

## Range Management Strategy

### RANGE POLICY

The need for a national policy concerning the scientific management of rangelands has been recognized since independence in 1947. The CENTO range teams in 1964 and 1971 recommended the formulation of a national range policy. The Pakistan Range Management Conference held in 1966 recognized the importance of involving livestock producers in major decisions regarding range policy, and recommended the creation of grazing advisory committees (including the representatives of public) at provincial, divisional and district levels to outline range policy and programme and to implement these decisions, (PFI, 1966). The Working Group on Range Management (1970) also stressed the urgency of the developing rangeland management policies.

The National Range Management Committee (1973) outlined the following policy guidelines which should be implemented immediately.

- All rangelands will be developed/managed primarily for livestock production consistent with the concept of multiple land use.
- Indiscriminate and unscientific practice of shifting cultivation and breaking rangelands for agriculture has proved unrewarding and harmed the land by reducing their productivity to support livestock. Shifting cultivation should be stopped in arid/semi-arid zones and on steep slopes. Regulated, scientific methods should be adopted and fodder crops could be cultivated to support the maximum number of livestock compatible with correct land use to increase economic returns.

- Legislation is needed to support range management agencies and their programmes.
- To develop and manage vast rangeland resources, independent and effective organizations will be created at provincial as well as federal levels. These organizations will be exclusively responsible for planning, developing and implementing range management schemes.
- To ensure co-operation, support and participation, producers will be involved at all levels of project formulation and execution. Suitable technical as well as economic incentives will be provided to seek producers cooperation and encourage their participation in range management programmes.
- To optimize economic returns from rangelands, efforts will be made to ensure proper feeding, management, marketing and upgrading of livestock through selection and breeding. Preparation of livestock feeds from agro-industrial wastes and by-products will be encouraged. In order to eliminate or minimize overgrazing, surplus livestock off take facilities should be created to make maximum use of excess livestock. This would require streamlining of management, marketing, processing, packing and even export of livestock/livestock products. Feed lots will be organized.
- A balanced integration of rangelands, croplands and forestlands is imperative to ensure year-long optimum provision of forage and fodder to livestock.
- Scientific range management will improve the economic well being of stockmen. The range development programme will no longer be primarily concerned with the direct financial return to state.

The national range policy should include the recommendations of various committees. Management of rangelands must be phased over next 15 years. During the seventh five-year plan period, development of technical manpower, establishment of research facilities and creation of scientific awareness among the pastoralists may receive priority. Range management plans based on proper resource evaluation may also be prepared during this period. Range areas located in different ecological zones may be selected for demonstration projects concerning the scientific management of rangelands. Range research should be made an important component of each project. The eighth five-year plan may primarily focus on large scale adaptation of the practices demonstrated in pilot projects.

## **RANGE AGENCIES AND ORGANIZATIONS**

At present no independent agency deals with the management of rangelands in Pakistan. The public rangelands are under the control of the Provincial Forest Departments. In Punjab and Sind provinces, Conservator of Range Management positions have been created to look after range development projects. It has been difficult to attract and retain highly qualified range managers partly because range management is viewed as

being outside the mainstream of Forest Departments. The posts are more isolated, offer few amenities and personnel receive no extra compensation. In Baluchistan, a few range areas are under the control of Provincial Forest Department. Cholistan Development Authority in Punjab and Arid Zone Development Authority in Sind are also working in desert range areas. However, they have not yet initiated any project dealing with the management of rangelands. At the federal level, the Inspector General of Forests in the Ministry of Food, Agriculture and Cooperatives looks after the affairs of range management sector.

The need for an independent agency dealing with planning, development and management of rangelands in Pakistan has been emphasized time and again. The First Range Management Conference (1966) and Working Group for Range Management in 1970 recommended the creation of a separate rangeland agency. The National Range Management Committee in 1973 recommended a comprehensive organization structure for the federal government and the provinces. In 1983, a Subcommittee of Range Management outlined an institutional strategy for the development of range resources (Government of Pakistan, 1983); this involved creation of a post of Rangeland Development Commissioner under the Ministry of Food, Agriculture and Cooperatives.

