the intermediary traders usually earn most of the profit. Low quality meat is provided to the consumers at a high price and the consumption of meat and animal proteins in the producers community is very low.

Forest Department control: Livestock graze on the ranges without any regulation. Forest Department have no effective control over livestock grazing in range and forest areas. Local inhabitants have grazing rights in all the grazing lands—at lower elevations during winter and at higher elevations (in nullahs) during summer. Only in Deosai plains the number of livestock visiting from outside the boundaries of Northern areas is registered and a nominal fee of Rs. 0.37 and Rs. 0.25 is charged for each goat and sheep head respectively. During 1978 summer total revenue was Rs. 4,000/- thus 13,000 livestock heads visiting Deosai plains covering about 130 km². This does not include the number of livestock belonging to the local inhabitants.

Problems in relation to grazing land utilization. Apart from physical factors viz., soil and climate, various problems in the utilization of grazing lands are as follows:

- (i) People like to keep large livestock herds of low quality animals rather than smaller herds of good quality breeds. Large livestock numbers are a matter of prestige and it is hard to convince the farmers to abandon the practice.
- (ii) The people own the grazing lands or they have rights in grazing areas. Ownership in most of the cases is communal. The Government have no control on grazing or proper utilization of the ranges. As rangelands are communally owned, the right holders as individuals are not interested in their development.
- (iii) Stock-men in general are poor with very low standard of living. They can hardly make their living and under the circumstances they cannot be persuaded to adopt better management techniques.
- (iv) The people are averse to new technologies. Acquisition of land for grazing management plans is resented. Land holdings, being too small, the local population is not ready to accept the idea of even leasing their land. They are also not prepared to forego their grazing rights. Under the circumstances grazing management plans are rendered useless.
- (v) Not trained personnel in range management are available to guide the stock men in their problems.

- (vi) Wherever possible, the marginal lands are converted into fields to grow crops, leading to wide—spread soil erosion.
- (vii) At high altitudes, the wood is scarce and during cold weather the inhabitants have even to uproot plants to keep warm.

Recommendations. Since the grazing lands are communally owned and people have unlimited rights even in Government owned grazing lands, improvement in the management of rangelands can only be through extension. The first target should be the improvement of animal health, and the increased off-take through more effective marketing which will increase returns to the livestock growers. With increased returns, it may be possible to convince the farmer and herder to reduce the number of animals and this may eventually improve the vegetative cover of the rangelands thus raising the plane of nutrition of the livestock. Needed is a group of dedicated and trained extension workers who would undertake this task.

APPENDIX

Temperature and Rainfall records* of 2 principal stations in Northern areas

Month	GILGIT			SKARDU		
	Temperature °C		Rainfall mm	Temperature °C		Rainfall mm
	Mean maximum	Mean minimum		Mean maximum	Mean minimum	
January	7.9	0.0	6.60	1.1	—8.9	22.35
February	11.7	2.8	6.60	3.3	—7.2	17.54
March	16.7	7.2	20.32	10.0	0.2	25.91
April	22.2	11.7	24.38	17.2	5.6	24.64
May	27.8	15.0	20.32	22.8	9.4	20.07
June	32.8	18.9	9.40	27.2	13.3	6.10
July	35.6	22.2	9.91	31.1	16.7	9.90
August	34.4	21.7	13.97	30.6	16.7	8.64
September	29.4	17.2	10.16	26.1	11.7	10.16
October	23.3	11.1	6.10	18.9	5.0	3.56
November	16.1	5.0	1.27	12.2	—1.7	1.52
December	10.0	1.1	2.79	5.0	—5.6	9.65
Annual	22.2	11.1	131.57	17.2	—4.4	160.02

*Average for 40 years.