

CHAPTER 12

NATURAL RESOURCE MANAGEMENT

12.1 Current Initiatives

During the last three decades, several initiatives have been launched to improve the management of natural resources in the North West Frontier Province: massive forest tree planting, mostly on privately owned mountain land; improvement of rainfed agriculture; an increase in the efficiency of irrigated agriculture; improvement in the marketing of fruits and vegetables; and reorganization of the Livestock and Dairy Development (L&DD) Department to enlarge its focus to include livestock production and genetic improvement in addition to animal health.

Large-scale forest tree planting on privately owned mountain land, with the cooperation of the owners, has been in progress since 1972, supported by the World Food Programme. The German-assisted Kaghan Intensive Forest Management Project developed administrative and technical methods for the sustainable management of high-elevation temperate coniferous forests. This work is still continuing, using local financial resources. The

Swiss-assisted Kalam Integrated Development Project, which started in 1981, developed the current model for the sustainable management of mountain land, with the participation of community and interest-based organizations and directed principally to improving the quality of life of the mountain farmer. The Dutch-assisted Malakand-Dir Social Forestry Project emphasizes the participation of communities in the sustainable development of forest and grazing lands. It is the only project that has also taken on the challenge of attempting to develop sustainable management systems for grazing lands.

The German-assisted Siran Forest Development Project seeks to combine the intensive forest management approach developed in Kaghan with the social forestry approach. Started in 1991, its principal challenge is to develop sustainable joint management systems for the beleaguered forests of Siran Valley. The European Union-assisted uplands rehabilitation projects soon to start in the Galiat, Dir-Kohistan, and Murree-Kahuta have been largely designed based on the experience of the Kalam Integrated Development Project. They emphasize the sustainability aspect of integrated management of natural resources, including maximum participation of local communities, beginning with the planning stage. The full involvement of the concerned Government departments is also important.

The Sarhad Rural Support Corporation (a non-governmental organization, NGO) primarily works towards organizing local communities for their development. Sustainable development of agriculture, live-stock, and forestry are important components of the programme. At present, however, the work is confined to the Char sadda, Kohat, Karak, and Mansehra areas.

Several innovative donor-assisted projects are being implemented for the sustainable development of agriculture: the agricultural component of the Chashma Right Bank Canal Project, supported by the Asian Development Bank (ADB), seeks to upgrade the competence of the local agricultural extension staff to disseminate better agricultural practices among farmers and to improve the supply of farm inputs.

Innovative methods for growing and marketing agricultural crops, with the participation of local people, is the focus of the agricultural component of Swiss-assisted Kalam Project.

The agricultural development programme of the Dutch-assisted PATA Irrigation Project is increasing agricultural incomes through the development and dissemination of improved technologies for agricultural production in the Provincially Administered Tribal Areas. And the Pak-Swiss Swabi Irrigated Agriculture Project is attempting to develop sustainable intensive farming systems.

Sustainable development of irrigation is the objective of three donor-assisted projects: the ADB-assisted on-farm water management (OFWM) component of the Chashma Right Bank Canal Project, the Japan-assisted OFWM Project III, and the World Bank-assisted OFWM Project III. They include water course improvement, precision land levelling of agricultural fields, improvement of water technology and land use, and construction of water tanks for storing water in water-deficit areas. All the above are carried out with the participation of local communities, organized as water user associations.

Four more donor-assisted projects are trying to improve the sustainability of fruit and vegetable growing: a new fruit and vegetable market has been constructed 14 kilometres from the existing one in Peshawar under an ADB-assisted pilot project aimed at improving the marketing of fruits and vegetables; a Dutch-assisted project seeks to strengthen the training of women in fruit and vegetable production and preservation, improving human nutrition and increasing employment opportunities for women; a Swiss-assisted project, the Malakand Fruit and Vegetable Project III, is an institution-building and research and development project aimed at the sustainable development of horticulture in Malakand Division; and the Swiss-assisted Potato Development Project aims at the improvement of the economic conditions of the local farmers through streamlining the marketing of potatoes.

Finally, the World Bank Agricultural Research Project seeks to upgrade the capabilities of the agricultural research system through education and training, improved linkages between research and extension, and support to high-priority research initiatives.

12.2 Forestry

The sustainable use of forests in the NWFP is of vital national as well as provincial interest for environmental as well as economic reasons. Although massive programmes of afforestation have been launched in the moist mountain tracts during the past two decades, adequate attention has not been paid to the depletion of natural forests, which appears to have considerably accelerated since the late 1970s. Moreover, insufficient attention has been paid to the rehabilitation of the natural vegetation of the southern parts of the NWFP, which is being overused to meet local needs for domestic fuel and grazing.

The SPCS forestry sector strategy available as a separate background study reviews the forestry situation in the NWFP and proposes a comprehensive programme of activities for achieving several objectives that would lead to the sustainable development of forests. It stresses rehabilitation of the environment and

improvement of the socio-economic conditions of mountain farmers. These objectives, and the activities needed to achieve them, are summarized in this section.

12.2.1 Eliminating Political Interference in the Functioning of the Department of Forests, Fisheries & Wildlife

Over the past three decades, the mandate of the Department of Forests, Fisheries and Wild life (DFFW) has been expanded from forest protection alone to the sustainable and integrated development of renewable natural resources. All participants in the SPCS workshops, particularly the forest owners, rights-holders, and users, were unanimous in attributing forest depletion mainly to political interference in the functioning of the Department of Forests, Fisheries and Wildlife. Eliminating political interference must, therefore, be a high priority to attain the sustainable development of forests in the NWFP.

The goal could be attained by adopting arrangements to insulate the organization against political pressure from amongst the various alternatives proposed by the forthcoming management review of the Department.

One possible mechanism would be the creation of a high-powered, non-political Forestry Commission consisting of persons of outstanding integrity and knowledge of forestry issues, to continuously monitor the forestry situation in the NWFP and to take effective remedial measures against any threat to its forests.

An additional mechanism would be to promote the joint management of all categories of forests. It would be good to remember that the Government is sole owner of only 7% of the forest area, known as Reserved Forests. Local people own 53% of the forest, classified as Guzara Forests, and they also get 60-80% of the sale proceeds from Protected Forests, which account for the remaining 40% of the forests. Thus any illicit removal of timber from Guzara Forests and Protected Forests together constituting 93% of the forest area of the NWFP is at the cost of the owners and rights-holders. Securing the collaboration of these stakeholders in the sustainable management of forests can be an effective way to counter the vested interests in the exploitation of forests .

12.2.2 Reorganizing the Department of Forests, Fisheries & Wildlife

A few decades ago, the Department was primarily managing Reserved Forests that were clearly demarcated by masonry pillars and accurately mapped, with the minor rights allowed to the local people clearly stated in the record of rights. But with the Government takeover of the forests of Dir, Swat, and Chitral from the Mirs and with the new programmes of tree planting on communal lands, the Reserved Forests now account for only 7% of the forests under departmental control.

Currently, the Department undertakes timber harvesting, tree planting on communal land, distribution of tree seedlings for planting on private land, improvement of grazing lands, protection of wildlife, management of fisheries, promotion of sericulture, and even the improvement of mountain agriculture. Hence, not only has its work increased in size and scope, but the role of the Department has also

changed substantially.

An interesting feature of this transition from a small organization concerned almost solely with the protection of Reserved Forests to a large Department, with varied functions, is a sense of piecemeal additions to the basic structure of the Department, inherited from the turn of the century. At no point during this transition has any significant attempt been made to review the structure and function of the Department, to make it an effective and efficient instrument for the attainment of its original mission. A management review of the Department will therefore be undertaken with a view to reorganizing its structure to enable it to be more effective and efficient.

12.2.3 Enhancing the Quality & Implementation of Forest Management Plans

Forest management plans are medium-term plans, prescribing the details of management to be used in each major forest area. The DFFW has made considerable improvements in the format and techniques of data collection for the preparation of these management plans over the past decade. And possibilities for making further improvements are being explored by the recently constituted Forest Management Centre (FMC). Since the quality of management plans, the rigour of their implementation, and the proper use of their prescriptions are the major determinants of sustainable forestry, the following activities should be implemented to improve these plans further:

- ?? the DFFW would lend full support to the FMC by adequately staffing it with high quality staff and monitoring its performance and achievements;
- ?? the DFFW will, with the Centre's help, revise the Code of Working Plan Procedures, train management plan personnel, exercise quality control during the preparation of management plans, and monitor implementation;
- ?? the DFFW will attempt to amend the service rules assigning management plan duties to Grade 16, 17 and 18 officers;
- ?? the DFFW will explore ways of securing the effective participation of forest owners, rights-holders, and users of various forest resources during the preparation and implementation of the management plans;
- ?? the DFFW will use all available means to secure adequate funds for implementing the prescriptions of the management plans, and would not start implementing any plan unless adequate funds for carrying out the whole plan have been assured; and
- ?? the DFFW will ensure that future forest management plans prescribe the sustainable development of all forest resources, not just timber.

