

Chapter 8

Summary

Rangelands are generally uncultivated areas which are mostly used for wildlife habitat and livestock grazing. Most of the countries in the Hindu Kush-Himalayan region including Pakistan are over-populated with livestock. Shortage of fuelwood and livestock feeds are the major problems in the region. During the past 40 years, significant achievements have been made in Pakistan for the improvement of feed resources from rangelands in different ecological zones of the country. The current effort is aimed to review the progress and achievements of Rangeland Management in Pakistan. The findings could equally be utilized by other countries of the region with similar ecology.

Rangelands in Pakistan extend over 60 percent area of the country. Livestock grazing is done even on crop harvested lands also. The major range areas of Pakistan in different ecological zones are as under:

Range Area	Extent (m.ha).	Distribution
Alpine pastures	1.68	Northern mountains, altitude above 3500 m.
Trans-Himalayan grazinglands	3.50	Hindu Kush region.
Himalayan forest grazinglands	0.67	Western Himalayas.

Pothwar scrub ranges	1.68	Pothwar Plateau and Salt Range
Desert rangelands	7.97	Thal, Cholistan, D.G. Khan and Tharparkar deserts.
Kohistan ranges	2.38	Kirthar range of Sind and Baluchistan.
Central Baluchistan ranges	8.00	Quetta and Kalat Divisions.
Eastern Baluchistan ranges	5.00	Loralai, Zhob, Sibi Districts.
Western Baluchistan ranges	18.50	Chagai, Makran, Coastal belt
Sulaiman mountain ranges	1.50	Western mountains along Afghanistan border.

During the past 20 years, plant introduction in various range ecological zones got high priority leading to the selection of the following promising grasses and legumes:

Main grazing areas	Recommended Species
Alpine pastures	<i>Phleum alpanicum</i> , <i>Festuca arundinacea</i> , <i>Elymus junceus</i> , <i>Medicago falcata</i> <i>Trifolium pratense</i> .
Trans-Himalayan grazinglands	<i>Lolium multiflorum</i> , <i>Dactylis glomerata</i> , <i>Agropyron desertorum</i> <i>Chrysopogon</i> sp., <i>Astragalus</i> spp. <i>Medicago sativa</i> , <i>Potarium sanguiserba</i> .
Himalayan forest grazinglands	<i>Lolium multiflorum</i> , <i>Festuca arundinacea</i> , <i>Agropyron cristatum</i> , <i>A. desertorum</i> , <i>Chrysopogon aucheri</i> , <i>Dichanthium annulatum</i> , <i>Bothriochloa pertusa</i> , <i>Trifolium pratense</i> , <i>T. repens</i> , <i>Medicago sativa</i> .
Pothwar scrub ranges	<i>Cenchrus ciliaris</i> , <i>Panicum antidotale</i> , <i>Pennisetum purpureum</i> , <i>Chloris gayana</i> , <i>Chrysopogon aucheri</i> , <i>Dichanthium annulatum</i> , <i>Digitaria decumbens</i> ,

Macroptilium atropurpureum, *Vicia sativa*,
Medicago sativa, Annual medics.

Desert rangelands

Cenchrus ciliaris, *Lasiurus indicus*,
Pennisetum orientale, *Panicum antidotale*

Kohistan ranges

Cenchrus ciliaris, *Lasiurus indicus*,
Panicum antidotale, *Chrysopogon aucheri*

Central Baluchistan ranges

Agropyron desertorum, *A. elongatum*,
Festuca elatior, *Medicago sativa*, *Elymus*
junceus.

Sulaiman mountain ranges

Chrysopogon aucheri, *Panicum antidotale*,
Dichanthium annulatum.

Fodder trees and shrubs are an important source of livestock feed in many countries of the world. Due to special morphological characteristics, shrubs are better suited to the harsh environment of the desert. Therefore, the trend of replacing shrublands by grasses and cultivated crops needs to be discouraged. Shrubs play a vital role in maintaining ecological equilibrium viz., control of soil erosion, provision of habitat for wildlife, sand dune stabilization, etc. Some of the trees and shrubs are highly drought resistant and tolerant to salinity. Through planting of trees and shrubs, coupled with adapting latest dryland afforestation technology such as drip irrigation, pitcher irrigation, earthen tubes, etc., there is ample scope to make the desert bloom.

