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Ethnobotany and the management of fodder and fuelwood at Ayubia National Park, North West Frontier Province, Pakistan

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Fodder and fuelwood are two of the most important livelihood resources for mountainous regions, including in the Himalayas (Messerli and Yves, 1999; Ramakrishnan et al., 2000, Aumeeruddy and Pei, 2003). Mountain environments are characterised by rugged terrain and severe climate, with limited access both to arable agricultural lands and to roads and modern infrastructure. This explains a high level of dependency on natural resources such as medicinal plants for health care, fuelwood (in the absence of access to other forms of energy), and fodder resources for livestock rearing. The latter is an important supplementary activity to agriculture.

Deforestation in the Himalayas is generally attributed to demographic pressure and related effects. These include increases in: demand for land for cultivation; livestock population; and use of the remaining forest to meet growing needs for fodder, fuelwood and timber. Social issues, such as social relationships, perceptions and values of natural resources for different social groups, issues of access and control over resources, and issues of power in relation to deforestation, have on the other hand rarely been discussed in current literature as possible driving forces to deforestation (Rieger, 1977; Saxena et al., 2001).

This paper portrays a case of deforestation in the Himalayan mid-hills of northern Pakistan (North West Frontier Province) in the context of the interaction between local societies, and a National Park, namely Ayubia National Park, and forested areas located outside the park, with special reference to fodder and fuelwood management. Collection of fuelwood and fodder (mainly by women) is regarded by foresters and conservationists as the major cause of deforestation in the area (Aumeeruddy, 1996). Local knowledge and practices pertaining to fodder and fuelwood management are analysed in this paper in the context of a high level of conflict and/or general absence of sharing of views between different social groups. The main groups involved are women, who are responsible for fuelwood and fodder collection to meet livelihood needs; foresters and influential men who are mainly concerned with timber management; and some environmentalists, whose’ main focus in the area is the protection of rare bird populations in the National Park.

This work is part of a project initiated in 1997 as a collaborative effort between WWF Pakistan and the People and Plants joint programme of UNESCO, WWF and the Royal Botanical Gardens KEW, with the main aim of developing an applied ethnobotany project to investigate the status of fodder and fuelwood management at Ayubia National Park and in its periphery. The project, currently known as Ayubia Ethnobotany Project, also aimed at providing recommendations for improvement of fodder and fuelwood management systems, as well as implementing some activities to contribute towards greater sustainability of plant resources at Ayubia National Park and in the surrounding forests. Ayubia Ethnobotany Project has been conducted in two phases: a first four-year period (1997-2000) with a large component of research as well as initiation of some implementation, and a second phase (2001-2004), which has mostly focused on implementation.

The results presented in this working paper cover mainly this first phase, with some elements of the follow up during the second phase until 2002, especially regarding social forestry. The overall objectives of the People and Plants programme in Pakistan were to: (1) strengthen the capacity for work in applied ethnobotany in Pakistan through a programme of training of young professionals and students and (2) achieve better integration between conservation and development at selected field sites.
## Contents

1 **Part 1: Applied research activities**

1 **Introduction**

3 Major development issues in Pakistan

4 Conservation priorities

5 Priorities for capacity building in ethnobotany

6 **Ayubia National Park**

9 An interdisciplinary team approach with strong linkages with local communities

10 **Ethnobotanical approaches and methods**

10 Project initiation

11 Baseline surveys

12 Focused research on fuelwood and fodder

12 Methods

14 Major results

18 Fodder production in homestead areas and in *Rakhan* and *Guzara* forests

21 Sociological survey

21 Wild vegetable and mushroom collection in the National Park

22 Pheasants

22 A general proposition for fodder and fuelwood management at Ayubia National Park

25 **Part 2: Implementation approaches in practice**

25 **Social forestry activities**

25 Background

25 Major results

31 **Part 3: Environmental education: working with school children**

32 Conclusion and discussion

34 References

36 Acknowledgements

36 Acronyms and abbreviations
The importance of forests for local livelihoods and the realisation throughout the region that local communities should be formally involved in the management of forests have lead many countries to shift their forest management approaches to Joint Forest Management or Community Forestry (Aumeeruddy *et al.*, 1998) which implies the sharing of decision making and management practices of forests between local communities and the Forest Department. In Pakistan this approach has not yet been established although structural changes are underway in the Forest Department to enable a greater role for local communities in the management of forests (Shinwari and Khan, 2001). The work conducted at Ayubia National Park and in the surrounding forests was thus developed in order to provide a model, where the aim is to improve the management of forests including fuelwood and fodder resources outside the National Park. The aim was also to encourage the development of agreements between the communities from local villages and the Forest Department for the joint management of forests in which communities have certain rights of use, and thus reduce pressure on plant resources in the National Park. The intention was actually to develop a model, which could be adopted by the Forest Department.

**Major development issues in Pakistan**

Pakistan is the 10th most populated country in the world with 144 million people and a total area of 796,095 sq.km or 79.6 million hectares. Major national development issues are to alleviate poverty through increasing agricultural production and through improvement of other sectors such as industrial development, trade and tourism (UNEP/WTO, 1998). In the forestry sector, programmes of afforestation have been developed to try and meet the country’s needs in timber and fuelwood. The government also seeks to improve education levels, health care systems, and communications. The harvesting of timber through commercial logging is threatening environmental quality including supplies of some resources required by local communities (WWF-Pakistan 2000a). Local cultural and social systems are progressively fading - as a result of changing lifestyles and effects of centralised administration - and along with them some local knowledge of resource management (Shinwari *et al.*, 1996). National health care support at the village level is poor due to lack of dispensaries and qualified staff. The use of medicinal plants is therefore a necessity in many rural areas.

Women are usually responsible for fuelwood, fodder and water collection as well as many other agricultural tasks. Access to fuelwood and fodder and other non-timber forest products (NTFPs) is also decreasing due to reductions in forest cover and also mis-management of existing forests. Besides being overwhelmed by fuelwood and fodder collection tasks, education of young girls is also affected by lack of schools for girls. As is generally recognised throughout the region in South Asia (Gururani, 2002) and based on our own assessment of the situation at Ayubia National Park, the link between women and resource management requires particular attention (Aumeeruddy, 1996).

Livestock management is an important issue in North West Frontier Province (NWFP) (48% of the land cover is classified as grazing land), as it is progressively expanding at the expense of forests (Anonymous, 1995). For forest managers and the Forest Department this is seen as a very negative impact, whereas for women especially concerned with livestock raising, management of open rangelands for grazing is required to sustain local livelihoods. Rangeland ecosystems have been analysed in many other parts of the world and are recognised to be important areas in terms of their overall species diversity (not only regarding useful resources) although in many cases the rangelands are actually a product of high levels of interaction between people, livestock and nature (Bengtsson-Lindsjö *et al.*, 1991; Lepart and Debussche, 1992). In Pakistan, based on our observations at Ayubia National Park, forest ecosystems, seen as more natural ecosystems especially by foresters, tend to attract more attention for conservation. The interest of foresters actually lies in timber production and especially conifer species which benefit from a higher level of protection in Pakistan than other trees (Ashiq, pers. obs.).

Thus there is a clear distinction between women, who are generally more concerned with non-timber forest products such as wild vegetables, mushrooms, tree leaf fodder and fuelwood, and who are in favour of open grasslands for fodder production, and men, especially foresters, who favour timber and forest ecosystems. It is interesting to note that women are also very highly interested in trees and forests for fuelwood and fodder, as well as for NTFPs. Although conifers are cut illegally for fuelwood, these species are not particularly well adapted for fuelwood production because they do not coppice. Women and foresters share a concern for conserving some forests, but women are more in favour of a mixed landscape with both forests and grassland clearings.

When considering what to conserve, and for whom, and what type of landscape to maintain, and for what long-term environmental aim, issues of power are important. Conflicts of uses or of values of different resources within a common space between different social groups – at Ayubia, influential men, women, bird conservationists, Wildlife and Forest Departments, rich summer residents...
from large urban areas, hotel owners - is at the origin of many mismanagement problems. Applied ethnobotany, a discipline which is at the interface of social and biological sciences, is particularly useful in this context to analyse conflicts of use, practices and perceptions, as well as proposing new avenues for management (Cunningham, 2001; Aumeeruddy and Pei, 2003; Hamilton et al., 2003).

Conservation priorities

Forest cover represents only 5.2% (4.58 million ha) of the country’s area, but the country is highly dependent on trees as well as on non-timber forest products (NTFPs) (Shinwari and Khan, 2001). Biological resources are a major concern for the country because they represent the livelihood basis for a large portion of the population. Biodiversity is endangered through: increase in population; clear-cutting for timber exploitation; overgrazing in forest undergrowth as well as in pastures; unsustainable collection of NTFPs such as medicinal plants, for trade; and unsustainable collection of fuelwood (GoP, 1998). Fuelwood is still the main source of energy in Pakistan with 90% of the rural population and 50% of the urban population mainly relying on fuelwood. It is interesting to note however that only one fourth of the fuelwood needs come from natural forests, the major source of fuelwood being mainly through growing of privately owned trees on farms (Anonymous, 1995). Forested areas occur mainly in the North West Frontier Province (NWFP), Azad Jammu and Kashmir, Northern Areas and Murree Hills at relatively high elevations, in fragile mountainous environments. These mountains are important watershed areas and the current rate of deforestation could have major impacts on the environment as well as on local livelihoods.

Forests in Pakistan fall under two major legal statuses: state-owned forests which are not accessible for use by local communities (mainly state Reserved and Protected forests), and other forests where some level of access up to private ownership may be given to either communities or individuals (e.g. Guzara and Communal forests). All forests are under the responsibility of the Forest Department. National Parks are located in state-owned forests. They are usually Reserved or Protected forests, and are managed by the Wildlife Department while falling also under the responsibility of the Forest Department. This double responsibility adds to the complexity of the management of National Parks. Commercial forest exploitation may take place in Reserved forests. Guzara forests are allocated to local communities on the basis of specific rights of use – a limited amount of timber may be harvested in such forests; collection of dead wood and non-timber forest products as well as grazing are allowed. At the local level, Forest Divisional Range Officers apply the rules and regulations of the Forest Department in Guzara and Reserved forests including National Parks, through a policed system of fines. In National Parks, strict restriction of access to forest products is enforced. High levels of conflicts prevail between the local communities and the Forest and Wildlife Departments for the use of Guzara forests, Reserved forests and the National Parks. Overall forest management in Pakistan is marked by a very strong and centralised approach with few processes allowing negotiation at the local level to integrate local needs, especially those of the communities living near the forested areas. Although the concept of joint or participatory forest management is being introduced in NWFP, it is still in its primary stage and has not yet been put into practice (Ayaz, M. 2001).