All these activities should be given equal weight, and their order here does not imply their priority. They must all be enforced to obtain a full synergistic impact on sustainable development.

12.2.4 Improving Forest Laws & Their Enforcement

The Forests Act, 1927 and the NWFP Hazara Forest Act, 1936 are similar laws developed in the nineteenth century. They are mainly punitive, but the penalties provided are the same as 100 years ago, completely disregarding the large increases in timber prices. Nor do they adequately provide for proper management of natural resources. Moreover, the laws are not enforced properly due to lack of vigorous prosecution and general indifference to forest offences. The following measures should be adopted to achieve the objective of improving forest laws and their enforcement:

- ?? the Government of NWFP and NGOs will launch effective communication and education programmes aimed at raising people' s consciousness and that of special audiences such as the magistracy, judiciary, decision makers, and politicians about the consequences of forest depletion;
- ?? the DFFW will improve the system of detection and prosecution of forest offences;
- ?? the DFFW will enlist the support of local communities in the prevention and detection of forest offences through joint management programmes, with appropriate incentives;
- ?? NGOs will encourage wide publicity of instances of flagrant violation of forest laws by powerful elements; and
- ?? the DFFW will participate fully in the task of revising forest laws, and the law will provide for stringent penalties to forest offenders and a legal framework for joint management of forests.

12.2.5 Improving Forest Education

The current system of forest education produces authoritarian foresters knowledgeable only in the physical and biological aspects of the environment, with little exposure to the social sciences. Since people living in and around forests predominantly determine whether development is sustainable, forest education must add human needs to the present focus on rocks, soils, insects, and plants. Moreover, integrity, commitment, and attitudes are immensely more important for sustainable development of forests than academic brilliance. Forest education must therefore strive to inculcate these values rather than simply emphasizing technical learning. The following measures should be initiated to start this transition:

- ?? ensure the posting of committed, knowledgeable, and dynamic persons of high integrity as teachers of forestry;
- ?? revise forestry curricula to include social sciences alongside the physical and biological aspects, as well as work with rural communities;

- ?? make pre-service education a prerequisite for the recruitment of foresters and forest guards;
- ?? create opportunities for continuous professional and management training of DFFW personnel;
- ?? actively seek and create opportunities for advanced education abroad, as incentives for out-standing performance; and
- ?? ensure that persons trained abroad serve for at least five years in the DFFW in the fields of their specialization after their return.

12.2.6 Settling the Rights of Local People in Protected Forests

Forty percent of the forests, categorized as Protected Forests, have neither been demarcated nor had the rights of local people settled through the judicial process. This renders them highly vulnerable to encroachment for agriculture, in addition to creating disputes among the rights-holders. The rights-holders unanimously oppose a judicial process of demarcation and settlement of rights in Protected Forests for fear of jeopardizing their claims of ownership over them. An innovative approach is needed to break this stalemate. The Government will constitute a high-level committee to investigate this problem, and negotiate with local communities the terms for the demarcation and settlement of rights in these forests.

12.2.7 Alleviating the Poverty of Mountain People

The poverty of people living in and near forests is the principal cause of forest depletion. If economic conditions are improved, there will be less need for people to unsustainably cut the forests on which they subsist. Two approaches will be used to attain this objective:

- ?? participatory integrated development programmes will be prepared, processed, and implemented for all the moist mountains of the NWFP, to increase employment opportunities and income for local people; and
- ?? the DFFW will intensify its efforts in human resource development in all current projects and future programmes. It will also participate actively in any activities of the Social Action Programme being implemented in its jurisdictions.

Although considerable wealth is generated in the NWFP from timber produced in the Hazara and Malakand Divisions, little of this is passed on to the mountain people. They can, at best, hope for casual employment as unskilled labour at low wages. To provide gainful employment to the local people, the Forest Development Corporation will develop more appropriate and cost - effective infrastructure for improved timber harvesting in the commercial forests. This will emphasize the optimum use of trained forest workers operating as entrepreneurs in small groups, as successfully demonstrated in the Kalam Integrated Development Project and the Kaghan Intensive Forest Management Project.

Large amounts of money are disbursed to the owners of Guzara Forests and the holders of harvesting rights in Protected Forests as their share of sale proceeds of timber. The owners and rights-holders consider the system of disbursement to be slow, complicated, and full of leaks. The DFFW must reform the system. This needs strong support and commitment at the highest levels in Government because of the

strong vested interests in the region.

In addition to ensuring prompt payment to owners, the DFFW will also endeavor to find ways of promoting savings and investment for community development by encouraging the activities of appropriate credit institutions.

Women and children in the mountains generally collect and sell mushrooms as well as several medicinal plants to earn occasional cash income. To raise the income of the poorest and increase employment opportunities in the mountains, the DFFW will initiate studies on improving the harvesting, processing, marketing and propagation of suitable non-wood forest products.

12.2.8 Reducing the Excessive Removal of Timber

In addition to regeneration, sustainable forestry also requires that the quantity of timber removed from a forest not exceed the net annual growth (the annual growth minus natural mortality and illicit removals). The number and volume of the trees and their net annual growth must be carefully calculated in the forest management plans for each forest area, and net annual growth prescribed as the maximum quantity of timber that can be removed from the forest. In theory, all this is fine; in practice, the limit has been frequently circumvented for various reasons:

- ?? political pressure;
- ?? collusion of DFFW functionaries for political patronage, career advancement, or financial gain;
- ?? illicit felling by local people to meet their needs of timber from the forests, as they would otherwise have to buy it from major timber markets at the ruling market rates;
- ?? lengthy procedures for the disbursement of the people's share in the sale proceeds of timber, forcing them to sell their shares in advance to forest contractors who then become part owners of the timber and thus have an incentive for illicit fellings; and
- ?? illicit felling by timber thieves because of high timber prices and the weakness of forest laws and their enforcement.

To ease illicit felling to meet local needs, the DFFW must realistically estimate the sustainable yield during the preparation of management plans for the forests, and initiate suitable arrangements to satisfy essential local needs. Since very high prices of timber are also a major cause of the most recent increases in illicit fellings, the Government of NWFP should also convince the Government of Pakistan to abolish all duties and taxes on the import of construction-grade timber.

12.2.9 Decreasing the Use of Forest Trees as Fuel

People residing in the mountains almost all depend entirely on firewood for heating in the winter and for cooking year-round. Where forests are surrounded by large and

rapidly growing populations, in Siran Valley for example, annual fuel wood needs can be several times greater than the yearly growth of forests. Since energy is an essential need for human life, especially in the mountains, no amount of coercive forest control can prevent the use of forests unless the supply of firewood is increased and vigorous efforts are made to provide alternative sources of energy. The Department should therefore:

- ?? approach the Government of Pakistan to extend natural gas to more towns and large villages in the mountains;
- ?? approach the Government of NWFP to accelerate the pace of hydel development;
- ?? launch more agro-forestry programmes in suitable areas, emphasizing the planting of multi-purpose forest trees;
- ?? emphasize the planting of such trees in all programmes of tree planting on privately and communally owned land, ensuring their adequate supply in all forest nurseries; and
- ?? initiate carefully supervised tree pruning in order to supply fuel wood to local people, in cooperation with the leadership of the community.

12.2.10 Ensuring Prompt & Adequate Regeneration

Prompt and adequate regeneration is essential for sustainable forestry. A major cause of forest depletion has been lack of adequate attention to regeneration in forestry practices in the NWFP. When trees are felled without ensuring their replacement, depletion is the inevitable consequence. The establishment of prompt and adequate regeneration requires:

- ?? the participation of local communities—especially the graziers in the protection from grazing and fires, areas to be regenerated (in Protected and Guzara Forests, before harvesting, written agreements will be obtained from the concerned communities and individual owners guaranteeing the protection of the areas under regeneration);
- ?? provision of adequate funds for the regeneration of harvested areas;
- ?? switching to methods of regeneration appropriate to each specific situation, instead of depending on natural regeneration; and
- ?? monitoring by the new FMC, which at present confines itself to the preparation of forest management plans for individual forests.