Scientific management of livestock as well as the development of forage resources needs equal attention. Range management experience during the past 40 years indicates that foresters have successfully improved several rangelands by reseeding of grasses, planting trees and shrubs and developing water ponds. However, most of the projects where livestock were introduced had little tangible impact. On the other hand, range management projects run by livestock specialists concentrated on the veterinary aspects and paid little attention to ensure sustained forage production from rangelands. It is, therefore, imperative that range managers, who have been trained both in the management of range vegetation and livestock production, be assigned the responsibility of rangeland management. The need for the creation of a cadre of range professionals in Pakistan was emphasized by Johnston (1962). A prerequisite to the development of such a cadre is to ensure that working conditions and other amenities of range management positions are comparable to those enjoyed by individuals in related endeavours. At present, they are not. A transfer to a range management posting is viewed by most forest officers as a retrogressive step in their career. This attitude must be changed to attract adequate technical ability to rangeland problems. The payment of Unattractive Area Allowance for range management personnel may be an added incentive.

Those already trained in range management should be mobilized to work in the field. Unfortunately, few are interested in the discipline because of the reasons outlined above. Transfers at less frequent intervals or transfers limited to the range management field would greatly enhance the development of a group with a comprehensive knowledge of their discipline.

The National Commission on Agriculture (1988) has recommended

the creation of a Watershed and Aridland Development Authority (WALDA) under the Ministry of Food and Agriculture with the following functions:

- To evolve a long range policy for conserving the country's land, water and forest resources.
- To undertake or promote appropriate research activities in cooperation with the federal and provincial agencies in the field of watershed management, range development and development of arid areas.
- To coordinate and financially support, to the extent possible, the activities of all federal and provincial agencies dealing with the subjects entrusted to the Authority.

The proposed "Authority will perform a policy coordinating, funding and training role for the provincial agencies, which will be charged with the main responsibility for the execution of policies and programmes. The Authority should cover all the natural resources - water, land and forest - in the areas covered by its activities and can commence its operations with a nucleus organisation created by the merger of the present Watershed Management Wing of WAPDA and the office of the Inspector General of Forests in the Ministry of Agriculture. The main task of the new organisation will be to develop a resource development and management plan and to coordinate and support the work of existing organizations, such as the Federal Arid Zone Research Institute, the Pakistan Desertification Monitoring Project, the Cholistan Institute of Desert Studies, the Cholistan Development Authority and the Sind Arid Zone Development Authority, (SAZDA) and the Agency for Barani Area Development (ABAD) in the Punjab. Some of the organisations will have to be strengthened or new ones may be created to deal with tasks which are not now being addressed. Detailed plans for this purpose can be formulated after the master plans for watershed management, range development and the development of barani and arid areas have been prepared".

The current drought prevailing in the country is directly threatening the very existence and survival of human beings, livestock and wildlife in the deserts of Cholistan, Tharparkar and Kohistan. Therefore, recommendations of the Commission must be implemented immediately so this vast natural resource can be protected.

Given the limited technical manpower available in the range management sector, the Authority may help provincial agencies to prepare management plans of rangelands, organize short term training courses for provincial range managers and provide liaison with international agencies to keep abreast with the latest technology. For this purpose a Directorate of Rangeland Management with a core staff of the following professionals is needed in the Authority:

- i. Range Management Specialist
- ii. Range Improvement Specialist
- iii. Range Livestock Management Specialist

- iv. Range Sociologist cum Economist
- v. Range Evaluation cum Planning Specialist

The provincial agencies like SAZDA, Cholistan Development Authority etc. may recruit range management professionals to undertake range improvement/development projects.