Field adaptation trials of indigenous and exotic trees and shrubs in different ecozones may be intensified. The following selected trees and shrubs need to be planted over large areas in these zones:

Main grazing areas	Recommended species
Alpine pastures	<i>Artemisia maritima</i> , <i>Haloxylon</i> spp., <i>Amorpha fruticosa</i> , <i>Indigofera gerardiana</i> .
Trans-Himalayan grazinglands	<i>Amorpha fruticosa</i> , <i>Indigofera gerardiana</i> , <i>Prunus padus</i> , <i>Fraxinus excelsior</i> , <i>Aesculus indica</i> , <i>Alnus nepalensis</i> , <i>Quercus dilatata</i> , <i>Hybrid poplar</i> , <i>Elaeagnus</i> spp.
Himalayan forest grazinglands	<i>Quercus incana</i> , <i>Grewia oppositifolia</i> , <i>Prunus</i> spp., <i>Robinia pseudoacacia</i> .
Pothwar scrub ranges	<i>Acacia modesta</i> , <i>A. cynophylla</i> , <i>Ceratonia siliqua</i> , <i>Leucaena leucocephala</i> , <i>Robinia pseudoacacia</i> , <i>Olea ferruginea</i> .

Desert rangelands	<i>Acacia nilotica</i> , <i>A. tortilis</i> , <i>Prosopis cineraria</i> , <i>Tecoma undulata</i> , <i>Zizyphus mauritiana</i> , <i>Calligonum polygonoides</i> .
Kohistan ranges	<i>Acacia nilotica</i> , <i>A. senegal</i> , <i>Leucaena leucocephala</i> , <i>Atriplex nummularia</i> , <i>A. polycarpa</i> , <i>spineless cactus</i> .
Central Baluchistan ranges	<i>Atriplex canescens</i> , <i>Caragana ambigua</i> , <i>Pistacia khinjuk</i> , <i>Fraxinus excelsior</i> , <i>Elaeagnus spp.</i> , <i>Artemisia maritima</i> .
Sulaiman mountain ranges	<i>Artemisia spp.</i> , <i>Haloxylon recurvum</i> , <i>Zizyphus nummularia</i> , <i>Acacia modesta</i> , <i>Olea ferruginea</i> .

Range reseeding had been the major component of development projects carried out in various parts of the country. Natural revegetation had been limited to high rainfall areas of northern Pakistan. Although protection of vegetation from grazing had significant effect on species composition, the process of plant recovery had been slow in desert rangelands. Artificial reseeding on the other hand, had been successful in aridlands of Thal, Kohistan, Pothwar and parts of Tharparkar. Mixed seeding of 'buffel' and 'gorkha' grasses before the onset of monsoon rainfall season proved exceptionally useful. Small scale testing of annual medics, vetches, oats and cowpeas widened the prospects of introduction of several new forage crops. The failure of range reseeding operations in the Cholistan desert points out limited scope of artificial reseeding in low and erratic rainfall areas.

There is an extreme shortage of drinking water in desert areas, for human and the livestock population. Rainfed ponds alone cannot meet the requirement of desert dwellers. The development of extra water reservoirs in the desert ranges may retrograde range trend. Development of communication systems, provision of watering points alone probably may not provide relief to the drought affected in Cholistan and Tharparkar unless concerted efforts are made to increase livestock feed resources. Several range areas in the country remain un-exploited for want of adequate water. Migratory routes of nomads in Baluchistan are dictated by the availability of water points. Therefore, provision of livestock water points at suitable distances may be given due consideration in the development of rangelands.

Northern mountains are valued for watersheds which drain into Tarbela and Mangla reservoirs. Being strongly sloping these mountains are highly erodible. Pothwar Plateau being highly fragile is subject to soil erosion. Soil and water conservation practices such as afforestation, reseeding of grasses, land preparation and construction of engineering structures (terracing, etc.) can significantly check soil erosion. Proper livestock grazing in these areas would substantially increase life span of the dams as well

as improve land productivity. In these areas proper use of the land according to the ecological principles needs due consideration. Adequate technology has been developed for an integrated land use development.

Rain harvesting and water spreading in the arid had been practised since times immemorial. Dry afforestation techniques tested in the Thal area provide a new horizon for the improvement of desert areas in Pakistan. Dryland planting techniques such as grass and plastic mulching, drip irrigation, watering through pitchers and sand filtration of saline water are worth testing on large arid tract. The successfully tested techniques of water spreading coupled with reseeding of grasses in Rakh Miran area indicate its wide application in the 'Rod-Kohi-System' of Sulaiman mountain ranges. The centuries old karez irrigation system in Baluchistan has worked well under very arid conditions. There is an enormous scope of exploiting solar and wind energies for mining underground water in the desert ranges of Sind and Baluchistan. However, there is a need for low cost technology.

Native and exotic shrubs have been identified which are highly drought tolerant and can be grown in saline water in the deserts of Thal, Cholistan, Tharparkar and Baluchistan. Mesquite regarded by foresters as a weed is highly desirable for sandy deserts and saline areas.