12.2.11 Controlling Grazing in Forests

Uncontrolled forest grazing is the principal cause of failure of forest regeneration. It is also the dominant factor in the loss of natural biodiversity. The DFFW should undertake the following measures to initiate controlled grazing in forests at lower intensities:

- ?? scale up programmes of participatory integrated natural resource development and actively participate in the area development programmes of other agencies;
- ?? strongly emphasize controlled grazing, increasing fodder supplies, livestock disease prevention and genetic improvement, and culling and marketing of less productive farm animals to ensure the adequate nutrition of fewer, healthier, and potentially more productive livestock;
- ?? start programmes of managing suitable forest areas for enhanced production of fodder, particularly those close to areas to be protected for biodiversity or watershed values; and
- ?? initiate appropriate, practicable, and flexible systems of rotational grazing in forest areas.

12.2.12 Rehabilitating Natural Vegetation in the Southern Districts

According to Stebbing (1921), "the valley of the Indus had been famous for its timber from the days of Alexander down to the year 1841. Forests of *Dalbergia sissoo* (shisham) existed on either side of the river and on numerous islands from Torbela [Tarbela] to Attock but these were felled during the rule of the Sikhs, and the remaining trees adorning its banks had been swept away by the terrible flood of 1841."

As late as the 1860s, Dr. H. Cleghorn's report to the Government of India mentions the Kachi forest near Bannu, on the left bank of the Indus, and a shisham and olive forest about 15 kilometres from Kohat as "the only sources from whence any great supply of *sissoo* can be obtained in the Punjab [these areas were then a part of the Punjab]. And there are few trees in India which so much deserve attention as the *sissoo*. Considering its rapid growth, durability of the timber and its usefulness for many purposes, the wood is universally employed when procurable, both by Europeans and natives where strength is required. Great efforts have been made to introduce this tree, and where there is depth of soil as in the Kachi Forest, it grows to large sizes."

Though several foresters since Cleghorn continued to impress upon the Government of India the need for forest rehabilitation in these areas today's southern districts of Kohat, Karak, Bannu, Lakki, D.I. Khan and Tank during the British era, little headway was made, according to Stebbing (1962), due to "political difficulties in the way of the forward forest policy, even in the administered and protected portions of the North-West Frontier Province." Moreover, the emphasis during this period was only on the 'conservation' of existing forests rather than on the much more expensive forest rehabilitation, a situation that was made worse by the worldwide economic depression after 1931.

Significant forest rehabilitation work started in the southern districts in the late 1980s. From 1986 to 1994, forest trees were planted over 14,000 hectares of land by farmers in the Kohat, Bannu, D.I. Khan, Peshawar, and Mardan Forest Divisions under the Forestry Planning and Development Project sponsored by the U.S. Agency for International Development. In addition, about 3,800 hectares of forests and 1,300 kilometres of roadsides and canal banks were planted in the southern districts from 1987 to 1995 with funds from the Annual Development Programmes. Under the World Bank-sponsored Income Generating Project for the Afghan Refugees, about

2,000 hectares were planted in Kohat and Karak Districts and about 230 kilometres of strips were planted along canals in D.I. Khan District. An ADB-assisted participatory integrated development project that includes Lakki District is presently under way.

As admirable as this start is for the Government of NWFP, the participating farmers, and the DFFW, it falls far short of rehabilitating the natural vegetation of the southern districts and of providing sustainable supplies of firewood. The following initiatives will be taken to increase the scope of the work being done and make it sustainable:

- ?? a phased participatory integrated renewable resources development programme will be prepared, processed, and implemented, with the first phase covering a tehsil (administrative unit) in each southern district, where prospects for farmer participation and conditions for plant growth are most conducive;
- ?? the local forest staff will implement a participatory integrated development programme using the forestry development fund; and
- ?? a survey will be carried out to assess the feasibility of re-introducing shisham along the banks of the Indus, using the participatory approach. If the results of the survey are favorable, a programme will be launched for this purpose, using seed collected from shisham trees of the best stem form and timber quality, and grown on the lands of the progressive farmers of the NWFP.

12.2.13 Reducing Cultivation on Mountain Slopes

Cultivating steep mountain slopes without adopting protective measures leads to accelerated soil erosion. The continuation of these practices is evidence of increasing human pressure on mountain land. Soil erosion will be reduced by the extensive application of the measures given in this strategy for the alleviation of poverty of the mountain people.

12.3 Grazing Lands

Grazing is the most widespread use of land in the NWFP, practiced wherever natural vegetation can grow. Grazing lands are estimated to cover about 2 million hectares and, together with cropped land grazing, they provide all the sustenance for the province's 6.4 million goats and sheep and for about 80% of its 4.6 million cattle and buffaloes (Government of NWFP, 1995). Heavy uncontrolled grazing has reduced natural vegetation, which can recover only during brief spells in spring and the monsoons. The depleted grazing lands provide less feed of lower quality than what they could under better management. Moreover, an adequate cover of natural vegetation is also essential for the maintenance of biodiversity, the protection of watersheds, and the prevention of soil erosion.

Improvement of grazing land management is an extremely difficult task. About 80% of the livestock are owned by over a million farm households, and the remainder are owned by the landless. Both these groups maintain livestock for subsistence and cash income. The prices of livestock and their products are generally kept depressed by Government in the interest of urban consumers. Export of livestock is discouraged through export quotas, which also reduces prices.

Since grazing land management is a multi-disciplinary field and Government departments are mostly unidisciplinary, no department has seriously undertaken the responsibility for this onerous task. The DFFW has several Ph.D.s in this subject on

its staff; grazing land management is included in the curricula of forest education; and grazing lands are an important component of natural resources that foresters consider their domain, and they have about 1.5 million hectares of land (ibid) under their control. Yet the Department has persistently shied away from taking any major initiatives. Only the Malakand Social Forestry Project includes a component of grazing land improvement. Despite the almost insurmountable difficulties for a major breakthrough in the improvement of grazing lands, it is inexcusable to keep ignoring about 33% of the agriculturally productive land of the NWFP, while attempting the sustainable development of renewable natural resources.

Three existing Government departments should undertake such programmes: the DFFW, the L&DD Department, and Agricultural Extension. They should also accommodate in their structures competence in participatory techniques, ecology, livestock husbandry, agricultural economics and marketing, and feeds and fodders. All departments should be encouraged to present their concepts to Government for this purpose, indicating the individuals who would spearhead their approach. In addition, all area development, integrated development, and barani (rain-fed) development projects should be asked to add grazing land improvement to their programmes. During the 'transition to implementation' phase of the SPCS, a detailed strategy will be prepared for the sustainable management of grazing lands.

12.4 Agriculture & Animal Husbandry

The NWFP's physical resources for agriculture are limited, with only 1.38 million hectares of very good to moderate quality and 580,000 hectares of poor-quality arable land (Mian and Mirza, 1993). Of about 1.92 million hectares of cultivated land (net area sown plus area sown more than once), barely 46% is currently irrigated (Government of Pakistan, 1995). Yet, agriculture is extremely important in the rehabilitation of the human environment because it is the producer of food and the source of disposable income for about the two-thirds of the population. Moreover, the livestock subsector is particularly important as a producer of high-quality food for people.

Livestock extend the carrying capacity of the province for human life, particularly in areas not suitable for sustainable crop production. Also, almost 90% of the NWFP's livestock are owned by small farmers and the landless, providing an opportunity for improving the quality of their lives. It is therefore essential to keep increasing the productivity and profitability of agriculture while ensuring the maintenance and improvement of its physical resources and of the human environment.

Agricultural productivity does not depend on physical endowments alone. It is also influenced greatly by the quality of the human resources engaged in agriculture, by the competence of public institutions serving the sector, by the economic and policy environment, and by the state of the physical and marketing infrastructure.

12.4.1 Organization & Empowerment of Farmers

The NWFP is a province of small farmers. About 91% of the farm households own less than 5 hectares each of which only about 1 hectare is cultivated (Government of Pakistan, 1990). They are poor, powerless, and often apathetic. Institutional credit and even technical advice seldom reach them. Their heavy dependence on non-

institutional credit weakens their bargaining power in marketing. Because of their precarious situation, they are risk-averse, and do not easily adopt technologies that require investment but may not yield immediate and substantial returns.