### RANGE RESEARCH NEEDS

The scientific management of rangelands in Pakistan was initiated at the Maslakh Range Project in 1954. A Range Management Research Branch was created at the Pakistan Forest Institute (PFI), Peshawar, during 1964. Since then, Provincial Forest Departments have developed several range education, demonstration and research projects in various areas. A major advance was the establishment of a Directorate of Range Management and Forestry in the Pakistan Agricultural Research Council (PARC) in 1974. In 1975, PARC developed a National Forage and Fodder Research Programme to achieve the following objectives:

- i. To develop an integrated National Forage and Fodder Research Programme whereby each research institution would be a vital component of the system; National Agricultural Research Centre at Islamabad would be a nucleus institute of this programme.
- ii. To select and breed superior forage and fodder varieties.
- iii. To evaluate varieties, fertilizers and other agronomic practices to maximise the forage and fodder production per unit area of important forage crops.
- iv. To evaluate forage and fodder quality through biochemical analysis as well as feeding trials with livestock; and
- v. To introduce, test and select grasses, legumes, shrubs and important forage trees in various range ecological zones of Pakistan.

**Range Research Activities:** The organization of the forage and pasture research network in Pakistan is given in Figure 8.

Current research activities at different collaborating institutions/stations under the National Forage and Pasture Programme are listed in Table 41. Progress and plan of work of the cooperating units is reviewed periodically and priorities of research are determined according to the socio-economic needs and ecological conditions of the area.

Range research activities in Pakistan also involve germplasm evaluation, pasture evaluation trials, pasture management studies and economic evaluation (Figure 9).

**Range Research Thrusts:** So far, very little information is available for the scientific management of range resources. There is an urgent need for the development of a comprehensive National Range Research Plan, which can be prepared by appointing a range research group under the supervision of WALDA. All range development projects must have a strong research component. Research in various range ecological zones may be

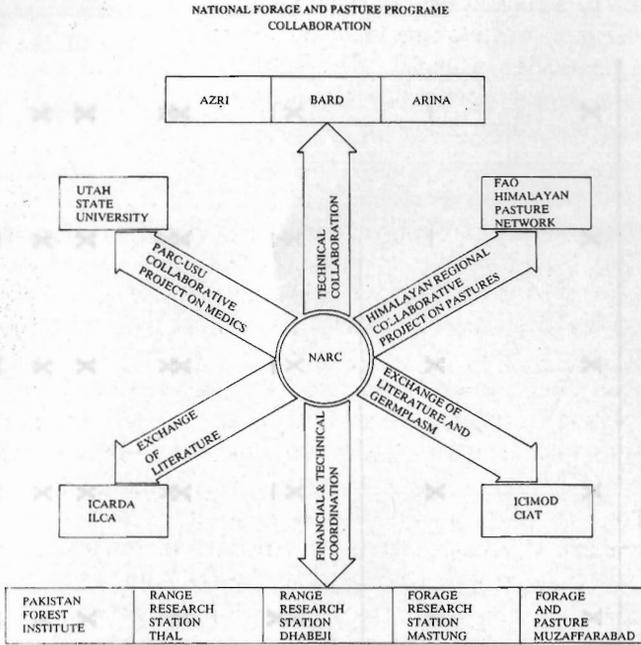


Figure 8. Forage and pasture research institutions network in Pakistan.