The Pakistan Forest Institute (PFI) located in Peshawar (NWFP) is the main training institute for foresters in Pakistan and includes research sectors such as wildlife, silviculture, social forestry/ agroforestry, sericulture, and medicinal plants. General ethnofloral surveys have been conducted by the PFI including some quantitative surveys especially on medicinal plants. PFI also focuses on cultivation of medicinal plants but little analysis of the conservation status of medicinal plant species at source areas has been conducted (Khan, 1985; 1991). Little importance is given to Non Timber Forest Products at PFI in general as opposed to timber management, which is the priority of the forestry sector in Pakistan.

International NGOs such as IUCN and WWF are involved in Pakistan in work on natural resource management with a strong concern given to the role of local communities. Notable achievements include biodiversity and threat assessments at Zarghoon juniper forests of Baluchistan (WWF -Pakistan, 1998), developing management plans for protected areas, as for example, WWF’s involvement in developing Khunjerab National Park Management Plan including activities for trophy hunting inside the Park (WWF- Pakistan, 1996) or through site-specific projects on particular issues such as management of Chilgoza pine in Baluchistan based on a process of conflict resolution (WWF- Pakistan 2000b). IUCN has been involved in recording traditional management of medicinal plants in Bomberete valley in Chitrail (Ali and Khuwaja, 2003). Among local NGOs, the Agha Khan Rural Support Programme is regionally recognised for its experience related to natural resource management involving local populations in afforestation programmes, cultivation of medicinal plants, and social forestry. International agencies such as the European Union, and the German Agency for Technical Co-operation (GTZ) are also involved in major
projects in close collaboration with the Forest Department: the European Union (EU) project “Environmental Rehabilitation in NWFP and Punjab” and GTZ Joint Forest Management project in Mansera (NWFP). Some policy issues were addressed through thematic workshops by WWF-Pakistan such as those which addressed joint/participatory forest management, land tenure and resource ownership, and curriculum development in applied ethnobotany (Shinwari and Khan, 2001; Hamilton et al. 2003).

Priorities for capacity building in ethnobotany

Ethnobotany is a multi-disciplinary science encompassing botany, anthropology, economics and linguistics, which studies the way in which a society relates to its environment and particularly to the plant world. These relationships can be social, economic, symbolic, religious, commercial and artistic (Aumeeruddy-Thomas and Pei, 2003). Since the early 1980s, there has been an increased focus on local management practices by ethnobotanists as a result of more global concern about the environmental crisis. A great number of ethnobotanists engaged in studies to understand the rationale of such practices, the functioning of local institutions relating to management practices as well as their impact on the conservation of biodiversity (Posey, 1985). At the inception of the project in Pakistan, the main objective was to identify gaps in ethnobotanical approaches, especially regarding resource management and issues of sustainability.

An introductory workshop was organised in September 1996, jointly by WWF-Pakistan, the National Agricultural Research Centre and the National Herbarium in the context of the People and Plants UNESCO/ICIMOD ethnobotany project for the Hindu Kush Himalayas (Shinwari et al., 1996). The status of applied ethnobotany in Pakistan was an important output of this workshop which showed that ethnobotany in Pakistan had mainly focused on people’s use of medicinal plants with relatively little concern given to other plant resources, and it was recognised that large-scale trade was endangering the resource-base. However, the practicalities related to resource management, aspects related to tenure, ownership, rights of access, methods of harvesting and exploitation had not yet been investigated. WWF was one of the initiators of that workshop, and the importance of working with local communities for the conservation of resources was an important item of the workshop’s agenda. Consultation during the workshop with conservation managers, academics, NGO representatives, and practitioners such as traditional doctors (hakeems) have shown that there is much interest in using ethnobotany as a tool to learn more about people’s needs and perceptions, in order to design more appropriate conservation approaches. Members from departments of botany at University of Peshawar and Islamia College as well as researchers from the National Agricultural Research Centre have clearly shown their interest in pursuing research activities in the field of applied ethnobotany and agreed to contribute directly through training students in this emerging field. The National Herbarium has also showed very high interest in the field of ethnobotany. The role of NGOs as brokers between local communities, academic institutions and government agencies has also been identified. Finally, practitioners such as hakeems expressed their interest in contributing directly to applied ethnobotany through field training for better harvesting methods and distribution of written mate-

Photo 1. Attendees at the first applied ethnobotany workshop held at Ayubia National Park, Peshawar University Summer Camp Baragali, 1997.
which developed in Pakistan for applied ethno-
obotany actually led to focusing the second phase of the project from 2000-2004 on a program of curriculum development at the national level in applied ethnobotany for universities and educational centres in forestry.

Ayubia National Park

Ayubia National Park was chosen for developing this project in applied ethnobotany because it is representative of many situations encountered in other forested areas in NWFP, i.e. very high pressure on resources due to a high population density, mismanagement due to unclear access and tenure regimes, and a high level of conflict between local communities and the Wildlife and the Forest Departments.

Ayubia National Park is located some 2.5 hours drive north of Islamabad, in the Galliat Hills. It was declared a National Park in 1984, with the main objective of preserving its beautiful landscape, ecosystems and biodiversity for scientific research, education and recreation. Altitudes vary from approximately 3,000 m at the Mukspuri Top to 2,300 m as an average height throughout the park (Figure 1). Its area initially of 1,684 hectares was extended towards the north in 1998 and now totals 3,312 hectares. The vegetation is said to be one of the best examples of moist temperate forest in Pakistan. It is surrounded by about twelve important villages and three small towns (Nathiagali, Ayubia and Khanspur). It is estimated that about 42,000 people live on the periphery of the park in about 6,000 households and depend on resources from the park, especially for the collection of fodder and fuelwood. The ethnic groups in the major villages surrounding Ayubia are Karalls and Abassis, with mostly Karalls in the villages of Malachh and Pasala and mostly Abassis in the other main villages which are Darwaza, Mominabad, Ramkot, Rial, and Lahurkas. They speak a common language known as Hinko. Other groups such as Syeds, Gujars, Mughals, Awans, and Rajputs are present but are much less represented. Most of the villages are close to the main road which runs through the small towns. The villages are surrounded by agricultural lands which are confined to valley bottom terraces and grasslands and forested land on the steeper slopes. Most of the forests outside the park are either Reserved forests which are in principle restricted from use by the local population or Guzara forests which are either private or community forests but which are however highly restricted as regards the cutting of timber, in particular conifers, which remains under the control of the Forest Department. In principle, people may use grass, shrubs and collect deadwood. Some of the areas designated on the map as Forest Reserves or Guzara forests are now denuded lands or at best grasslands.

Most of the vegetation in and around Ayubia National Park is heavily influenced by people. The vegetation of Ayubia which seems fairly well preserved in places, is dominated by coniferous species principally Pinus wallichiana and Abies pindrow mixed with scattered broad-leaved tree species such as Quercus dilatata, Aesculus indica, Ulmus wallichiana and Prunus padus. However, due to human impact in the park, populations of broad-leaved trees have declined; on the other hand Pinus wallichiana and Abies pindrow being very resilient, large areas now have been colonised by these two species leaving seemingly little space for broad-leaved species to grow and a relatively poor vegetation in the understory. Outside the National Park, forested areas are almost entirely composed of Abies pindrow in the northern aspects, and Pinus wallichiana elsewhere (Photo 2).
Ayubia National Park is a major recreation area and a large number of local tourists visit the area, mostly from Islamabad and Abottabad. Though no official figure is available regarding the number of tourists, local estimates vary from 90,000 to 100,000 people visiting per year. Numerous hotels as well as summerhouses are located in the periphery of the park in Nathiagali, Ayubia and Khanspur. The park has developed some fairly good infrastructure for the tourists who can walk along a well-demarcated path crossing the park from Dungagali to Ayubia, enjoying the view and the feeling of wilderness.

Despite complete legal prohibition for extractive use of products from the National Park, people, especially women, rely heavily on this area for fuelwood and fodder (both trees and herbaceous) collection (Photos 3 and 4). Though they prefer collecting deadwood, pruning of green branches and felling of small trees also occur. Broad-leaved tree species and Taxus wallichiana, a conifer (yew), are favoured for fodder, especially in early spring when grasses are not yet available. Grasses and herbs are collected abundantly from April to September in the park in “woman-made” small clearings in the forest (Photo 5). Much larger pasture areas at the highest altitudes such as at the Mukspuri Top are specialised areas where some livestock are left to graze freely during summer (Photo 6) Other resources collected from the National Park include mushrooms, medicinal plants and wild vegetables. Timber is also extracted illegally, not necessarily by local people but also possibly by “outsiders” through a network of influential people (Photo 7). Though hotels and summerhouses buy fuelwood from other areas, cases of fuelwood extraction from the park have also been noted. Free grazing in the park by oxen and buffaloes is a current feature and badly affects the regeneration of broad-leaved palatable species. Outside the National Park, people also collect fuelwood, mostly through pruning of tree branches (little dead wood remains), both in Reserved forests and Guzara forests (Photo 8). Trees are ring-barked so that people may have access to deadwood as the trees progressively dry up and also possibly to have access to more grasslands rather than forested lands (Photo 9). Grass fodder is mostly collected in open areas of grassland, and free grazing by cattle as well as goats currently occurs. Goats are not left grazing in the park because of the fear of leopards. Many resources including some medicinal plants, mushrooms, most broad-leaved tree species and some herbaceous plants have become scarce outside the National Park. Broad-leaved tree species are planted or preserved in agricultural lands. These are fruit trees, but fodder trees such as Ulmus wallichiana and Quercus dilatata, and shrubs such as Indigofera sp. may also be found quite abundantly in some villages. The trees are old, and probably originate from wildings which have been preserved; no regeneration is occurring due to cattle and goats grazing freely in the agricultural lands after the harvest season.
Photo 6. Mukspuri Top, inside ANP, a large man-made pasture area for non-milking cows and buffaloes which are left to graze freely during the summer.