Several of these problems can be mitigated by mobilizing farmers, using the participatory approach. Although agriculture has been used as an entry point by all such programmes launched by the Planning, Environment and Development Department, the Food, Agriculture, Livestock and Co-operatives (FAL&C) Department and the DFFW, they have only partially adopted the participatory approach. To remedy this, the following measures would favourably influence small farmers towards sustainable agriculture:

- ?? greatly emphasizing the participatory approach in the agricultural extension education work of the NWFP Agricultural University and in the Agricultural Training Institute, including practical work with farming communities on participatory projects;
- ?? encouraging agricultural education, extension, and research employees to participate vigorously in the agricultural components of participatory projects;
- ?? incorporating the participatory approach in the on-going development programmes in which it is not yet included; and
- ?? conceiving, preparing, processing, and implementing new integrated development programmes incorporating adaptive research, extension, and development through the participatory approach for each agro-ecological zone, particularly in areas needing special attention, such as the rain-fed zone.

12.4.2 Overhauling Public Services in Agriculture

Pre-service Training

The FAL&C Department and the agricultural research system have the major responsibility for conceiving, planning, processing, implementing, and monitoring the sustainable development of agriculture in the NWFP. Their ability to perform these functions depends entirely on the competence, knowledge, motivation, dynamism, and management skills of the employees.

The professional staff of the Department and the research system belong to several academic disciplines. Graduates of veterinary science and agricultural engineering study totally different subjects from the other agricultural scientists. Though the latter start with the study of the same subjects, they soon branch off into several specialties. This insularity is intensified during their careers, as they generally serve in their specialties for the greater part of their service. The result is the development of a tunnel vision that fails to take a holistic view of the world of the farmer.

Moreover, several subjects essential to service in the Department and the research system are either not taught in the agricultural universities or are taught in an indifferent manner, without being related to real-world issues. Some examples are

economics, sociology, management, and communication.

There is also a difference between the campus and the world of the farmer. University education does not prepare the student for working in that other world. It also does not inculcate in the student a sense of mission, which is essential to overcoming hurdles in life. New entrants to the Department and the research system come with fragmentary theoretical knowledge of a small part of agriculture. Other major shortcomings are ignorance of how the agricultural system functions; inability to take a holistic approach to problems; lack of dynamism and of management, inter-personal, and communication skills; and the absence of a mission and the zeal to achieve it. These continue throughout individuals' careers unless remedied through advanced education abroad, posting to the Secretariat, or service in the Pakistan Agricultural Research Council or international agencies.

All these shortcomings could be remedied through six months pre-service training organized at the Division of Continuing Education and Public Service of the NWFP Agricultural University, using outstanding talent from the agricultural sector of the NWFP as well as from the Pakistan Agricultural Research Council.

Such a course would infuse the participants with the mission of dynamic and sustainable agriculture, provide opportunities for life-long linkages between agricultural scientists belonging to diverse specialities, and create an esprit de corps among them, which is a hallmark of an excellent public service. The Government of NWFP and the NWFP Agricultural University should consider pre-service training for fresh entrants to the agricultural research and extension system.

In-service Training

In-service training is needed to familiarize agricultural scientists of the NWFP with new knowledge or practices not yet in use in the province. A good example is the Animal Husbandry In-service Training Institute, which is attempting to inculcate livestock husbandry and extension among the functionaries of the LD&D Department. A similar need for mass reorientation is needed in agricultural research and extension, soil conservation, and perhaps other areas of agriculture also.

The Department knows about the need for such in-service training and hopes to start it in its Agricultural Training Institute, which is being upgraded, and at the Division of Continuing Education and Public Service, NWFP Agricultural University. The quality of the instruction imparted and its impact would largely be determined by the quality of resource persons running the courses.

Advanced education abroad for employees of the agricultural system is essential for keeping abreast of new knowledge being developed. Both degree and non-degree courses are essential for creating excellence in the agricultural sector. The Government of NWFP should continue advanced degree and non-degree level education abroad as part of donor-assisted projects and as special training programmes.

Management Reviews

The current hierarchical structure of the Department and the agricultural research system, now under the NWFP Agricultural University, has evolved piecemeal since its origin as a component of the revenue department in 1913. Its present shape is the result of ad hoc subdivisions of some of its units, accretions of remnants of defunct organizations or development projects, or the loss of an activity to another organization.

Several evaluations of various components of the system have been carried out by various agencies, including 24 evaluations of agricultural extension activities (Naqvi and Khan, 1994). A review of agricultural research was also completed in 1994.

These have pointed out various shortcomings and questioned the validity of several approaches that have been used for years.

The Department has realized the need to review the functioning of its various facets.

The LD&D Department is being reorganized as part of an ADB-assisted project, and a horticultural policy dialogue is in progress with the help of the Pak- Swiss Malakand Fruit and Vegetable Development Project. These may result in the reorganization of the horticultural sector. Such reviews are needed for all its segments, including Agricultural Extension, Agricultural Engineering, OF WM, Soil Conservation, Cooperation, Agricultural Development Authority, Agricultural Economics and Policy, and Agricultural Marketing. The Government of NWFP should continue the reviews of the various facets of the Department and the agricultural research system and reorganize them to increase their effectiveness and efficiency.

12.4.3 Improving the Economic Environment for Agriculture

Sustainable development of agriculture requires investment decisions of labour and capital for more than a million farm households. For most of them, farming is just one of the several means of making a living. Farmers will only decide to stay in agriculture if it is seen to be as profitable as other activities.

According to the Prime Minister's Task Force on Agriculture (1993), the Government of Pakistan has been discriminating against agriculture in its trade, rate of exchange, and pricing policies. All these have resulted in the impoverishment of farmers and of rural areas. To rectify the situation, the Task Force recommended :

- ?? establishing an Agribusiness Investment Board to promote and facilitate the development of agribusiness in the rural areas;
- ?? constituting an Agricultural Coordination Committee of the Cabinet for the consideration of all matters relating to agriculture;
- ?? improving the current price support policy to ensure a higher rate of return on investment than the bank mark-up rate;
- ?? continuing the procurement of all market surplus commodities in the post-harvest season, and establishing a stabilization fund to support procurement;
and
- ?? removing export duties on agricultural commodities.

Though most of these recommendations (since approved by the Cabinet) pertain to the Government of Pakistan, the Government of NWFP could consider doing the following:

- ?? enabling the Institute of Development Studies of the NWFP Agricultural University to conduct research on issues of agricultural economics and policy;
- ?? creating such a capability in the FAL & C Department for upgrading the Economics and Marketing Unit under the Director- General Agriculture Extension, and staffing the positions created with persons qualified in agricultural economics and marketing;

- ?? creating positions for agricultural economists in important research institutes and stations;
- ?? seeking opportunities for advanced education abroad in agricultural economics and marketing; and
- ?? commissioning a review of Government policies that discriminate against agriculture, such as provincial and district controls on prices.

12.4.4 Streamlining the Agricultural Marketing Infrastructure

The marketing infrastructure for agricultural commodities is generally weak. There is only one regulated market in the province, and physical facilities for wholesale markets are poor. On-farm and off-farm storage capacity is limited. Grading and packaging is primitive, and processing facilities are few. A major initiative is needed to improve the marketing infrastructure for agriculture.

To remedy the situation, the Government of NWFP should consider commissioning a study on agricultural marketing in the NWFP, preparing projects for implementing the recommendations of the report, and upgrading the existing Economics and Marketing unit in the FAL&C Department, including staffing it with persons qualified in the subject.

12.4.5 Improving Small Farmers' Access to Institutional Credit

Access to institutional credit is mainly handicapped by the low amount available, the collateral required, the lengthy procedure for obtaining loans, and the failure of loans reaching small farmers due to malpractices in the system. Credit obtained for agriculture is also often misused for non-productive purposes.

To remove these difficulties, the Prime Minister's Task Force decided to increase the allocation for institutional credit from 5% of agricultural gross national product in 1991-92 to 15%, and to issue pass books to all farmers, required by the Loans for Agricultural Purposes Act 1973, within two years so that they could be produced as evidence of collateral while obtaining loans. The Agricultural Credit Advisory Committee has decided that nationalized banks will disburse agricultural credit under a supervised agricultural credit scheme. This will greatly reduce the misuse of credit for non-productive purposes.