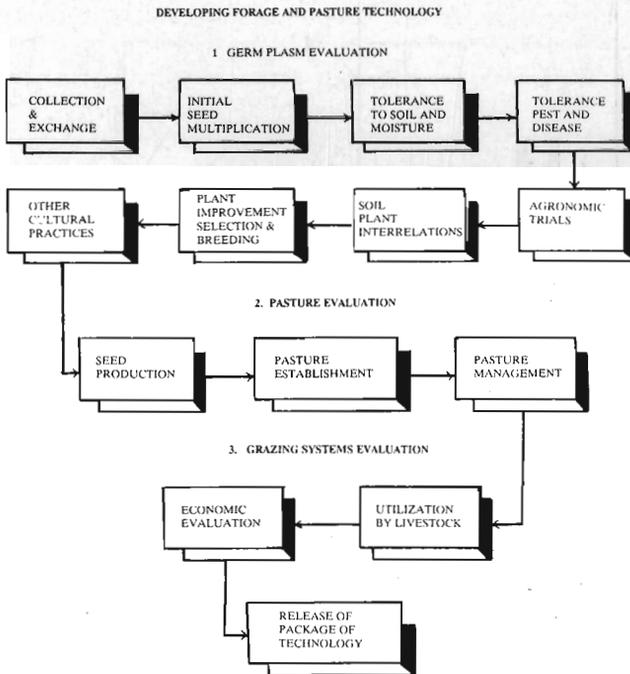


Figure 9. Range and pasture research methodology adapted in Pakistan.

Table 41. Research activities under way at different Range Research Stations/Institutions

Research activities	NARC	PFI	Thal	Dhabeji	Mastung	Muzaffar- abad
Collection and introduction of superior exotic and indigenous forage species/ecotypes and preliminary screening and selection under different ecological conditions.	X	X	X	X	X	X
Uniform agronomic trials on the improved varieties of <i>Cenchrus ciliaris</i> , <i>Panicum antidotale</i> , <i>Pennisetum purpureum</i> and <i>Chloris gayana</i> .	X	X	X	X	-	-
Ecophysiological studies on plant, soil and water relationship	X	X	-	-	-	-
Test adaptation trials of shrubs and trees for fodder, fuel and soil improvements.	X	X	X	X	X	X
Application of suitable improvement practices for pasture development.	X	X	X	X	X	X
Evaluation of nutritional value of forage grasses, legumes, shrubs and tree species/ecotypes.	X	X	X	X	X	X

(continued)

Table 41 continued

Establishment of ecological exclosures	-	X	X	X	X	X
Seeding of pasture lands to test, demonstrate and evaluate package of technology.	X	X	X	X	X	X
Establishment of pastures of selected grasses and legumes for simulated and/or animal grazing trials.	X	X	X	X	X	X
Seed multiplication of promising forages and their distribution	X	X	X	X	X	X

strengthened by adequate funding and provision of qualified range scientists and research facilities at various coordinating units of the National Forage and Pasture Programme.

Research must be initiated or strengthened in the following areas:

- i. Forage germplasm evaluation.
- ii. Range improvement studies such as reseeded, range fertilization, water harvesting and spreading.
- iii. Range resource inventory, evaluation and utilization modelling.
- iv. Range plant-soil-water relationships.
- v. Forage quality and range animal nutrition.
- vi. Development of supplemental feeds such as silage, urea molasses, etc.
- vii. Testing of grazing systems.
- viii. Selection of forages for winter feeding.
- ix. Selection of drought and salt tolerant plants.
- x. Economic evaluation of livestock ranching.
- xi. Determination of the social customs and patterns of range use and learning which approaches/incentives will facilitate social changes or adaptation of new practices.

**Research on Fodder Crops:** Research on fodder crops is being conducted at the following institutions:

- i. National Agricultural Research Centre (NARC), Islamabad.
- ii. Fodder Research Institute (FRI), Sargodha.
- iii. Livestock Production Research Institute (LPRI), Bahadurnagar, Okara.
- iv. University of Agriculture, Faisalabad (UAF).
- v. Agricultural Research Institute (ARI), Tandojam.
- vi. Agricultural Research Institute (ARI), Tarnab, Peshawar.
- vii. Agricultural Research Institute (ARI), Sarian, Quetta.

The research activities at the above institutions are given in Table 42

Some of the main constraints and problems in increasing fodder production are as follows:

- Paucity of technical manpower, specialized in fodder crops.
- Shortage of short-term training of in-service personnel.
- Lack of good quality seed of high yielding fodder varieties.
- Failure of private/public agencies to produce seed of fodder crops.
- Inadequate use of fertilizer in fodder crops by farmers.
- Lack of large-scale dissemination of improved fodder production technology.
- Lack of coordination/linkage with international institutions dealing with fodder crops.
- Lack of provincial institutions to deal with fodder research in various agro-ecological regions.
- Insufficient financial resources for fodder crop research.