Photo 7. Marked tree in Guzara forest which signifies that this tree belongs to a particular person who will harvest it for timber, and Mr. Bashir involved in the village of Malachh in the protection of community forests.

Photo 8. *Pinus wallichiana* lopped by women in the lower part of the tree crown for fuelwood.

Photo 9. Ringbarked *Pinus wallichiana* in a Guzara forest near Malachh.
An interdisciplinary team approach with strong linkages with local communities

The project team was conceived to include young professionals, academics, and people from local communities; a field office was established to facilitate project staff’s full involvement at the field level. Close collaboration with a Project Advisory Committee (PAC), which included community representatives, NGOs, and Wildlife and Forest Department staff, was ensured from the inception stage and has been consulted throughout the project. The Project Officer, who stayed full time at the project site, ensured liaison between all local stakeholders.

Various people have been associated with the work conducted at Ayubia during the first phase, including a Project Officer (Abdullah Ayaz) who is a forester, three student botanists (Iram Ashraf, Asma Jabeen and Aneel Gilani) who conducted ethnobotanical research as part of MSc or MPhil degrees and who also worked temporarily as consultants, or research assistant, a social forester (Junaid Khan) and a sociologist (Hasrat Jabeen) who are young professionals (Photo 10). Asma Jabeen has been mostly associated with work conducted on fodder, and is in the process of writing a PhD thesis on fodder management at Ayubia National Park. Ms. Hasrat Jabeen has been responsible for the work conducted on fuelwood, regarding surveys as well as implementation of the social forestry aspects. She is the initiator of the fuelwood efficient stove scheme. Two field assistants from local villages, Ms. Sabiha Zaman and Mr. Mohammed Sajjad, have also played important roles in this project through liaising with local villagers and providing direct assistance for field surveys. The Regional Coordinator (Yildiz Aumeeruddy-Thomas) for Himalayas and the People and Plants Programme Coordinator (Alan Hamilton) provided technical support in collaboration with Ashiq Ahmad Khan, Chief Technical Advisor at WWF Pakistan. Yildiz Aumeeruddy-Thomas also conducted joint field research with the students and young professionals as a means of training as well as providing orientation for their academic work in close relationship with their research supervisors. The project staff also received regular training with help from different institutions including WWF Pakistan, Lahore office, Pakistan Forest Institute, and the National Agricultural Research Centre. Mr Abdullah Ayaz, in addition to his overall role as Project Officer, conducted specific surveys, especially regarding analysis of levels of damage upon trees, and of the vegetation history of the area, and took a leading role in the implementation of the social forestry component of the project.

Linkages with local communities were ensured through the setting up of a number of committees and working groups to improve coordination between the project and the local villages. Project Advisory Committees and Local Village Committees were set up in 1997 and have been consulted on a regular basis to provide feedback from the project and to discuss the results of the different surveys undertaken, as well as to plan further activities.

The Project Advisory Committee mainly aimed at bringing together on a common platform representatives from local villages, government agencies such as Forest and Wildlife departments staff, as well as representatives of other social groups present, such as hotel owners. These committees have been functional throughout the first phase and have played an active role during the second phase in implementation of various project activities. Precise terms of reference (TOR) were defined in 2002 for the Project Advisory Committee, as follows (Shinwari, 2000):

Roles of the Project Advisory Committees are to

• assess the progress of the project;
• suggest a mechanism to distribute stoves, fruit plants, seeds, grasses;
• act as witness to:
  - whatever is agreed between the project and the community,
  - ensure that Terms of Partnerships (ToOPS) are honoured by both sides,
monitor the implementation of various agreed activities, and indicate gaps, resolve conflicts, if they arise between the project and the community, provide necessary advice.

The roles of the Village Advisory Committees were to ensure the participation of all the villagers in the project activities, and to avoid conflicts at village level. The meetings between the project and the Village Advisory Committee were informal and were arranged whenever felt needed by any of the two parties. Usually such meetings were arranged before any new activity started in a village. The membership of such committees was flexible and anyone could attend the meeting. However, the participation of a few key persons in the village including the members of PAC from that particular village was necessary.

Four Women Advisory Committees were established at village level. The aim of establishing these committees was to ensure that women can voice their views or demands, and also to ensure the active and meaningful participation of the women in sustainable use of the park resources.

Active Partner Groups were also formed, involving men and women who are collectively involved in one or more project activities. The purpose of these groups was to ensure more systematic planning and execution of project activities. Such groups were generally formed on the basis of neighbourhood relationships.

A series of national training courses attended by some 25 participants, mainly university professors, students and conservation managers, have been organised at Ayubia. Work at the site was used to highlight the importance of local knowledge, perceptions and practices for developing appropriate conservation approaches and related methods in applied ethnobotany. Participants contributed their experiences to help guide the project (Aumeeruddy et al., 1998). Starting from 2001 on, Zabta Shinwari followed by Habib Ahmad together with an International Project Advisor, Professor Pei Shengji, have been mainly responsible for following up the social forestry activities initiated in years 1999 and 2000, as well as other activities such as the launching of a medicinal plants cultivation scheme, and awareness raising activities in ethnobotany clubs at local schools. New field project staffs were appointed from 2002.
Ethnobotanical approaches and methods

Project initiation

Ethnobotanical work started with the identification of important issues related to conservation of plant resources and needs in capacity building in applied ethnobotany at the national level. This was through a workshop organised in Islamabad by the UNESCO/ICIMOD ethnobotany project in the Hindu Kush Himalayas, as part of the People and Plants Initiative (Shinwari et al., 1996). The site was chosen with the help of WWF Pakistan because ANP’s situation is representative of major forest issues in northern Pakistan and because its proximity to major towns would facilitate capacity building at the national level. Planning of activities at the site level was further conducted with community representatives, local NGOs, state agents, and Divisional Forest and Wildlife Officers (Aumeeruddy, 1996).

Ethnobotanical work started at ANP in 1997 by WWF Pakistan with technical help from the People and Plants Initiative. The programme of ethnobotanical work was devised with the following points in mind:

1. Involvement of local communities in park/forest reserve management is not well developed in Pakistan;
2. Experience in ethnobotany applied to conservation and development is a relatively new subject here;
3. Gender issues are important (see above), and a major question is how women can be properly involved in planning/management systems;
4. Tenure regimes and relationship to management is an important issue which relates to the policy level.

Given the considerable amount of progress needed to find better solutions, it was thought best if the project concentrated initially on three aspects:

1. Trying to get good objective documentation on the present state of plant resource use (who is using plant resources and for what, which resources, impact of use on the resources, regimes of tenure, decision making system);
2. Trying to build confidence with local communities who are very sensitive to projects related to plant use;
3. Trying to encourage avenues of communication between communities and government agencies.

Baseline surveys

The first year’s activities (March-December 1997) consisted in baseline data collection to assess:

1. Overall activities related to plant resource use, with a focus on fodder, fuelwood collection and related women’s knowledge as these subjects were identified from the beginning as being important;
2. Local and formal tenure regimes of resources (land and plants) in areas situated outside the National Park, and informal and formal control systems inside and outside the NP;
3. State of conflicts and problems and demands of different local actors;
4. Vegetation status, an exercise meant to give the project staff some insights into vegetation dynamics, regeneration patterns, impact of trampling, grazing, fuelwood and fodder extraction.

The project also trained an MSc student whose work focused on the use of medicinal plants in and around the National Park. A national level training workshop was conducted which was attended by some 25 participants. The project also conducted a number of parallel activities such as lectures at local schools, establishing an ethnobotanical trail along the most-used public track in the park, and devising pamphlets and stickers. An informal policy level meeting was held with high officials including among others, Commissioner of Hazara District-Forest Department Secretary, representatives of the European Union Natural Resources Conservation Project Galiat—a social forestry project working with the government on joint forest management issues.

Methods used were: group discussions, household questionnaires and informal surveys, either in villages or on the ground; vegetation plots (50x20 m) were set up and parameters recorded, including DBH and approximate height of all trees, damages to trees and their reactions (Photo 11), and number of seedlings and saplings in five 10x10 m sub-plots. Herbs and shrubs were identified in five 10x10 m sub-plots and density/coverage of herbs in five 1x1 m sub-plots.

As a result of the first years activities, it appeared that fodder, both tree fodder and grass, are collected in the park. Grass fodder is also collected on farmlands. Grass fodder collection does
not seem to affect the resource in the park, while tree fodder collection, such as collection of oak leaves through the lopping of branches, may well be affecting the regeneration of oak in the park. Fuelwood collection is affecting the stock of standing trees in the park; many tree branches are lopped, but young trees are also cut (Ayaz, A. 1998).

Due to this situation, alternatives for fuelwood and tree fodder collection need to be found. Planting trees in agricultural lands is not feasible as agricultural lands are even too small for meeting each family’s needs; by-products of agriculture (maize straw) used as fodder are also produced on agricultural lands and introducing trees would only decrease production of agricultural crops and fodder.

The initial baseline survey which aimed also at understanding the different tenure regimes of forests located in the periphery of the park showed that there was a great level of confusion, especially regarding the limits between Guzara forests and Reserved forests (Photo 12). Within Guzara forests, it appears that there are some informal arrangements for the use of different Guzaras by different parts of the same village or different villages, but the rules of access are unclear. Trees growing in the Guzaras are in addition still under the control of the Forest Department, a situation which highly discourages tree planting in the Guzara. People can only collect dead wood. As a result of this, very serious damage to trees through debarking leading the trees to dry up and eventually die, is currently found in the Guzara/Reserved forests. Finally the situation is made more complex by the fact that an influential network of men, locally known as the timber mafia, harvest trees in the Guzara/Reserved forest. It is in the context of this background that women’s requirement for fodder and fuelwood needed to be analysed.

Developing Guzara forests is a potential alternative to reducing pressure on the National Park, providing clear management prescriptions are accepted both by the communities and the state agencies. Besides, it seemed that grass collection in the park could be allowed on a controlled basis without affecting the park’s integrity. More data were still needed to verify whether pheasants’ nests were affected by mushroom collectors. The policy level meeting contributed to reinforce the objectives of the project, one of which is to provide enough data to enable the state agencies to make decisions.

Focused research on fuelwood and fodder

Based on these preliminary results, the second year’s approach was readjusted to achieve a main objective, which was to propose a joint state and community management model (starting with one community and a small group of people) to the state agencies for consideration. Possible elements of this management model were: tree cultivation in Guzaras for fuelwood and fodder by well organised user groups; grass collection in the park on a prescribed basis; and possibly collection of mushrooms and wild vegetables in the park. Deadwood collection in the park should also be considered if no wood can be provided by the state on a subsidized basis.