Some pioneering work has been done on stabilization of sand dunes in Baluchistan and Thal deserts. These biological techniques of sand dune fixation need to be expanded over large areas.

Due to over-use of the ranges, several undesirable plants have invaded range and cultivated lands. Controlled burning helps in the replacement of undesirable plants by the desirable ones and increasing the forage production as well. Potential of herbicides may be explored in various ecological zones.

Rangelands provide habitat for the conservation of wildlife and preservation of other natural resources. There is ample opportunity for the development of recreational facilities.

Comprehensive inventory and evaluation of the natural resources (grazinglands) need to be prepared to provide a framework for sound land use planning and resource management. The evaluation and utilization model of Lohi Bher Range provides a basis for such ventures. Working plans of major range areas may be prepared by using such technology.

Livestock are the major user of rangelands. About 70 percent of rural population is engaged in livestock production. Contribution of livestock to GNP is about nine percent. At present, the livestock population is about 93.54 million head. Total TDN requirement is about 43.8 million tonnes against the available TDN of about 34.4 million tonnes. Currently, there is shortage of about 21 percent of TDN and 35 percent of DP. Livestock population is increasing at a rate of about four percent. Therefore, concerted efforts are needed to fill the present feed gap and meet future requirements. Rangelands have the potential to produce at least double the current available yield.

Hay and silage preservation can ensure year-round supply of forage.

New innovations like urea molasses, etc., may help in meeting nutritional requirements of livestock. The performance of livestock particularly sheep, goat, cattle, camel, buffalo and yak on rangelands have not been studied. The technology from cultivated areas cannot be directly applied to range areas. Therefore, livestock production technology for rangelands may be developed so that commercial ranching can be popularized.

Very little is known about the traditional grazing patterns and practices of the pastoralists. Of special interest are the centuries-old nomadic, semi-nomadic, transhumant and sedentary systems of grazing being practised in various parts of the country. Detailed studies are needed to investigate their ecological as well as economic viabilities.

Categorizing over 60 percent area of the country as wastelands by planners is unrealistic and contrary to the fundamental philosophy that nothing has been created useless. Through consistent national range policy, with proper planning and organization and use of scientific knowledge of the resources, the so-called wastelands can be used for the betterment of human being. Ever increasing pressure of population demands formulation of a comprehensive master plan for the development of this vast natural resource. The basic steps needed in this direction are: formulation of a national policy, creation of Watershed and Arid Land Development Authority (WALDA) at federal level, development of technical manpower, preparation of technical rangeland management plans and their execution by the competent and motivated range professionals.

Coordination among various agencies such as Sind Arid Zone Development Agency (SAZDA), Cholistan Development Authority, etc. are needed for comprehensive planning and judicious use of the meagre technical as well as financial resources. Technical collaboration with international agencies may help in the development of range resources.

Range research, in Pakistan, has not been given due priority. Inadequate allocation of financial resources had always restricted initiation of a comprehensive range research programme. At present, most of the funding is provided by PARC through National Forage and Pasture Programme which had been too meagre to cover such a vast and variable natural resource. There is an immediate need for preparation of master plan for Range Research. National Forage and Pasture Programme may be strengthened to the level of National Research Institute with research stations in each major range ecological zone. Research activities may be oriented to develop package of technology for commercial ranching. Range improvement/development projects may include a research component.

There is an acute shortage of technical manpower in range management sector. Although several long and short term training facilities were provided by PARC in the recent past, the huge technical manpower requirements can be met only by offering in-country M.Sc. degree programme in range management at PFI, Peshawar, and UAF, Faisalabad. Range Management Departments at both these institutions need to be strengthened by providing more qualified staff, modern laboratory, field research facilities and adequate operational funds. The NARC, Islamabad

may offer **Ph.D.** research facilities in collaboration with the aforementioned institutions through extending advanced level laboratory and field research facilities. **Range** graduates from agriculture universities may be treated equivalent to **PFI** degree holders for range management jobs. The **NARC** may regularly hold post graduate diploma courses and short-term training for **in-service** professionals. The professionals may constitute a society duly **affiliated** with the International Society of Range Management. This may provide an intellectual forum for exchange of visits, technical materials, etc. The society may initiate publishing a scientific journal and a quarterly newsletter on the subject.

Participation of local pastoralists in the preparation and execution of range management plans has been felt at every forum. Grazier association experience in Thal may be tested in other areas. Village organization system applied in the Northern Areas by Aga Khan Rural Support Programme has produced useful methodology for involving local people in the development of grazinglands.