Small farmers' access to institutional credit can be greatly increased by mobilizing cooperatives, encouraging existing community-based, interest-based organizations, and promoting the creation of new ones. It will also be improved by having the Government of NWFP consider following up the implementation of the decisions of the Prime Minister's Task Force and the Agricultural Credit Advisory Committee. The Government should also commission a study on agricultural credit in the NWFP, to determine its adequacy and recommend measures for improving it.

12.4.6 Preventing the Expropriation of Very Good to Moderate Quality Agricultural Land

As already stated, the NWFP only has about 1.38 million hectares of very good to moderate quality agricultural land capable of being farmed sustainably and providing economic returns on investment. This is a priceless resource for present and future generations of the NWFP; it is irreplaceable once it is lost.

But a considerable portion of this resource is being lost annually to urban development and the establishment of industries. Sustainable development of agriculture demands that such conversion be stopped immediately; otherwise, the province would be faced with the impossible situation of meeting its rapidly increasing food needs from an ever dwindling resource base.

A number of measures can be taken to discourage the use of agricultural land for

non-agricultural purposes:

- ?? a Geographical Information System study should be commissioned to determine the area of cultivated land lost annually to urban and industrial uses;
- ?? Government projects such as new townships and industrial estates should not be located on arable land;
- ?? private conversion of agricultural land to non-agricultural uses should be discouraged by law. Towards this end, existing legislation and its enforcement should be examined and strengthened, if needed; and
- ?? the quality of land to be used for establishing an industry or executing any other major project will be indicated in environmental impact assessments, and the use of agricultural land should be considered as an adverse impact.

12.4.7 Reducing the Hazards of Agricultural Pesticides Use

Pesticides are poisonous substances with wide-ranging adverse effects on people and animals. They may be ingested, through ignorance or accident, or absorbed through the skin by farm workers spraying or working in freshly sprayed fields. Also at risk are consumers who may eat fruit and vegetable with pesticide residues (Mohammadullah, 1994).

There has been no regular, systematic monitoring of the effects of pesticides on human health in Pakistan. What exists is research that has documented pesticide residues in foodstuffs, and in soil and groundwater (Jabbar and Mallik, 1994). Though no such studies have been conducted in the NWFP, there is anecdotal evidence of village children dying from the accidental ingestion of pesticides. Another adverse effect of the inappropriate use of pesticides is the apparent emergence of pesticide-resistant pest strains.

Since the cessation of aerial spraying of sugar-cane, the average annual consumption of pesticides in the NWFP has come down from about 420 tonnes during 1984-87 to about 241 tonnes. Of the pesticides used in the NWFP during 1992, about 4% were chlorinated substances; 52% were organophosphates; 23%, carbonates; 8%, pyrethroids; 7%, herbicides; and 6% were hydrocarbon fungicides (Pakistan Agriculture Book, 1993). Since May 1993, the use of chlorinated pesticides has been banned in Pakistan because of their long residual effect. But organophosphates are still in use, even though they are more toxic to vertebrates than chlorinated pesticides. The same with pyrethroids: they are the least toxic to mammals, but they are highly toxic to bees and fish.

The Agricultural Pesticides Ordinance 1971, amended in 1991 and 1994, and the Agricultural Pesticides Rules 1973 regulate the import, manufacture, formulation, sale, distribution, and use of pesticides. Although a breach of their provisions is punishable by imprisonment up to seven years and a fine of upto Rs. 1 million, the penalties have seldom been invoked in the NWFP due to the absence of a mechanism for their enforcement.

Two views about pesticides are generally current in the NWFP. One is that a considerable quantity of hazardous, expired, inferior pesticides are being smuggled into Pakistan, and that farmers are using large quantities of such 'camp pesticides'. The other view is that farmers are very discriminating in the selection of pesticides, and purchase them only from reliable dealers who stock the products of reputable

manufacturers. Both views may be correct; the former in case of small farmers, and the latter, for medium- and large-scale farmers.

The current pesticides-use practices in the NWFP suffer from several shortcomings. Pests are becoming resistant to pesticides with the use of less potent 'cheap pesticides'. Agricultural workers are not aware of the serious health hazards of contact with or inhalation of pesticides, and therefore do not take adequate protective measures against them. And consumers of products containing excessive pesticide residues do not know that they are at risk of contracting serious diseases. A number of remedial measures will therefore be taken to reduce the hazards of pesticide use:

- ?? commissioning a detailed study on pesticide use in the NWFP as a prelude to mounting a comprehensive programme for safe and effective pest control;
- ?? upgrading the plant protection component of the Agricultural Extension Division to enable staff to perform their functions effectively and efficiently; and
- ?? after studying practices in the Punjab, creating mechanisms for the effective implementation of the Agricultural Pesticides Ordinance 1971, amended in 1991 and 1994, and the Agricultural Pesticides Rules 1973.

12.4.8 Introduction of Integrated Pest Management

Pests and diseases are an important hurdle in the way of the sustainable development of agriculture. Their importance will increase during a more vigorous programme of crop breeding for enhancing crop yields and as climatic conditions change, increasing climatic stresses for plant growth. Agriculture in the NWFP now almost entirely relies on the use of chemicals for the control of pests and diseases. As pointed out in the preceding section, these pose serious environmental hazards and exacerbate the problem as pests become resistant to pesticides; minor pests can become major ones due to the destruction of their predators.

A change-over is needed from the current pesticide centred approach to pest control to integrated pest management (IPM), including the minimum use of environmentally safe pesticides and the enhanced use of physical and biological methods of pest management. To accomplish this, a project may be started to develop and introduce IPM in the NWFP, using the combined talents and resources of the NWFP Agricultural University and the research system and providing additional facilities such as transport and operating expenses. The focus of this project's work will be:

- ?? compiling and disseminating IPM methods that have proved successful in the NWFP and other parts of Pakistan;
- ?? based on the above, and in collaboration with the concerned teachers,

- designing courses for various levels of agricultural education;
- ?? reviewing world literature on IPM;
- ?? launching adaptive research to test the effectiveness under local conditions of IPM methods that have been proved successful elsewhere;
- ?? disseminating useful results; and
- ?? initiating research on unsolved problems in collaboration with the Commonwealth Institute of Biological Control, Rawalpindi, the Nuclear Institute of Food and Agriculture Peshawar, the Nuclear Institute of Agriculture and Biology Faisalabad, and other centres of IPM activity in Pakistan and abroad.

12.4.9 Amelioration of Soil-related Problems

Several soil-related problems prevent the sustainable development of agriculture in the NWFP:

- ?? low organic matter content causes the deterioration of soil structure, thereby continuously decreasing soil productivity
- ?? leaching of saline-sodic soils without the application of gypsum, and irrigation with water high in sodium, increases soil sodicity, which breaks down the soil structure and ultimately makes soils unfit for agriculture;
- ?? clay/sandy and gravelly soils need proper soil preparation and addition of organic matter for optimum crop production; and
- ?? soil erosion causes the progressive loss of soil fertility, and, when serious, the loss of soil itself.

The NWFP has the potential for dealing with most of these problems. The research system and the Soil Science Department of the Agricultural University can identify the specific soil-related problems and prescribe solutions. A system is needed in which organized farmers are closely linked to research, extension, sources of credit, inputs, and agricultural machinery, and can market their products profitably. Some donor-assisted projects such as Swabi Irrigated Agriculture Project are already working on these subjects.

Such projects would be prepared for each agro-ecological zone, processed, implemented, and monitored. To enlist the participation of all the components of the agricultural system, the role of lead agency for various projects would be distributed among different units, depending on the focus of the project, the quality of the concept paper prepared by the unit, its professional resources, and its past record of performance. Each project would be multi-disciplinary, integrated, and participatory.

12.4.10 Mounting a Programme of Crop Breeding

One of the most important components of sustainable agriculture is a vigorous programme of crop breeding aimed at increasing crop yields, building resistance against pests and diseases, and enhancing adaptability to changing environments.

The last is of particular significance in the context of the climate change that appears to be occurring. This could be achieved through:

- ?? taking stock of competent and productive crop breeders throughout the research system and the universities;
- ?? adjusting crop breeders' postings in order to take the maximum advantage of their advanced educational qualifications obtained under various programmes;
- ?? posting scientists with proven leadership qualities as heads of research institutes, stations, and divisions, with important responsibilities for crop breeding; and
- ?? preparing development projects for breeding important crops, involving research, extension, and participatory integrated development projects

12.4.11 Enhancing the Productivity of Livestock

Increasing the productivity of livestock is necessary to improve the quality of life of the people of the NWFP in general and of small farmers and landless livestock owners in particular. It may also decrease the intensity of grazing in forests and grazing lands. Increasing the sustainable productivity of livestock is the concern of the recently created Livestock Production Extension Directorate of the L&DD Department. But its activities are at present confined mainly to three intensive livestock production areas centred around Peshawar, Mardan, and Swat.