In order to achieve this new orientation, the project proceeded from November to December 1997 and from March to September 1998 with the following surveys:

1. The social structure and decision making processes at the village level;
2. The bribery and fine system;
3. Demands in fuelwood both by women and by hotels - types of wood collected, areas of collection, structure of collection groups, timing, storage etc.;
4. Demands and supply in fodder, types of fodder collected, where, by whom etc.;
The level of damage on specific tree species including *Taxus wallichiana*, *Cedrus deodara* and *Quercus dilatata*.

Data resulting from these studies and a possible management system were presented at a policy level meeting in October 1998.

Methods

Methods used during the second year of the project were for the specific subjects covered by the project, as follows:

1. **Fuelwood** – in winter a sampled number of households was selected mainly in Malachh and Pasala and the amount of wood in fuelwood piles stored for winter time was measured, the species collected were identified as well as parts collected and types (branches, trunks, dead, green etc.), collection areas in the Park, time needed for collection, and the tree species available on the farms. In spring, an indoor survey was conducted with a sample of 40 households from three villages around the Park: Pasala, Malachh, and Lahurkas. Field trips were conducted to the collection areas with nine groups of women (each time one group of women). The sociologist, Ms. Hasrat Jabeen, followed women collecting fuelwood in the National Park to assess techniques of collection, species collected, amounts collected, as well as areas of collection. Back to the village from the trip, the work consisted in sorting out the amounts of each tree species present in the headloads. A village survey with the same nine groups was conducted to evaluate the type of storage and amounts, as well as seasons of collection. A fuelwood survey was conducted in almost all hotels (21) in the surroundings of the National Park in five main villages, which are Dunga Gali, Nathiagali, Ayubia, Kooza Gali, and Khanspur. Information was obtained by visiting the wood stores in each hotel, identifying directly the type of wood, measuring length and diameter of wood samples, volumes of wood stored, and interviewing the hotel staff. Finally a survey was also conducted in summerhouses in three villages: Ayubia, Dunga Gali and Nathiagali. The surveys were mainly conducted with the help of the watchmen who are permanent, whereas the rich owners generally visit only between June and September. Wood used during winter is mainly for the needs of the watchmen.

2. **Fodder** – a questionnaire survey was conducted with 24 households in winter (1997-1998) (10 in Malachh, 10 in Pasala, 4 Khanspur) followed by another questionnaire survey in spring with a group of ten households to assess fodder produced and purchased as well as major characteristics of the agricultural system. A field survey was conducted in winter by Asma Jabeen in the context of her MPhil, by measuring amounts of fodder on the homestead with a prior study of local units of storage, identifying species used and storage system. Field trips were conducted in spring with women groups collecting fodder in the National Park, and a similar approach was adopted as with fuelwood. In addition, biomass plots were set up in different areas to characterise the production of grass over the season. The criteria used for sampling households, both to conduct the fuelwood survey and the fodder survey, were the people's willingness to respond. High sensitivity of women who are in an illegal position was a main issue while conducting these surveys, and the mediation of the field assistant, Ms. Sabiha Zaman, and the fact that the project staff were mainly women (apart from the project officer), have greatly helped.

3. **Damage levels on trees** – surveys were conducted along trails counting encounters over five meters on the sides of the trail to assess the present population structure of three tree species. Data from the fuelwood and fodder surveys allowed identification of the villagers from which people were collecting in these areas, and which species were preferentially collected. Data are correlated between these different surveys to obtain more insights into what is used, and the impact on tree population structure.

4. **The sociological survey** consisted of a questionnaire survey on aspects related to decision-making systems and user group structure.

5. **The Survey of mushroom and wild vegetables** collected in the National Park was conduct-
ed on the basis of a semi-structured indoor survey as well as a number of field trips with women collectors to verify habitats and collect samples of plants and mushrooms. The survey was conducted with a sample of 40 households mainly based on households willing to answer questions, most people generally not wanting to disclose information related to an activity which is formally illegal. People who responded to the survey in each household were actually those people who were engaged in collection of vegetables and mushrooms.

Research work conducted after the second year of the project focused on fodder, but short surveys were also conducted on traditional tree management in homestead areas, the history of vegetation cover in the area, and a survey of people’s willingness to manage Guzara forests. We are presenting here briefly only the methods relating to fodder.

(6) Research conducted after 1998 – Elements of research which were carried out after 1998 were mainly related to fodder production in the National Park as well as in homestead areas. This is because it was felt that data needed to demonstrate the overall fodder management system were still missing. It was thus decided that Asma Jabeen would continue at least until 2000, in the context of her PhD field studies, to conduct a number of surveys to obtain a complete picture regarding fodder management in ANP and in the surrounding forests and homestead areas. Major aspects covered were:

(a) A detailed analysis of fodder management in farmlands for fodder production, including identification of land use units dedicated to fodder production, and areas of Guzara forests used etc.

(b) Fodder use patterns in the National Park as well as characterising of headloads collected from the National Park.

(c) Biomass and floristic studies to estimate the useful productivity of collection sites in the National Park, Guzara forests and Rakhan, as well as the effect on plant diversity of overall collection patterns in the park (Photo 14). Results relating to the biomass and floristic studies are not given in this paper as they are being analysed by Asma Jabeen and detailed results will be available in her thesis.

Major results

FUELWOOD – The survey on fuelwood showed that the main source for collection of fuelwood is the National Park. Women collect mostly deadwood but may also prune live branches or cut small trees if deadwood is not available. Collection sites are clearly identified, and bear specific names.

Analysis of presence and absence of fuelwood species in collection areas and occurrence of species in bundles and headloads show that although Quercus and Taxus are present in most of Pasala collection sites, no groups out of seven are collecting Quercus and only one group is collecting Taxus.

Even though Quercus and Taxus are good fuelwood species, occurrence of species in headloads shows that in Pasala and Malachh, Pinus and Abies remain the most collected species. In collection areas showing a northern aspect, Abies is in larger quantity than Pinus in the bundles, and vice versa in southern facing collection areas. It was found that only one group out of 11 collects Quercus (from Malachh) and two groups collect Taxus (one from Malachh and one from Pasala).

Women collect mostly Abies or Pinus for a number of reasons. Women collect mostly dead wood, either on the ground or from the trees because green wood is heavier and therefore more difficult to carry over long distances. The species that is most abundant in each area is also the one which produces more deadwood, hence the pre-
dominance of either *Abies* or *Pinus*, depending on where the women have been collecting. Another reason why women do not collect *Quercus* for fuelwood is, because, according to some, they prefer to preserve this species for fodder. During exercises conducted during the training workshop in October 1999, it appeared that some women manage *Quercus* according to a rotation cycle, leaving some individuals to recover for up to 10 years, a practice which shows their interest in maintaining the resource base.

Collection groups are made mainly on the basis of neighbourhood – women within a group are not necessarily bound by family linkages. However, houses are often clustered according to family linkages though this is not a formal rule. The groups vary in size from 3-5 to 31-40.

Bigger groups are those which have to travel longer distances, either because villages are located far from the National Park border or because these groups have decided to go to collection sites which are remote in the park. Women from Pasala village visit twice as many collection sites than women from Malachh, confirming a trend already recorded in a survey conducted in December 1997. This may be due to the fact that Pasala village is more scattered and spread out over a larger area than Malachh.

The situation of Lahurkas (a remote village with difficult access to the road) is hard to interpret as only one group of women has been observed. Observation of this group however showed that they had cut a whole live tree of *Quercus incana* into small pieces. This may be due to the fact that the practice of “buying” trees from the park seems to be more widespread in that area, hence the women’s eagerness to cut a living tree. Data is insufficient at this level to understand that situation.

The average weight of wood stored between mid-June and mid-September is 2,385 kg/household. During summer, it was found that each family uses an average of 19.8 kg of wood per day. In winter, the average is of 42.2 kg per day. Based on these results and on the basis of 150 winter days and 215 summer days per year, it has been calculated that one family needs 11,037 kg of fuelwood per year, that is about 11 tonnes.

Regarding the survey of fuelwood consumption by hotels, a major finding is that hotels are to some extent also using fuelwood illegally from the National Park. Based on a total number of 21 hotels (virtually all hotels located in the surrounding of Ayubia National Park) surveyed, it was found that they use an average of 50.9 kg of wood per day in summer and 45.6 kg when open in winter (not the case for most hotels). For the summer period alone (about 215 days), the total amount of wood used by hotels surrounding Ayubia represents some 300 tons of wood (an average of 14 tons per hotel per summer season). Although hotels use wood partly originating from the lowlands with species such as *Dalbergia sissoo* and *Robinia pseudoacacia*, it was found in hotels of three villages, namely Dunga Gali, Kooza Gali and Khanspur, out of five villages investigated, that most of the wood used was from local sources. Out of a total number of 21 hotels surveyed, eight hotels relied entirely on wood from the area, among which six used mostly *Quercus* species (*Quercus incana* and *Quercus dilatata*). Four out of these six hotels relied entirely upon *Quercus* spp. and *Taxus wallichiana*. Although hotel consumption is low as compared to the total consumption of the population living at the park’s periphery (6,000 households using 11 tons per family per year!), six hotels using an average of 14 tons, mostly of *Quercus* and *Taxus* per year is not negligible. Data is missing however to assess whether the *Quercus* or *Taxus* wood used by the hotels come from whole trees which have been cut up, or mostly from deadwood. These findings show that hotels may well be competing to a certain extent with women through collection of...
species such as *Quercus* and *Taxus* for fuelwood, whereas women would rather prefer to keep such species for collecting leaf fodder.

Regarding summerhouses, it was found, for 20 houses surveyed, that the average consumption per day in summer is 8.5 kg, whereas in winter 40.8 kg were used for each house. This represents an average of about 10 tons per house per year. The most preferred species were *Pinus* and *Abies*, but *Taxus* is also used quite significantly. 15 out of 20 watchmen interviewed reported that they collected wood mainly from Ayubia National Park.