**Research priorities:** The following areas of research are recommended

**Table 42. Fodder crops research activities under way at various agricultural institutions**

Research activities	NARC Islam- abad	UAE Faisal- abad	FRI Sargodha	ARI Tando- jam	ARI Sariab	ARI Tarnab
Collectin & introduction of superior exotic & indigenous fodder crop species/ varieties and their screening and selection	X	X	X	X	X	X
National uniform performance trials on sorghum, millet, cowpeas, berseem, lucerne, oats and barley varieties	X	X	X	X	X	X
Agronomic and other cultural practices for evaluation of high fodder yielding, multicut nutritious and disease and insect resistant varieties of different fodder crops	X	X	X	X	X	X
Bio-chemical analysis and digestibility trials	X	X	X	X	X	X
Breeding and hybridization of fodder crops to produce nutritive and high yielding varieties	X	X	X	X	X	X
Demonstration of improved fodder varieties on farmer's fields	X	X	X	X	X	X
Seed multiplication of selected, improved fodder crop varieties and their distribution	X	X	X	X	X	X

for increasing fodder production in cultivated lands:

- Breeding better varieties of fodder crops.
- Demonstration of improved production practices for fodder crops like berseem, lucerne, oats, sorghum, maize, millets, barley, cow-peas and guara.
- Development and multiplication of seed of improved varieties.
- Evaluation of the nutritive value of grasses, legumes, cereal, and other fodder species/varieties through biochemical analysis, feeding and digestion trials.
- Studies of crop rotation and intercropping to integrate livestock and crop production.
- Collection and introduction of germplasm of superior exotic and local fodder species/varieties and evaluation under different ecological conditions.
- Determination of the irrigation requirements for different fodder crops.
- Improved methods of preserving fodder.
- Development of fodder varieties suitable for saline and water-logged soils and drylands.

*Actionable Programmes:* The following programmes are suggested:

- Introduction trials at various Fodder Research Institutes.
- Uniform national yield trials to test and select varieties at various institutes under irrigated and barani conditions.
- Uniform national yield trials to test and select varieties at various institutes under irrigated and barani conditions.
- Plan outreach programmes for farm demonstrations.
- Crop rotation trials to determine how the fodder crops and varieties fit into the cropping patterns of different ecological zones.
- Plan studies on hay and silage making and preservation of fodder.
- Determine the water requirements of fodder crops.
- Evaluate the nutritive value of grasses, legumes, cereals and other fodder species/varieties through biochemical analysis.
- Implement a hybridization programme to produce a S.S. Hybrid and a B.N. Hybrid.
- Acquire and maintain parent lines of existing high yielding hybrid crops like 'Sadabahar'.
- Produce seed of improved and tested varieties of fodder crops at research institutions/stations and multiply this seed at Provincial Seed Corporations.
- Develop fodder varieties for saline, waterlogged and dry lands.
- Establishment of a national fodder research institute with sub-centres in every province.

## RANGE EDUCATION

There is an acute shortage of those with technical training in range management. In early 1960s, a few foresters received their degrees in range

management from the United States. During past 10 years, PARC sponsored five Ph.D and eight M.S. students and several short term courses in range management. More than 100 professionals enrolled in training courses organized by National Forage and Pasture Programme during 1982-87 at NARC. So far, there has been no concerted effort to training of pastoralists or livestock farmers.