Shah (1995) identifies several environmental concerns in the current system of animal husbandry in the NWFP: too many unproductive animals; overgrazing of rangelands; poor livestock housing; indifferent handling of animal by-products; lack of an adequate marketing system; and the risk of zoonoses (diseases naturally transmitted between humans and animals, such as brucellosis, tuberculosis, rabies, salmonella, toxoplasma, and anthrax). The following steps will be taken to enhance the sustainable productivity of livestock:

- ?? continuing to develop a rapid programme of training the functionaries of L&DD Department and interested farmers, particularly those involved in participatory integrated development projects;
- ?? encouraging the Livestock Production Extension Directorate to participate in all the participatory integrated development projects, and to prepare, process, and implement their own projects along these lines;
- ?? introducing controlled grazing of rangelands, the culling of unproductive animals, disease prevention including the prevention of zoonoses, and cost-effective improved livestock housing;
- ?? commissioning a study on livestock marketing that will also propose pragmatic and cost-effective improvements in the system
- ?? preparing, processing, and implementing a programme for improving the

- system along lines pro-posed in the commissioned study;
- ?? motivate livestock research to initiate herd dynamics studies as proposed by Khan (1994);
 - ?? preparing and implementing a project for the promotion of fodders and forages in the NWFP agriculture;
 - ?? commissioning a study on the impact of Government policies on the producers of livestock; and
 - ?? revising existing policies that adversely influence the returns to the producer, and initiating policies that can increase the sustainable productivity of livestock.

12.5 Water & Irrigation

An adequate and regular supply of water is needed for the economic cultivation of crops. But rainfall in the NWFP is insufficient and poorly distributed through the year. Irrigation is therefore essential to increase crop yields, expand the choice of crops that can be grown, and enhance the reliability of crop production. About 46% of the cultivated area of the NWFP is irrigated—some 83% of it with canal water, and the rest with tube-wells, open wells, and lift pumps (Government of Pakistan, 1995). Major irrigation projects are planned and implemented by the Water and Power Development Authority, and hand-ed over to the provincial Irrigation Department, along with one year of organization and maintenance costs. Since these costs are heavy, particularly in the NWFP, the Government is gradually increasing the water charges to the beneficiaries until by 1997-98 they will equal the costs.

Until recently, a substantial increase in the irrigated area of the NWFP was not possible because the province could not draw more than 700,000 hectaremetres of water from the Indus River Canal System. This constraint has now been relaxed with the allocation of an additional 366,000 hectare metres of water from the system under the Water Apportionment Accord of March 1991. The NWFP, however, will have to find the funds for designing and implementing projects to develop water supplies to fully use its share. When such projects are completed, in about 10 years, an area of about 400,000 hectares will be added to the present irrigated area of 850,000 hectares, increasing the irrigated area to about 1.25 million hectares, 65% of the total cultivated area of 1.9 million hectares. This is about the limit to which irrigated agriculture can be increased in the NWFP.

Considerable savings can be made in the use of water, however. About 45% of the water is lost in conveyance, and about 25% in field application. The reduction of these losses has been attempted since 1976-77 under the on-farm water management programme by renovating the water channels and precision- levelling of cultivated fields, with the participation of the beneficiaries organized in water user associations. As a result of this programme, irrigation water available to crops has increased considerably, raising the cropping intensity by about 7% since 1975-76. The Eighth Plan (1993-94 to 1997-98) irrigation sector covers:

- ?? designing and implementing new irrigation projects;
- ?? strengthening embankments, desilting, and brick lining canals in sections to

- increase channel capacity and improve water availability at the tail-end;
- ?? renovating water channels, and precision land-levelling to decrease conveyance and application losses;
- ?? constructing protective embankments to reduce flood damage to cultivated land, roads, and habitations;
- ?? excavating tube-wells to depress water-tables in water-logged areas;
- ?? testing sprinkler, trickle, and demand-based irrigation systems to increase irrigation efficiency; and
- ?? improving indigenous water harvesting systems in the arid zone.

12.5.1 Improvements in Water Use Efficiency

Since irrigation is critical to the sustainable development of agriculture in the NWFP, and since the supply of irrigation water is finite, water must be applied more effectively, equitably, and efficiently. Towards this end, the Irrigation Department must strive to maintain the irrigation and drainage infrastructure effectively and efficiently, operate the system with farmer participation to meet crop needs optimally, ensure equitable distribution of water amongst all shareholders, resist urbanization of canal and tube-well commands, regulate abstraction of groundwater to maintain its quality and ensure its sustainable use, maintain and operate Salinity Control and Agricultural Rehabilitation Programmes to restore soil productivity of salt-affected and water-logged soils, protect designated areas from floods by keeping drainage lines clear, and secure the participation of other Government agencies in the performance of these tasks (unpublished communication from Engineer Allah Bakhsh Baloch). Additional measures will also be taken to improve the efficiency of water use:

- ?? eliminating political interference in the functioning of the Irrigation Department, and ensuring equitable supply of irrigation water to all its users;
- ?? conducting a management review of the Department and remodeling it into a participatory organization;
- ?? revising the Canal and Drainage Act and improving its implementation;
- ?? adopting crop zoning to prevent over-withdrawal of water by farmers
- ?? ensuring conformity with the cropping intensities prescribed for each water course;
- ?? introducing discipline among water users to ensure availability of water at the tail-end of canals; and
- ?? excluding charges for activities unrelated to the improvement of irrigated

agriculture from the Irrigation Service Fee levied on farmers

12.5.2 Groundwater

Though the recharge capacity of the NWFP's groundwater is about 3.85 million hectare-metres, only about 950,000 hectare-metres (25%) is being utilized. The availability of groundwater in the NWFP is seriously curtailed by the province's topography. Although the recharge is spread over a vast area, retrievable groundwater is concentrated near the discharge zones. The scope for the development of groundwater therefore gets confined to the areas close to rivers and streams, except for certain isolated pockets from which groundwater can be abstracted irrespective of their location. This is one of the reasons for the limited potential of groundwater development in areas situated away from the discharge zones.

A serious problem of groundwater use in certain areas of the NWFP is abstraction in excess of recharge, as occurs in Karak, Kohat, Bannu, and D.I. Khan. The groundwater balance in these areas is negative, and sinking more tube-wells is lowering the water-table and making water more expensive for existing users. Another adverse impact of over-abstraction of groundwater is the contamination of the sweet water zone by saline groundwater, which is occurring in Karak. To prevent the further depletion of groundwater and a deterioration in its quality, groundwater development will be regulated by law through the Irrigation Department.

12.6 Soil Conservation

According to Mian and Mirza (1993), about 15% of the NWFP's cultivated land suffers from moderate water erosion and about 4% from slight erosion. The erosion hazard on cultivated lands is especially significant in the mountains. About 25% of forest and grazing lands are also beset with moderate and about 8% with slight water erosion. Half of the agriculturally unproductive land (Class VIII) is afflicted with severe soil erosion.

As noted earlier, control of soil erosion is important for the sustainable development of agriculture, because erosion continuously reduces soil productivity and, in severe cases, removes the soil itself. It is particularly important in the mountains, where soils are shallow and their removal exposes bare rock that can neither absorb water nor sustain plant growth. Soil erosion in the mountains not only decreases agricultural, forest, and rangeland productivity, it also exacerbates local flood hazards due to a reduction in the water storage capacity of mountain soils. No effective arrangements exist in the NWFP for soil conservation.

Grazing lands are village commons, with little or no husbandry. Forests are often open to continuous uncontrolled grazing and generally have little ground vegetation cover. Soil conservation on agricultural land is the responsibility of the Soil Conservation Unit of the Directorate of Agricultural Engineering of the FAL&C Department. This unit is a relic of the Soil and Water Conservation Organization of

the former West Pakistan, and confines its work to constructing check dams in torrents to prevent the erosion of cultivated lands on its banks.

12.7 Fisheries & Aquaculture

Because of its climatic diversity, the NWFP has both cold-water and warm-water fisheries—the former at higher elevations, and the latter in the lower areas. Trout species dominate the cold-water areas. Brown trout were first introduced in the Kaghan Valley in 1928, from Kashmir. From there they have been carried to Swat, Chitral, Dir, and Kohistan as part of the fisheries development programme. Rainbow trout were introduced from North America in the 1980s.