**Fodder**—Farmers living near Ayubia National Park have small landholdings (0.25 - 0.5 ha). Each family rears livestock to meet its daily needs in milk, and occasionally meat. The livestock owned are mainly cows, buffaloes, goats and horses. The average number of animals per family is very low *i.e.* one buffalo or one ox and one goat per family (Jabeen, 1999). Landholdings include agricultural fields as well as non-arable lands known as Rakhan lands, which are too steep or too rocky for cultivation and which are mainly used for grass production. All agricultural fields yield either fodder in the form of residues of food crops (*e.g.* maize) or are fully cultivated with fodder grasses especially when there is not enough manpower to cultivate them. Most men from the area indeed tend to work as waged labour rather than on their farmlands.

The main patterns for “feeding” livestock are as follows:

In winter all animals are stall-fed with residues of agricultural lands, and grass fodder from agricultural and Rakhan land. During September to October, all residues of agricultural crops and grasses from farmlands are gathered and stored for winter. If needed, some families may purchase fodder from other families who have a surplus. In summer, herbaceous and tree leaf fodder are collected from the National Park on a daily basis and fed directly to the animals.

In summer, if time allows, cows and buffaloes may also be brought to graze on a daily basis, in adjacent Guzara or Reserved forests. Goats will generally roam around in the *Guzara* and Reserved forests and are not watched. Non-milking buffaloes and oxen are left during summer in pasture lands inside the National Park and are brought back to the farmland in October.

Major findings of the fodder survey conducted in 1998 were that:

(1) During winter fodder for feeding livestock came mainly from the homestead area, *i.e.* grasses from margins of agricultural fields, straw such as maize and wheat from the agricultural fields, and grasses from private *Guzara* forests (Rakhan). The Rakhan are effectively privately owned and managed for grass. One sample plot from the Rakhan area showed a much higher proportion of grasses compared to the park. This finding is important as it shows on one hand that some *Guzara* forests with poor scattered *Pinus* populations could be turned into highly productive grass fodder production areas, and on the other hand that there may well be parallel opportunities to establish effectively private tree planting in *Guzara* forest if the population has the control over the trees. This is not the case at present due to decisions related to *Pinus* tree cutting still lying with the Forest Department.

(2) In spring and summer, women depend on grasses and tree fodder collected mainly in the National Park. Fodder collected at this period is used on a daily basis. The seasonal fodder collection and production calendar is given in Figure 2.

Harvest starts in mid-March at the beginning of spring, when tree fodder starts to be available. Until about the end of May, women mostly rely on tree fodder until grasses are sufficiently abundant. Tree and herbaceous fodder are collected until late October. Grass fodder is generally preferred to herbs and tree fodder if available. From June to September, headloads are made of a mixture of grass/herbs and tree fodder. Thirty three species of grasses and herbs have been recorded in fodder headloads collected from the National Park. Grass species most commonly collected from the park are *Poa pratensis*, *Agrostis nervosa*, *Bromus* spp., *Chrysopogon gryllus*, *Arthraxon priomoides*, and *Festuca gigantea*. There are variations in the floristics composition of grass headloads collected from the park because grass phenology and growth rates differ highly, and also because women shift from closest collection sites at the beginning of the season to collection sites located further inside the park later in the season, coming back to the initial sites once grasses have grown back to a length which allows collection with sickles. Women during this process of collection have a very selective approach to avoid toxic species or to collect preferred species according to whether they need to feed milking cows, young calves etc. Work undertaken by Asma Jabeen for her MPhil shows that women have a detailed knowledge of fodder characteristics and properties (Photo 15). Moreover this work also shows that there are variations in the floristic composition from one site to another, due to aspect, whether or not the site is grazed by cattle, percentage of tree cover etc. Floristics composition also varies through the season. Grasses (*Poaceae* species) are preferred to herbs by women. This is possibly related to the high water content in herbs as compared to grasses. Carrying heavy headloads of herbs with a high water content is difficult, and represents less ‘feeding’ biomass for livestock. A
The total number of seven grass species and 47 other species, including herbs, ferns, small shrubs, and vines, were found to grow in five sites investigated in the park. A detailed floristic study was conducted by Asma Jabeen (Jabeen, 2000) aiming at comparing floristic compositions, particularly dominance of the most common species in relation to type of ‘management practices’ applied (grazed or non-grazed sites, sites with high pressure of collection as opposed to sites with lower pressure of collection). This comparative approach showed that:

- Grazing affects species diversity and dominance in favor of the development of Poaceae (grasses);
- High pressure of harvesting of grasses and herbs by women affects plant diversity and dominance in favor of certain species of Poaceae such as Poa pratensis;
- Herb species diversity is quite high still because women collect selectively grasses and leave the herbs.

Grass species represent 70 to 80% of headloads collected from the park. Biomass (dry weight) collected per family has been estimated to be an average of 8,517 kg based on an average weight of bundles collected daily and extrapolated to the number of days women collect grasses in the National Park (Jabeen, 1999).

**Figure 2. Fodder collection, production and livestock rearing calendar at Ayubia National Park and adjoining villages.**

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tree fodder collection in the National Park</td>
<td></td>
<td></td>
<td>Grass and tree fodder collection in the National Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock fed with tree fodder</td>
<td>All livestock stall fed with winter feed from farmlands</td>
<td>Collection of crop residues, grasses from agricultural lands and Rakhan, drying and storage for winter</td>
<td>Milking cows with tree and grass fodder from the National Park. Oxen and male buffaloes graze freely in pastures in the Park. Goats graze freely in Guzara forest</td>
<td>All livestock stall fed with winter feed from farmlands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Photo 15. Asma Jabeen giving an overview of the diversity of values attributed to fodder species by local women.**
The preferred species of tree fodder collected from the National Park are *Aesculus indica* (bankhor), *Taxus wallichiana* (barmit), *Quercus dilatata* (barungi), *Ulmus wallichiana* (kain) and *Prunus padus* (kala kath). All fodder collected between May and October is used on a daily basis and is not stored. Collection sites are similar to fuelwood collection sites. Timing is also similar. Collection sites are precisely located inside the park and bear specific names. Each site is used jointly by women from only one village or sub-villages from a common larger village.

**Figure 3.** Sketchmap of fodder and fuelwood collection sites in Ayubia National Park (not including Park extension after 1988). Source: Jabeen, A. 1999.

**Fodder produced in homestead areas and in Rakhan and Guzara forests**

Jabeen (1999) analysed the mosaic of different land types which are identified locally as Doga, Kalsi, Banna, Beth, Thaia and Rakhan, each of these land types being dedicated to different types of fodder production (Table 1).

Maize and other crop residues are produced from Doga and Kalsi. A particular grass, which is locally known as Maniara identified by Jabeen, A. (1999) as an *Alopecurus* species is cultivated on Banna and is cut once a year in September and stored for winter (Photo 16). No specific fodder species are grown on Thaia and Beth but animals are left to graze freely in these areas. The major reason for this is the lack of time and manpower to manage these areas. Rakhan are managed, especially through using fire to eliminate bushes and herb species. This technique favors the growth of a few grass species which are: *Apluda mutica*, *Festuca gigantea*, *Brachypodium* spp., and *Panicum* spp.

Villagers also bring their animals to graze in Guzara forests where they have a right of grazing animals as well as grass and deadwood collection. Reserved forests where people have no formal right to graze animals and collect deadwood have no clear boundaries with the Guzara forests so that people use both types of forests for grazing their animals depending mainly on the proximity of these forests to their homestead areas.

During the months of September to October, grasses are collected from farmlands. Some ten species of grass have been recorded growing in the homestead area (Jabeen, 1999). These are: *Maniara - Alopecurus* spp., *Lundar - Apluda mutica*, *Malla - Panicum* spp., *Dugri - Digitaria* spp., *Bheran - Festuca* spp., *Jodra - Poa* spp., *Rakha na gha - Brachypodium sylvaticum*, *Bhari gha - Aristida funiculata*, *Batkhi - Chrysopogon* spp., *Buron - Cenchrus pennisetiformis* - *Phacelurus speciosus*.

Besides grasses, all residues of crops such as maize and wheat are harvested in September and stored for winter.

Local units of storage have been studied in detail (Jabeen, A. 1999) and show a very structured approach to storage for grasses. The small-
Table 1. Land use types for the production of fodder (after Jabeen, 1999).

<table>
<thead>
<tr>
<th>Land use types</th>
<th>Description</th>
<th>Size</th>
<th>Type of fodder production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doga</td>
<td>Man-made flat terraces</td>
<td>&gt; 8 marla (&gt; 200m²)</td>
<td>Residues of crops such as maize and wheat</td>
</tr>
<tr>
<td>Kalsi</td>
<td>Small man-made terraces</td>
<td>&lt; 8 marla (&lt; 200m²)</td>
<td>Residues of crops such as maize and wheat</td>
</tr>
<tr>
<td>Banna</td>
<td>Field margins</td>
<td>No specific size</td>
<td>Cultivated fodder grass species</td>
</tr>
<tr>
<td>Beth</td>
<td>Potential flat agricultural land not transformed into terraces</td>
<td>No specific size</td>
<td>Bushes and wild grasses</td>
</tr>
<tr>
<td>Thaia</td>
<td>Potential steep agricultural land not transformed into terraces</td>
<td>No specific size</td>
<td>Bushes and wild grasses</td>
</tr>
<tr>
<td>Rakhan</td>
<td>Large forest areas transformed into grasslands with scattered pine trees</td>
<td></td>
<td>Enriched with grasses and use of fire to exclude bushes</td>
</tr>
</tbody>
</table>

Table 2. Grass fodder and agricultural straw storage unit system in Malachh and pasala village.

<table>
<thead>
<tr>
<th>Storage units</th>
<th>Local names</th>
<th>Equivalence between different storage units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handful of grass</td>
<td>Datha</td>
<td>-</td>
</tr>
<tr>
<td>Basic feeding unit of grass</td>
<td>Gaddi</td>
<td>1 Gaddi = 11 Datha</td>
</tr>
<tr>
<td>Intermediate storage unit of grass</td>
<td>Gadda</td>
<td>1 Gadda = 7 Gaddi</td>
</tr>
<tr>
<td>Largest storage unit of grass</td>
<td>Ghara</td>
<td>1 Ghara = 38 Gadda</td>
</tr>
<tr>
<td>Basic feeding unit of maize</td>
<td>Poola</td>
<td>1 armful</td>
</tr>
<tr>
<td>Intermediate storage unit of maize</td>
<td>Loe</td>
<td>1 Loe = 7 Poola</td>
</tr>
<tr>
<td>Largest storage unit of maize</td>
<td>Ghara</td>
<td>1 Ghara = 10 Loe</td>
</tr>
</tbody>
</table>

Photo 16. Dr. Alan Hamilton and Asma Jabeen observing Maniara grasses (Alopecurus spp.) cultivated on field margins for fodder.
The basic feeding unit for one animal per day is a Gaddi, which consists of a number of handfuls of straw. The latter are packed into larger subunits, which are piled up to form a large stack known as Ghara (Photo 17). The same approach applies for maize and other crop straws, but the names of basic and sub-units may vary. The relationship between the different sub-units is given in Table 2.