**Graduate Course Work at PFI:** At present, range management is taught at PFI, Peshawar, and the University of Agriculture, Faisalabad. The Baluchistan Agriculture College, Quetta and Barani Agriculture College, Rawalpindi are introducing B.Sc. in Range Management Programmes. At PFI, only one graduate course in range management is offered as a part of M.Sc. Forestry Programme. The course contents are as follows:

i. *Introduction:* Definition of rangeland and range management, importance of range management as a science, its contribution to the national economy, components of land resource (i.e., water, soil, forage, timber, wildlife, people and aesthetic values and their relationship with forage production), integrated management of land resources as contributed by watershed management, forest management, wildlife management and range management and benefits of an integrated approach.

ii. *Development of range management:* Grazing as a natural result of interaction between man and game, development of pattern of use in nomadic life, semi-nomadic and sedentary life (agriculture and industrialization), brief development history of range management in the United States, South America, Australia, Europe, Asia, Africa and Pakistan.

iii. The range resources of Pakistan.

iv. *Basic principles of range management:* Plant morphology and range management, classification of plants into grasses and grass-like, forbs, shrubs and trees; comparison, morphology, importance of plant morphology in range management and morphological responses of plants to grazing and browsing.

v. *Plant physiology and range management:* Physiological activities of plants as affected by range management, absorption of minerals and water, translocation modes, photosynthesis, metabolism, storage of food material and growth, range management and ecology, principles of plant succession and development of rangelands, conception of climax vegetation and seral stages and stabilization of seral stages.

*The principles of plant competition and the stability of rangelands:* Interaction between environmental factors and organism, effect of grazing on selection and stability of plant species, removal of plant tissue, mechanical decrease in canopy coverage, diminution of litter cover and its effects, compaction of soil, autecological condition, phenology and range management, responses to environmental factors i.e. climatic, edaphic and biotic.

- vi. *Concepts in range management*: The animal unit (A.U.M.), carrying capacity, utilization in relation to carrying capacity, intensity and frequency of use, preference value, productivity, key species, key area; indicator species and range readiness.
- vii. Range suitability classification.
- viii. Grazing systems.
- ix. *Range management techniques*: Range sampling methods, range analysis, range condition and trends, range mapping, determination of utilization, water development, salting, fencing and herding.
- x. *Range improvement*: Protection, rehabilitation by natural and artificial means, control of water and prevention of erosion.
- xi. *Range nutrition*: Seasonal fluctuation in the nutritional status of plant tissues, effect of season and intensity of use on the nutritional status of plant tissue, relationship between range condition and range livestock production, requirements for supplemental feed, maintenance ration and production rations for breeding and lactating animals, poisonous and undesirable plants on rangelands and their control.
- xii. *Range policy*: National policy with regard to ownership.
- xiii. *Range livestock husbandry*: Kinds of range livestock, important breeds of sheep, goats, and cattle, importance of foraging habits of range livestock animals (goats, cows and camels), preference for forage, methods of taking forage, grazing patterns, response to terrain, daily requirements for food and water, range management and livestock production.

The education offered is probably too short to produce qualified range managers who can run the range project independently. The need for a full-fledged M.Sc. degree programme in range management at PFI was stressed by Goodwin (1966). ABAD (1987) stated that curricula in PFI cannot meet the academic needs of range management. Without trained personnel, the range management programmes cannot operate effectively. It is also very difficult to attract students into range management when the career possibilities are minimal. Development of special courses for a M.Sc. in Forestry with specialization in Range Management is underway at PFI. On the request of the Director of Forest Education, PFI, the author developed the following four special courses in range management.

- i. Range resources of Pakistan.
- ii. Range development and improvements.
- iii. Range livestock production.
- iv. Range evaluation and utilization modelling.

**M.Sc. Course Work at UAF:** The University of Agriculture, Faisalabad, is the only institution which awards a multi-disciplinary M.Sc. degree in forestry, range management and wildlife. However, provincial forest departments do not recognize graduates from this institution equivalent to those who earn a M.Sc. degree in forestry from PFI, even for

range management jobs.

The following courses are taught for B.Sc. degree in forestry, range management and wildlife (UAF, 1982).