Trout fishing is an important attraction for tourists and a significant means of livelihood for local tour guides. It is therefore an important component of the strategy for the sustainable development of mountain lands. In addition to sport fishing, seven private fish farms have also been established to supply trout to tourist-class hotels. The current annual production of trout is about 31 tonnes: about one-third each from rivers and streams, from Government hatcheries, and from private fish farms. So far, about 1,100 kilometers of cold-water streams and 10 lakes have been stocked with trout. The potential is much larger.

Though trout have started propagating naturally, the DFFW supplements this by annually releasing about a million fish raised in its nurseries. The southern reaches of cold-water bodies are populated by such species as the indigenous snow trout and the mahaseer. Warm-water fishing is practiced in the rivers, lakes, and ponds at the lower elevations of the NWFP. The fish species of commercial importance include indigenous carp such as the rohu, *Cirrhina mrigala*, and *Catla catla* and exotic species such as the Chinese, common, silver and grass carps. Current annual production of warm-water fish is about 400 tonnes: 17 tonnes from dams and reservoirs, 295 tonnes from rivers and streams, and 88 tonnes from private fish farms.

One recent activity of the DFFW is the encouragement of aquaculture in fish farms. In all, 192 private fish farms have so far been established, producing about 128 tonnes of carp annually. Aquaculture can play a significant role in improving the quality of life of the farmers by improving nutrition and increasing their disposable income.

Several factors work against the sustainable development of fisheries in the NWFP. The release of untreated domestic and industrial effluents into water bodies reduces the capacity for fisheries by decreasing the oxygen content of the water, poisoning the fish, and disturbing their metabolic processes. Encroachment of river banks for human habitation reduces spawning space and increases water pollution. Denudation of mountain slopes triggers soil erosion, and the resulting increased silt loads in water bodies choke the spawning grounds.

Overfishing, beyond sustainable limits, is another important reason for the decline of fish stocks. Several illicit means are often used in fishing: nets; dynamite; electrical shock; and insecticides. Fishing during the spawning season is another problem. The environmental constraints to the development of fisheries will be eased as the environmental programme of the water bodies of the NWFP is formulated and gets

under way. A detailed strategy for the fisheries sector will be developed to suggest the measures that would be undertaken to improve sustainability.

12.8 Energy Resources

By far the largest source of domestic energy used in the NWFP is biomass: about 6.3 million tonnes annually, of which 4.4 million tonnes consist of firewood (UNDP, 1991). About 97% of the rural and 70% of the urban population depends on firewood for cooking and heating. Only about 33% of the rural populace and 75% of the urban can afford to buy it; the rest must collect it themselves. Nearly 60% of the demand is met by tree growth on farmlands that can be considered sustainable. The rest is made up by cutting scattered trees from the countryside and the illicit felling of trees from forests. Both these activities are unsustainable, because the trees cut are seldom regenerated. Electricity is used by about 61% of rural and 85% of urban households, mainly for lighting and to operate fans. About 55% of the electricity is used for domestic and about 25% for industrial and commercial purposes.

The NWFP produces about 30% of the country's electricity and consumes about 9% (van Dijk and Hussain, 1994). The NWFP has recently created the Sarhad Hydel Development Organization to supply electricity to remote mountain communities that cannot be serviced through the national grid. It has prepared several feasibility studies and will start implementing them as soon as it gets approval and funding. The potential for hydropower far exceeds the needs of the NWFP. The surplus power generated will be sold to the national grid.

The province has no known reserves of oil and gas, but consumes about 819,000 tonnes of petroleum annually, mainly for transport. About 3% of its households use natural gas, mainly for cooking. And 22% of the urban and 8% of the rural households use liquefied petroleum gas for this purpose (van Dijk and Hussain, 1994).

In the energy sector, the province's major concern is with the sustainability of trees removed for use as fuelwood. Though it plants about 40,000 hectares annually and distributes about 18 million plants and cuttings to farmers for planting on their fields, the survival rate is low due to uncontrolled grazing. Reduction in the use of fuelwood is occurring in some areas. For example, Abbotabad used to largely depend on firewood supplied from the local forests in the hills in the Galiat. The town has been supplied with natural gas recently, and this has reduced the pressure on the forests.

Alternative sources of domestic fuels are urgently needed to reduce forest cutting. Natural gas supplied to towns and large villages could take up one-third of the load. The remaining two-thirds of the rural population who cannot buy fuel and must collect it will have to depend on tree growth on farmlands and wild lands. Tree planting at current rates is needed along with regulation of grazing, with the participation of local communities in order to help the planted trees survive. An energy sector strategy has to be developed keeping these points in mind.

12.9 Mineral Resources

The NWFP and adjoining parts of Northern Pakistan are at the junction of three major mountain chains the Himalaya, Karakoram, and Hindu Kush. The varied geology

types within the province potentially provide considerable mineral wealth, including many metallic deposits, non-metallic deposits, fuel and energy minerals, and other gems and stones. Both the Government and private sector are vigorously involved in mineral exploitation and exploration.

Before 1970, little importance was given to the exploration and development of mineral deposits in the NWFP. At that time only 40 mining concessions were granted in this province. During the early 1970s, however, the provincial Government gave new importance to this sector; in response, a Directorate of Industries, Commerce and Mines was established to perform regulatory and mineral development activities. The Sarhad Development Authority (SDA) was assigned the job of exploring and developing the mineral resources of the province.

Current exploration and development activities are related to known mineral deposits, whereas vast areas remained unexplored. However, SDA has commenced regional exploration and geochemical surveys to cover an area of 14,000 square kilometres, particularly in Chitral, for the identification of mineral deposits and areas that can be further investigated. Often getting favourable results, SDA also launched similar regional exploration and geochemical surveys in Malakand and Hazara Divisions to cover an overall area of 30,000 square kilometres. The NWFP has considerable mineral wealth and, to date, 43 economic minerals have been discovered in the province.

The location of various mineral deposits and their quantities are given in Table. An evaluation of their economic value is still under way. Mining operations are not covered under the Environmental Protection Ordinance 1983 or under the proposed Environmental Protection Act, but a number of laws exist to regulate mining operations in the province under the regulatory body of the Inspectorate of Mines Labour Welfare, NWFP.

Mining remains the most hazardous industrial occupation, whether it is open pit or underground mining. Most mine owners use crude extraction methods, using drilling and blasting techniques that damage human health and also cause environmental problems. Nor is there a sense of the need for rehabilitation of mined sites. The first and most physical impact of this activity is the presence of mine itself. In underground mining activity, waste rocks are piled along the major shaft entrance and when the extraction activity is finished, the land is unusable for other activity. Surface, open pit and strip mining (for coal) are also under way. Such operations generally change the topography permanently. In both underground and surface mining, the exposed rock often adds pollutants very quickly to the surrounding ecosystem. Moreover, in mineral processing, particular metallic or non-metallic components may cause environmental problem including fine waste materials left on and around the processing plant, polluting the air, water, and soil.

Mine workers, especially those working under-ground, are continuously exposed to risk from extremes of noise; vibration; heat and cold; repetitive task strain; harmful chemicals; radioactive materials; potentially lethal levels of gases released during blasting, from diesel engines, or from the rock strata; and debilitating dust. One significant concern unique to the mining industry is the compound effect of an environment containing several or all of these harmful chemical, physical, and energy factors, which often exceed recommended human occupational exposure

limits.

The major conservation issues related to these activities are to ensure worker health and safety, to carry out proper and timely environmental impact assessments, and to require site reclamation once mining is finished. The measures recommended for the mining sector are to:

- ?? require environmental impact assessments for large-scale mining operations in both the public and the private sector;
- ?? assess the feasibility of imposing environmental fees on mineral extraction;
- ?? initiate environmental rehabilitation on a pilot basis for one mine site and make it mandatory for new mine operations; and
- ?? review and amend existing mining legislation to make mining operations environment-friendly.