Another storage system is the Jorian, which are stacks of grasses stored in trees. They are not structured into subunits. This type of storage mainly aims at maintaining grasses in dry condition out of reach of animals.

According to Jabeen (1999), variations in size/volume of Ghara are the following:
- maize = 17 to 47 m³;
- grass = 13 to 24 m³.

This variation makes the calculation of grass supply through the counting of number of Ghara stored on the homestead during winter unreliable for a precise calculation. However, these results can still be used for a rapid estimate of volumes used with consideration of the possible variance in the result. The Loe is an important measure and the most precise as it is the one used for buying and selling maize straw. Families who have surpluses of agricultural residues and grasses from agricultural areas sell these in the form of bundles (Loe), which are measured locally by a 12.5 feet long rope used to tie the bundle. Grass Loes are sold Rps 200 to Rps 300, while Maize Loes are sold Rps 60 to Rps 100 per Loe.

Most families need cash to purchase additional fodder during the winter season. The average amount spent per family varies from 3,480 Rps...
access to Liquid Petroleum Gas is unavailable, for families having more than 0.5 hectares of land to about 5,300 Rps for families with less than 2.5 hectares of land. Crop production, and therefore also fodder production, is decreasing, according to local perception due to:
1. increase in diseases,
2. decrease in soil fertility,
3. bad seed quality,
4. attacks by monkeys.

As part of the overall livestock-raising pattern, oxen and buffaloes are also left to graze freely in the National Park at the end of the ploughing season. Goats are not left in the National Park because of possible attacks by leopards. Oxen and buffaloes tend to graze mainly in man-made pastures in the park. Since these areas of open grassland are not looked after during that period, the animals roam around with a negative effect, especially on the regeneration of broad-leaved tree species.

**Sociological survey**

*Local institutions:* At the village level, families are grouped into Baradris. A Baradri is under the authority of a chief called Badka, who takes decisions regarding family affairs. All Badka of the same village form a council, the Jirga. The village Union Council, which is the government administrative unit at the village level, plays an important role in the village regarding all development activities. Above all, influential men who may or may not be part of the Union Council or the Jirga are the major decision makers.

*Decision-making:* At the family level men are the major decision makers, although women are fully responsible for livestock rearing, fuelwood and fodder collection, housekeeping and childcare. Women cannot earn money except by selling wild mushrooms. Men are responsible for ploughing fields, house construction, and they share tasks with women for harvesting. They are also responsible of earning money, and they take decisions regarding marriage and elections. Women control the choice of seeds (maize and fresh beans) and men buy potato ‘seeds’ from the bazaar. Women also decide on the formation of groups for fuelwood and fodder collection as well as areas of collection.

In four of the households surveyed, women did not collect fuelwood because the households were rich enough to buy the wood from the Forest Department (by payment of an informal ‘fine’ of 2,000 - 5,000 Rps per tree).

**Conflict with Wildlife and Forest Departments:**

In the villages of Pasala and Malachh, people consider the attitude of the Forest Department unacceptable because women are fined 50-200 Rps per bundle of fuelwood collected in the National Park. The main argument is that, since access to Liquid Petroleum Gas is unavailable, women have no choice for heating and cooking other than to collect fuelwood. Confiscation of axes is also considered very bad, and women in groups are to some extent feared by single forest guards because they are very vehement and generally refuse to surrender. On one occasion, a Wildlife Division Officer stopped some women from collecting wood during one of his visits to the area. This resulted in people from villages blocking one of the main access roads to Ayubia and the police had to intervene to enable the Wildlife Officer to leave the area.

The analysis of the informal ‘fining system’ shows that women pay 50 - 200 Rps per fuelwood bundle collected in the National Park. A system of legal fines is also applied; 57.5% of women surveyed out of 40 families admit paying either bribes or legal fines to collect dead or green wood from the National Park; 42.5% women left did not release information regarding bribery or legal fines. Though women rarely collect small trees or bigger trees, the known price for cutting a small tree is 100-400 Rps while bigger trees are paid 2,000 to 5,000 Rps. It should be noted that in Lahurkhas, fuelwood collected from the park is not solely for home consumption but is also sold to the nearby small town.

**Wild vegetable and mushroom collection in the National Park**

As stated above, most wild vegetables and mushrooms are now unavailable in the Guzara and Reserved forests located outside the Park. A certain level of integrity of the forest ecosystem therefore seems necessary to provide these resources upon which local households seem to rely. Moreover, given allegations that women’s activities in the park are affecting pheasant nesting in the park, it was considered important to assess activities related to wild vegetable and mushroom collection in the Park and to evaluate to what extent such activities are actually affecting the pheasant populations. Moreover it was foreseen that the importance of wild vegetables and mushrooms for local economy needed to be considered as an element of negotiation with resource users in the context of joint conservation strategies.

Types of mushroom collected were mainly different species of morel, *Morchella*, locally known as *Kali* and *Surkh Guchi* (*Morchella esculenta*), *Narela* (*Morchella sp.*), *Begar Guchi* (*Morchella sp.*). *Kali* and *Surkh* mean black and red and are apparently phenotypic variations of *Morchella esculenta*, the only mushroom which is collected for sale. The sale price of *Morchella esculenta* at the doorstep varies from 1,500 to 5,000 Rps, mostly on the basis of quality. Amounts collected vary from 10 to 1,000 grams of fresh weight per trip. The season of collection is from beginning of March to mid-May. Thirty eight per-
cent of respondents collect mushrooms on a daily basis and others collect every two to three days or once a week. Time spent for collection varies from three to eight hours daily. For women, collection is associated with fodder or fuelwood collection trips. For women who are not allowed to work out of their house context, guchi collection generally represents the only source of personal cash income. However, women, men and children are involved in this activity. In the 40 households surveyed, the collectors were distributed as follows: 21 women, 12 men, six boys and one girl.

The main vegetables collected are Kunji (Dryopteris stewartii), Mushkana (Nepeta laevigata), Kandhor (Dryopteris blanfordii), Mirchi (Solanum nigrar), and Tundi (Dipsacus inermis). The parts collected are young leaves for all species. The most collected vegetables are the two Dryopteris species, followed by Nepeta laevigata with amounts averaging 7 kg of Dryopteris stewartii, 4.1 kg of Dryopteris blanfordii and 3 kg of Nepeta laevigata per person per season. Kunji (Dryopteris stewartii) and Kandhor (Dryopteris blanfordii) are ferns. The leaves are always cooked as fresh vegetables. The collection season for wild vegetables is between April and the end of June.

Pheasants

Morchella (Guchi) and the two ferns collected tend to grow in moist, shady habitats. As regards the two pheasants nesting in the park, they have the following nesting periods: Koklass pheasant, Pucrasia macrolopha, nests from April to June, and Kalij pheasant, Lophura leucomelana, nests from May to August (Roberts, 1991; Thomas, 1998).

Roberts (1991), who has a secondary residence at Ayubia National Park and is a well-known specialist on the birds of Pakistan, made the following observations about the two pheasant species. Koklass starts nesting in April, continuing through until late June. “They forage mostly […] in open grassy glades where they feed on leaves of grass and other forbs. Nests found at Dunga Gali are generally sheltered under tree roots or under bushes.”

The Kalij pheasant is a resident, endemic to Pakistan. According to Roberts (1991), its main population in Pakistan occurs at the foot of the Margalla Hills (457 m), and some individuals have been observed (very rarely) in the Galiat Range at Changa Gali towards Ayubia, at up to 2081m. Its preferred habitat is low, dense undergrowth of low-elevation forests. The nesting period starts in early May.

Morchella collection ends in mid-May, and thus hardly interferes with the nesting season of the Kalij pheasant. Moreover, given the average altitude (around 2,700 m) of the villages of Malachh and Pasala which were investigated for possible encounters with pheasant eggs during mushroom collection, it seems that there is no possible overlap with the distribution of the Kalij pheasant. Thirty one out of 40 people interviewed reported never having seen any pheasant eggs while collecting mushrooms. The remaining nine people reported that they did find some pheasant eggs, but these eggs are unlikely to be those of Kalij pheasant. Koklass pheasant is still a very common species at Ayubia (Thomas, 1998, pers. com.), and thus interaction between the Koklass pheasant nesting period and mushroom collection around Malachh and Pasala cannot be considered a major conservation issue. More work should be conducted in the lower reaches of the Park to assess the possible interactions between human activity in the park and the Kalij pheasant.

A general proposition for fodder and fuelwood management at Ayubia National Park

Based on the above results, the following general proposition for fodder and fuelwood management was submitted for discussion in January 2001 at the WWF Pakistan level at the end of the first phase of the project (Figure 4).

The proposition was to develop joint forestry schemes using fast- and slow-growing species (those known and used by people from the area) in Guzara and Reserved forests located outside the National Park on the basis of agreements between the Forest Department and the given households.

Inside the National Park, it was proposed that grass cutting be allowed in well-defined areas. This was based on the preliminary results of floristic studies developed by Jabeen (1999) showing that grass collection areas created floristically rich openings, in which herbs and grasses are favored by selective harvesting by women in the otherwise almost closed canopy and species-poor Pinus wallichiana and Abies pindrow forest which dominates the park. Based on experiences in other temperate regions, it is also well known that such ecotones (forest-grassland transitional vegetation) are generally also very favourable to wildlife, including birds which are very important in the context of conservation at ANP. It was also proposed to allow mushroom and vegetable collection as an incentive for habitat protection. Formalising fodder or mushroom and wild vegetable collection inside the Park represented potential elements for negotiation with women to request that they abandon free grazing of cattle in the park as well as fuelwood collection. Regarding the latter activities, attribution of Guzara forests with clear ownership of trees in the context of joint management agreements for fuelwood and fodder tree species, as well as provision of tree seedlings and development of new Rakhan lands in Guzara and Reserved forests for
Grass production were seen as possible compensations. Development of Rakhan would actually mean allocation of forested lands to groups of families or single families and permitting the cutting of trees to allow the formation of highly productive grasslands.