- Farm forestry.
- Range management for animal husbandry.
- Introductory range and watershed management.
- Principles of range management.
- Rangelands of Pakistan.
- Principles of forestry.
- Forestlands of Pakistan.
- Principles of watershed management.
- Watersheds of Pakistan.
- Principles of wildlife management.
- Wildlife management in Pakistan.
- Range physiology and ecology.
- Climate and vegetation.
- Range forage.
- Range field problems.
- Range improvement and utilization.
- Range management planning.
- Range research methods.

The contents of the advanced courses in range management taught for a M.Sc. degree in forestry, range management and wildlife at the University of Agriculture, Faisalabad are outlined below:

*Range Improvement:* Importance of range improvement, detailed discussion of various range operations pertaining to range vegetation as well as range livestock such as artificial reseeding, water spreading, fertilization, controlled burning, water development, soil conservation, development of alternative feeds, range livestock improvement, introduction of exotic plant species and development of communication, and other facilities etc.

*Range physiology:* Generalized life-cycle of a range plant and review of major physiological processes with reference to grazing. Study of root system and shoot system, i.e., stem foliage and seed (production, viability, dispersal, germination, etc.). Root-shoot ratio, foliage-stem ratio, shoot-seed ratio and leaf area index.

*Range ecology:* Influence of climatic, biotic, edaphic and pyric factors on range flora and fauna; range population, their growth, dispersal, survival and competition; range communities, their structure, development or retrogression; range ecosystem, its analysis, stability and productivity; application of ecological concepts for various range problems.

*Advanced range management:* Range ecosystem, multiple land use, site classification, range condition and trend, range utilization, intensive range feed lots, fattening yards, prospects of private ranching.

Visit to livestock farms: Field practices in site and vegetation surveys and forage sampling.

*Advances in range forage:* Forages in a changing world, grassland

agriculture, botany of grasses and legumes, legume and grass seed production, evaluation of forage production, establishment of new seedlings, mixed cropping and weed control, soil fertility and fertilization of forages, role of nitrogen in forage production, physiological considerations in forage management, dehydration of forage crops; grass legumes silage and high energy silage, range pastures and their improvement, forage animal stresses, forage testing and its applications, utilization of forages by range livestock, forage land use efficiencies with commercial cattle, sheep/goat efficient users of forage tropical and sub tropical forages.

Identification of major forage species in Pakistan, collection and mounting of forage species, study growth behaviour of at least two important forage species, visit to various fodder research stations.

*Range and forest inventory:* Range and forest inventory, planning principles, inventory sampling design, range vegetation survey and mapping, quantity relationship, estimating grazing capacity, range condition, classification and trend, personnel and training, logistic support, field measurement procedures, calculation and compilation, field sampling, identification and measurement of vegetation, practice in map reading, interpreting aerial photographs, recognition of physical features, types of vegetation and their boundaries, preparation of range management map and or forest stock map.

The Department of Forestry, Range Management and Wildlife at University of Agriculture needs to be strengthened. For this purpose, the following steps may be taken immediately:-

- Instead of awarding a multi-disciplinary degree, the University should concentrate on range management programme. PFI is better equipped to offer a M.Sc. degree in forestry. However, Pakistan Forest College may be affiliated with NWFP Agricultural University.
- The University may recruit highly qualified staff by providing better incentives and research facilities for career development.
- The Department needs a range research station at Thal for field studies and thesis research.
- The graduate students should be allowed to do research work at NARC where better research facilities and competent range scientists are available.
- The M.Sc. degree in range management offered by the University of Agriculture should be recognized by Provincial Forest Departments that offer jobs in Range Management Projects.

A comprehensive education plan for range management must be prepared for short as well as long-term training. In-service training courses may be regularly organized by PARC. Field training for pastoralists may be offered by provincial agencies on a relatively large scale. The programmes of PFI and the University of Agriculture should be strengthened by offering incentives to attract highly qualified personnel in range management.