MINERAL DEPOSITS IN THE NWFP		
MINERALS	LOCATION	QUANTITY (million metric tonnes)
Metallic antimony	Chitral	0.076
Arsenic	Chitral	Not known
Chromium	Kohistan & Malakand	"
Copper	Chitral & Dir	"
Gold	Chitral	"
Iron	Chitral, Swat, Abbotabad, Mansehra, Bannu & Kohat	1014.5
Lead	Chitral, Swat, Kohistan, Mansehra & Abbotabad	-
Manganese	Abbotabad	0.080
Tin	Mansehra	Not known
Tungsten	Chitral & Mansehra	"
Nickel	Swat	"
Industrial Rocks/Minerals		
Alum	Karak	"
Asbestos	Chitral & Malakand	"
Barite	Swat, Mansehra, Swat & Mardan	0.078
Bentonite	Kohat & Karak	Not known
China clay	Dir & Mansehra	0.03
Corundum	Swat & Dir	Not known
Dolomite	Swat, Mardan & Abbotabad	"

Feldspar	Swat & Mansehra	0.0160
Fire Clay	Nowshera & D.I. Khan	Not known
Fluorite	Abbotabad & Dir	"
Fuller's earth	Mardan	Not known
Garnet	Chitral & Swat	"
Graphite	Chitral, Malakand & Mansehra	0.029
Gypsum	Abbotabad, Kohat, Karak & D.I. Khan	141.431
Cyanate	Swat & Mansehra	Not known
Laterite	Chitral, Abbotabad & Nowshera	32.120
Magnetite	Abbotabad	4.000
Marble	Chitral, Swat, Mansehra, Malakand, Bunair, Swabi & Nowshera	52.651
Mica	Chitral, Mansehra, Swat & Dir	Not known
Nepheline, Syenite	Swat, Hazara	200
Ocher	Abbotabad	-
Pyrite	Chitral & Mansehra	-
Quartz	Dir & Mansehra	-
Quartzite	Swat, Abbotabad, Haripur & Nowshera	17.4
Rock	Abbotabad & Nowshera	29.23
Rock Salt	Karak	-
Silica Sand	Mansehra, Karak, Bunair & D.I. Khan	89.005
Soap Stone	Swat, Haripur, Abbotabad, Kohat & Nowshera	0.94
Sulphur	Kohat	-
Vermiculite	Swat & Malakand	-
Fuel & Energy Minerals/Rocks		
Coal	Nowshera & Karak	-
Oil Shale	Karak & D.I. Khan	-
Radioactive	Mansehra, Bunair, Malakand & Karak	-
Precious & Semi Precious Minerals/Rocks		
Aquamarine	Chitral & Dir	-
Beryl	Chitral & Mansehra	-
Emerald	Swat	-
Topaz	Mardan	-
Tourmaline	Chitral	-
Tsavorite	Swat	-

Source: Geological Survey of Pakistan, 1993

12.10 Commitments This section looks at both short-term and long-term

commitments in each of the sectors discussed in this chapter.

Forestry

A commitment is made in the next three years to :

- ?? initiate measures for eliminating political interference in the functioning of DFFW;
- ?? initiate joint forest management in appropriate donor-assisted projects, and carefully monitor and gradually expand scope to other forest areas;
- ?? undertake a management review of the DFFW, and then reorganize the department in the light of the recommendations of the review;
- ?? introduce measures to enhance the quality of forest management plans, increase the rigour of their implementation, and restore their sanctity
- ?? initiate and continue making improvements in forestry laws and their enforcement;
- ?? initiate and continue measures for bringing about significant improvements in forest education and training;
- ?? form a high-level committee to investigate the need for demarcation of undemarcated forests and the settlement of people's rights in Protected Forests;
- ?? do any work on forest rights with the concurrence of local people;
- ?? prepare and process participatory integrated renewable resource development projects, to cover all the moist mountain watersheds for improving the ecology as well as the social and economic conditions of local people;
- ?? approach Government about improving the system of disbursement of the people's shares in the sale proceeds of timber from Guzara Forests and Protected Forests
- ?? require the FDC to start developing appropriate and cost-effective infrastructure for improved timber harvesting in commercial forests, emphasizing the use of trained forest workers operating as entrepreneurs in small groups;
- ?? approach the Federal Government about removing all duties and taxes on the import of constructional timber;
- ?? approach the Federal Government about supplying gas as a high priority to the towns and villages in the vicinity of wooded mountains;
- ?? ensure prompt and adequate forest regeneration by monitoring success rates and publishing results in the annual State of Forestry reports, while using the

- results in any performance evaluation of the employees of the DFFW;
- ?? prepare a phased programme of participatory integrated renewable resources development for each of the central and southern districts; and
 - ?? initiate with donors the conversion of all the on-going donor-assisted forestry projects to participatory integrated natural resources development projects, with a grazing land rehabilitation component.

Over the longterm, a commitment is made to:

- ?? continue the preparation, processing, and implementation of participatory integrated natural resources development projects until they cover all the moist mountains and all the southern districts ;
- ?? require the FDC to continue improving its timber harvesting system, using local trained forest workers ;
- ?? carefully monitor joint forest management, and gradually expand its scope;
- ?? in the annual State of Forestry reports, note any progress made in the elimination of political interference in the functioning of DFFW;
- ?? monitor law enforcement and publish the results in annual State of Forestry reports;
- ?? continue monitoring the revised system of disbursement of people's share in the sale proceeds of timber and take remedial action as needed, along with publishing the results in annual State of Forestry reports;
- ?? continue monitoring regeneration annually;
- ?? pursue demarcation and settlement of rights;
- ?? monitor the impact of exemption of all taxes and duties on the import of construction timber, if exemption is granted;
- ?? continue improving the quality and implementation of forest management plans;
- ?? continue improving forest education; and
- ?? continue the programme of the establishment and management of protected areas as

Agriculture & Animal Husbandry

A commitment is made in the next three years to :

- ?? initiate measures for organizing and empowering farmers ;
- ?? prepare and submit to the Government of NWFP a concept paper for starting pre-service training in agriculture ;
- ?? undertake a management review of the FAL&C Department and the research system;
- ?? commission studies on:
 - ?? – agricultural and livestock marketing in the NWFP and their improvement,
 - ?? – agricultural credit in the NWFP and its improvement
 - ?? – cultivated land lost annually to urban and industrial uses,
 - ?? – pesticide use in the NWFP and its improvement, and
 - ?? – soil conservation in the NWFP and its improvement .
- ?? prepare and submit to Government concept papers for the creation of Institutes of IPM, Horticulture, and Fodders and Forages;
- ?? start preparing participatory integrated development projects for ameliorating soil-related problems;
- ?? start implementation of measures for improving the quality of crop breeding;
- ?? start implementing the measures for enhancing the sustainable productivity of livestock;
- ?? in consultation with the Pakistan Agricultural Research Council, prepare a concept paper for surveying the state of agricultural biodiversity in the NWFP ;
- ?? continue implementing measures for organizing and empowering the farmers;
- ?? reorganize the FAL&C Department and the agricultural research system according to the recommendations of the management review;
- ?? initiate appropriate action on the recommendations of the reports on agricultural marketing, agricultural credit, loss of agricultural land, pesticide use, and soil conservation;
- ?? prepare and process PC-1s on the creation of an Agricultural Academy, on Institutes of IPM, Horticulture, and Fodders and Forages, and on participatory integrated development projects for each ecological zone for ameliorating soil-related problems, improving crop breeding, improving sustain-able

productivity of livestock, and conserving agricultural biodiversity.

Over the long-term, a commitment is made to:

- ?? continue implementing measures for organizing and empowering farmers;
- ?? continue improving agricultural marketing, credit, infrastructure, pesticide use, and soil conservation;
- ?? guard vigilantly against expropriation of agricultural land for other uses; and
- ?? implement projects for the institutions described.

Water Management

A commitment is made in the next three years to:

- ?? commission a management review;
- ?? prepare and submit to Government a concept paper on the need for public control of groundwater development by law; and
- ?? start reorganizing the Irrigation Department according to the recommendations of its management review.

Soil A commitment is made in the next three years to:

- ?? develop and apply flexible systems of controlled grazing appropriate to each site to improve the density and vigour of ground vegetation, with the cooperation of the land and livestock owners ;
- ?? work with the systems mentioned, to implement participatory integrated renewable resources development projects, with adequate incentives provided to the participants for overcoming their resistance to controlled grazing; and
- ?? expand the scope of the Soil Conservation Unit to encompass all practices for increasing the sustainable productivity of agricultural land prone to soil erosion, which should be facilitated by including such practices in participatory integrated renewable resources development projects

Fisheries, Energy & Mineral Resources

A commitment is made in the next three years to pre-prepare detailed strategies for these sub-sectors. Over the long-term commitment is made to implement the strategies.