The results of discussions regarding this proposition were that although joint management approaches as suggested could be envisaged as a form of implementation of this project, no rights for collection could be proposed for women in the park because this would create a precedent for all National Parks in Pakistan, and would thus require a change in the law which is very unlikely to happen. This meant that other resources may need to be considered for use in other National Parks, a situation which may lead to a lack of control at the national level because ways for obtaining such permissions may not always be based on such detailed studies as those developed at Ayubia. The only case at present of resource extraction or permitted human activities on a controlled basis from a National Park in Pakistan is that of Kunjerab National Park. Here people are allowed to graze their livestock as long as they do not hunt inside the park. The park authorities have worked with local groups of huntsmen to develop a trophy-hunting project in the park buffer-zone to compensate them for not hunting inside the park. Fuelwood collection is strictly banned inside Kunjerab National Park (WWF-Pakistan, 1996).

Guzara and Reserved forests outside National Park:
Develop family or group level joint management patches for
(1) fast and slow growing tree species
(2) grass management (Rakhan).

Inside National Park:
(1) Allow grass collection in well-defined collection sites.
(2) Allow mushroom and wild vegetables collection as an incentive for habitat protection.
(3) Discourage free grazing and fuelwood collection in exchange of attribution of new Guzara and Rakhan lands, fodder and fuelwood tree seedlings and ownership of trees.

In Homestead areas:
Plantation of fast and slow growing fodder and fuelwood trees.

Figure 4. A proposition for fodder and fuelwood management at Ayubia National Park and in adjoining forest and village areas.
Nevertheless these discussions led to some of the social forestry experiments undertaken during the first phase, such as tree nursery development and a fuelwood efficient stove scheme, to be expanded during the second phase. Rakhan area development – opening more areas exclusively for grass production in either the Guzara or Reserved forests – is an option which has not been considered by the project in the second phase. This is probably because it runs counter to the perceptions of forest management approaches in Pakistan, and the fact that maintaining forest cover is a priority. During the second phase of the project, most efforts were therefore focused on developing alternatives to fuelwood and fodder collection inside the park through:

1. Distribution of native tree seedlings to local villages to increase the production of fuelwood and tree fodder in local home-stead areas;
2. Developing an area of Guzara forest for enrichment planting on the basis of joint agreements with the Forest Department;
3. Expanding the fuelwood efficient stove scheme.

Regarding option (1), a possible side effect, related to the small size of the agricultural lands, is competition between trees and crop/fodder production. However, unused agricultural lands such as Beth and Thaia may be appropriate for tree planting.

Option (2) requires the formalization of agreements for enrichment planting of Guzara forests, providing the terms of agreement give some decision-making powers to women, who may then acquire a real incentive for not collecting fuelwood from the Park.

Option (3) is very important, because such an approach may effectively reduce the overall amount of fuelwood needed in the area.

However, none of these options addresses the issue of grass production, and there does not yet seem to be any clear method of replacing the amount of grasses collected from the National Park, nor the pasture services provided by the National Park.
Part 2: Implementation approaches in practice

Social forestry activities

Background

The implementation approaches were based on the assumption that the improvement of resource management in forest located outside the National Park and on private agricultural lands would help reduce pressure on the Park. Following the results of the fuelwood survey, a second assumption was that the substitution of stoves currently used for heating and cooking with fuelwood efficient stoves would lead to economy of energy and therefore reduce the pressure on fuelwood, in addition to reducing the burden of fuelwood collection by women.

The project tested both of the above-mentioned options at two villages located near the Park boundary on the western side: Malachh and Pasala. These are the same villages where the project had focused research on fuelwood and fodder. A first step was to propose the planting of fast-growing as well as local (not necessarily fast-growing) fodder and fuelwood tree species, either on degraded lands or on farmlands. It was assumed that these nurseries would constitute a source of planting stock for rehabilitation of Guzara forests, if an agreement could be made between the custodian departments and local communities to grant complete rights of access and tenure in Guzaras.

To achieve this, the project engaged with people from these two villages, especially women, to establish nurseries of fast-growing multipurpose and locally preferred species. There were three main purposes to this activity. One was to initiate a process to discuss with the villagers, men and women, an actual plan for increasing fodder and fuelwood production in areas where they have a “legal” control over the resources as opposed to in the National Park where resource consumption is strictly prohibited. The second was to train people in nursery raising techniques. The third purpose was, in the process of planning for the transplantation of the seedlings, to try and clarify, both with the Forest Department and with the villagers, issues of tenure over certain Guzara/Reserved forests where people could engage in tree plantation.

This was seen also as a first step towards discussing a joint management model between the Forest Department and local communities.

The objectives of the social forestry activities were therefore:
1. to develop nurseries of multipurpose tree species on farmlands, and transplant seedlings in appropriate areas following planning with local communities;
2. to provide fuelwood efficient stoves (FES) on a subsidized basis to decrease pressure on fuelwood collection;
3. to enhance awareness of local communities regarding the issue of fuelwood and fodder collection in Ayubia National Park.

The following problems were encountered while raising nurseries, and afterwards:
- Unavailability and use of non-viable planting stock resulted in the failure of some of nurseries.
- Climatic factors like drought affected the growth of plants in the nurseries.
- Difficulties in the availability of labor during the summer season resulted in delay to the completion of nursery raising activities.
- In some nurseries the owners damaged their own nurseries by inadvertently uprooting the seedlings.
- A further problem was that delays to the erection of fencing meant that cattle grazing resulted in damage to some nurseries.

Major results

Tree nursery development

Two villages, Malachh and Pasala, were chosen in 1999 for experimentation with tree nurseries. In order to implement this activity, first of all the major stakeholders were identified, and preparatory meetings were arranged with them to explain the objective of this scheme and to answer their queries. In particular, discussions were held separately with men and women to figure out what species were preferred and where they would like to engage in planting the trees in future. A target to cover 10% of families under the social forestry scheme was set by the project to be achieved during next four years. Interested persons, both men and women, were identified, based on the previous year’s contacts, personal interest, and with the help of members of the Project Advisory Committee. These people were
individually contacted and the availability and suitability of land allocated for nursery was checked.

Sites were selected for nursery raising on a household basis level, and then nurseries were developed with the help of hired labor and the nursery owners. Project staff also participated in this work. Two young women students of the Environmental Sciences Department of Peshawar University doing their internship with the project also joined the project team in developing some of the nurseries. The project sociologist, Hasrat Jabeen, with the help of the women field assistants, was the main initiator of this scheme. It was mostly the women who raised these nurseries as the men were either not available or were not interested in this task. Among the nursery owners, 90% were women and 10% were men (Jabeen, 2000). The nursery owner prepared the land, although the project staff helped in the preparation of beds and with sowing seed. Project staff also helped them in weeding of these nurseries as the activity of weeding tree seedlings appeared to be unusual for women and one in which they did not engage very easily.

A total of 25 nurseries of *Robinia pseudoacacia* (*Kikar*) were established during 1999 in the villages of Malachh and Pasala, and about 50% of these were successful. During the year 2000, 40 nurseries were established in the above-mentioned villages, along with re-sowing in about 12 nurseries damaged wholly or partly during the previous year (Jabeen, 2000). However, at the request of, and chosen by, the villagers, other locally preferred species, such as *Aesculus indica* (*Ban Khor*), *Ailanthus altissima* (*Darawa*), *Populus* sp. (*Sufeda*), and *Salix tetrasperma* (*Bins*), were also tried in that year, along with *Robinia pseudoacacia* (*Kikar*), *Kikar*, *Ban-Khor* and *Darawa* were raised from seed, while *Bins* and *Sufeda* were raised from cuttings (Photo 19).

After germination of the seedlings, a survey was conducted to assess the percentage of success. The growth and mortality of seedlings were monitored in 2000 on a monthly basis until October.

The project staff were trained at Peshawar Forest Institute (PFI) on nursery raising and associated techniques. This helped in the orderly and timely execution of nursery operations such as watering, manuring, and weeding, but availability of space remained a limiting factor. The shape of the nurseries was kept either rectangular or square, depending upon the space available. The average size of nursery established during 1999 was 6.8 m² and during 2000 it was 10.8 m². The nurseries raised could be called temporary bed nurseries. Fairly light, well-drained soils were usually chosen, and heavy clayey soils were avoided. The success percentage remained about 50-60% in nurseries developed during 2000 (Jabeen, 2000). Drought remained the main factor hindering the growth of plants in nurseries. It has been estimated that about 10,000 seedlings would be available from these nurseries for transplantation.

This activity was continued during the second phase of the project to cover the set target, with 70 nurseries raised during 2001, and about 67 nurseries during 2002, in addition to 65 nurseries raised during the project’s first phase.

During 2001, the overall success rate of nursery raising in three villages was only 18%. The reasons for this low rate of success are: (1) the low level of participation in taking care of the nurseries (protection, watering, weeding etc);
(2) the lack of technical skills of the nursery owners;

(3) that people adopted this activity because of other benefits offered by the project but not actually because of interest in raising tree seedlings themselves;

(4) the very long dry season (Ayaz, A. 2001).

Considering these poor results, it was decided to formalize the procedure of selecting partners for establishing nurseries through signing a Terms of Partnership (ToP).

A survey was conducted in 2000 to analyse people’s willingness to establish joint agreements with the Forest Department for enrichment planting of Guzara forests with tree seedlings originating from the tree nurseries. A major result was that the majority of households were very willing to try this new option. Among 23 households surveyed, 83 % showed interest in planting trees in Guzara if a land is allotted to them with an assurance that the trees will belong to them. Eighty seven percent of respondents have less than 2,000 m² of agricultural land, which is not enough for food sufficiency and they cannot therefore plant trees on their own land (Ayaz, A. 2000).

Due to the very low rate of success of nurseries in 2001, terms of partnerships (ToPs) between the project and the nursery owner were developed in 2002 in order to formalize relationships between the project and tree nursery owners. These ToPs aimed at:

- involving people who are really interested in this activity and are willing to take care of the plants and the nursery;
- ensuring that they have acquired all the necessary skills and have the proper tools to handle nurseries independently;
- achieving the required level of participation by the community.

The detailed proposed terms of partnership which was actually signed between WWF and the nursery owners is given in Box 1.

In 2002, the rate of success of tree nurseries increased to 64.5 %, compared with 18 % in 2001. According to Shinwari (2002), the success in tree nursery raising is related to a higher level of interest of nursery owners and better training imparted to people, possibly a direct result of the establishment of the terms of partnership. Another factor was the much better weather conditions in 2002.

### Distribution of seedlings to the nursery owners

During the planting season, the project distributed grown seedlings of preferred broad-leaved as well as coniferous species to nursery owners for planting on their land. The main purpose of this activity was to initiate the process of planting tree seedlings while waiting for the seedlings in the nurseries to mature and reach a sufficient size for transplantation.

The species that were distributed included *Abies pindrow*, *Aesculus indica*, *Bauhinia variegata*, *Cedrus deodara*, *Juglans regia*, *Populus* sp., *Pyrus* sp., *Robinia pseudoacacia*, and *Salix tetrasperma*. The villagers planted out these seedlings on private lands, especially on *Thaia* (steep land which cannot be cultivated) and *Banna* (margins of terraces) land. Children enthusiastically participated in this activity. The project team helped them in digging the pits, removing the tubes and planting the seedlings. About 4,035 seedlings of the above-mentioned species were planted under this scheme.

An additional 5,000 seedlings of the previous tree species, and also *Grewia robusta*, *Morus alba*, and *Quercus incana*, were distributed in July 2001, and 4,000 during July-August 2002. These seedlings were also planted on *Thaia* and *Banna* lands. Species introduced were chosen from amongst the species available in larger nurseries from the Province including from Haripur, N.W.F.P Forest Department and Natural Resource Conservation Project for Galliat.

### Impact of tree nurseries and seedling distribution

By 2002, the overall assessment of the situation, undertaken by Shinwari (2002), was as follows:

- A total of 172 nurseries have been established since 1999 in the two villages of Malachh and Pasala, with an overall average success rate of about 48 %.
- Some 1,000 seedlings were transplanted from these nurseries onto private lands.
- The project distributed an additional 10,000 seedlings of multipurpose trees which were also grown on private lands with an overall success rate of 43 %.
- A total of about 5,300 trees have been planted in a process which involved community participation, capacity building of local people in nursery raising and tree planting, and other aspects which are less easy to evaluate such as mutual learning processes between project staff and local communities, and possible changes in attitudes of communities towards on-farm tree management.

### Fuelwood efficient stoves

The project launched a fuel-efficient stoves (FES) trial during 1999, the purpose of which was to introduce cooking and heating technology that is efficient compared with the conventional systems, and thus to reduce existing pressure on the resources. In this respect the project obtained help from another NGO “Building and...
Construction Improvement Programme” (BACIP) which is working in the northern part of the country. BACIP trained the project’s sociologist in setting up of these stoves and provided the project with eight different designs of FES, which were installed in Malachh and Pasala villages. A collective meeting was organized by H. Jabeen with some 31 women from the target villages. The participants were briefed on the purpose of introduction of FES and entrusted to choose seven households among the women representatives present for the trial experiment. Households were also selected based on the capacity of the women or any other member of the family to keep records during the winter season of wood consumption. A second meeting was conducted with the selected women to explain further practical aspects of how to use the different stoves and to train people to fill in standard data sheet to record fuelwood consumption (amounts used on a daily basis) as well as the duration of daily use of stoves. These discussions were continued during the installation of the stoves in each household. (Jabeen H., 1999). Two households adjacent to each household with a new stave design were further selected to monitor the consumption of traditional model stoves.

Fuelwood consumption as well as duration of use was monitored from 1st November to the end of December 1999 in each household with a new, fuel-efficient stove, as well as in households with traditional stoves, for comparison.

A survey was also conducted with the households during visits conducted in winter to discuss ease of use, safety and other practical and comfort aspects. All households where new stoves were installed were visited at an interval of seven to ten days. During these visits, fuel consumption during that specific day was monitored, previous data sheets checked thoroughly, and guidelines provided to reduce the risk of mistakes in data collection by household owners. The results of a comparison between new and traditional stoves are shown in Table 3.
Two designs were selected during a collective meeting with women from different villages on the basis of their performance and local preference (Photo 20). The consumption of these stoves was 40-50% less than that of the conventional stoves. A local entrepreneur of wood stoves from Ayubia was sent for training in manufacturing of selected stoves to BACIP, Gilgit. Local people, especially women, showed a lot of interest in adoption of these stoves during a workshop arranged in Toheedabad. The project ensured the local production and adoption of these FES with the collaboration of NRCP, Galliat. Two hundred stoves were manufactured locally through the trained entrepreneur and distributed among residents of Malachh and Pasala on 50-60% subsidy jointly provided by NRCP, Galliat and Ethnobotany Project, Nathiagali during 2000 and 2001.

During 2002 the project continued this activity, and in that year, along with simple FES, the project also promoted the use of more advanced models of fuel-efficient heating and cooking systems, in collaboration with BACIP. Two new entrepreneurs were trained through BACIP during 2002. The project also facilitated the establishment of a FES manufacturing workshop in the local market to ensure the sustainability of this programme. Subsidy has also been reduced from 50% to about 43%.

In future the project intends to introduce water warming and room insulation technologies, in addition to further promotion of already introduced FES to increase the efficiency of use of the fuelwood collected from the local forests and the Park, in collaboration with BACIP and NRCP.

Table 3. Comparative consumptions of new design and traditional fuelwood stoves (after H. Jabeen, 2000).

<table>
<thead>
<tr>
<th>Stove no.</th>
<th>New Design</th>
<th>Traditional stove 1</th>
<th>Traditional stove 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per hour consumption in November (kg)</td>
<td>Per hour consumption in December (kg)</td>
<td>Per hour consumption in November (kg)</td>
</tr>
<tr>
<td>1</td>
<td>1.55</td>
<td>2.20</td>
<td>2.85</td>
</tr>
<tr>
<td>2</td>
<td>1.59</td>
<td>2.05</td>
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</tr>
<tr>
<td>5</td>
<td>1.57</td>
<td>1.81</td>
<td>2.85</td>
</tr>
<tr>
<td>6</td>
<td>1.63</td>
<td>1.65</td>
<td>2.90</td>
</tr>
</tbody>
</table>

Photo 20. Little girl from Toheedabad standing by one of the two models of the fuelwood-efficient stove which has been widely accepted locally.
Rehabilitation of a forest at Malachh

As a first step towards community involvement in the management of forests, the project, in collaboration with NWFP Forest Dept., NRCP and a local CBO, established nurseries to produce planting stock for rehabilitation of about 12ha (about 30 acres) of Reserve forest (Rakh-B) near Malachh village. NRCP and the Forest Department provided the seedlings for planting up the area. The local CBO is undertaking the job of looking after the nurseries and the plantation.

Specific interventions to improve fodder production

DISTRIBUTION OF IMPROVED MAIZE SEED

The existing variety of maize produces low quality and quantity of grains in the project area. The reasons for low production are the use of conventional methods of farming, low soil fertility, weed growth and use of poor quality seed. The project purchased improved maize seed from NARC and distributed it among the local people on 50% price subsidy. The project staff also provided advice on other aspects including weeding, and the use of farmyard manure and fertilizers to improve the production from their lands.

PROMOTION OF IMPROVED FODDER VARIETY

Excessive collection of fodder from Ayubia National Park and surrounding forests is another major issue in the area (Photo 21). In order to reduce this pressure, along with various other steps taken, the project also introduced an improved fodder variety on the advice of fodder experts at a community development project in Muzaffarabad, AJK – the “Neelam and Jhelum valley community development project”.

The species concerned is Sudan grass (Sorghum vulgare var. sudanense). This is a multicut species and matures in 45 days. It produces about 50-60 ton/ha (about 20-25 ton/acre) if proper manure is applied. Its seed was acquired from the Fodder Research Institute, Sargodha, Punjab.

On the assumption that local knowledge about plant resources is dwindling, this project engaged in some activities to evaluate children’s knowledge as well as developing activities to enhance their knowledge.

To address this issue, ethnobotany clubs were established in local schools so that children and their teachers could enhance their knowledge about the plant resources. At present, ethnobotany clubs have been established in nine schools (both boys and girls schools). Various activities were designed for member students from which they were able to learn more about the plants around them and their importance. These activities included holding of quiz competitions and debates on issues related to degradation of plant resources, in addition to general club activities. Although these clubs are working with a broader aim to revitalize local knowledge of plants, they also provide extra-curricular activities for students.

The objectives were to:
- enhance and propagate children’s knowledge about plant resources of Ayubia National Park;
- develop skills among children through which they could identify plants and the problems related to their unsustainable use;
- bring positive attitudinal change in the students for the success of future conservation initiatives in the project area.

After the establishment of ethnobotany clubs in schools, the following activities were undertaken that focused mainly on identification and learning of plant use. Lectures on the importance of plant resources of the Park and the need for their sustainable use were delivered in schools to the students by the project staff. Students were provided with display boards having photographs of useful plants from the Park with captions mentioning their names (local and scientific) and local uses. They were also provided with notebooks and asked to collect new plants and record information about these plants after consulting their elders. Visits were arranged for the students to the Park to improve their observation skills and to identify the plants. During these visits, students were also informed about various conservation issues in the Park. Students in two schools were involved in raising nurseries of fast-growing multipurpose tree species to raise their awareness of the importance of growing trees. Quiz competitions and debates were arranged among member schools on issues related to degradation of plant resources, and the students were also given prizes for best performance.

The results of these activities were encouraging. Student members of the ethnobotany clubs learned the names and uses of important plants, including plants of economic value. Members were also found to be quite aware of resource degradation in the Park and of the possible after-effects.

An important lesson learned through these activities was that children get proper motivation and learn more only if they are allowed or guided to identify the issues, and to seek solutions.

Three teacher-training workshops were conducted, both for male and female teachers from the schools in the project area. The objectives of these workshops were to develop a better understanding of the plant resources of Galliatt; to determine the actual and potential threats to these resources; and to devise a strategy to engage students in activities focusing on knowledge about plant resources and skills to conserve them.
Conclusion and discussion

This project has focused on fodder and fuelwood, which are two resources of major importance throughout the Himalayan region. The first phase of the project (1997-2000) involved applied ethnobotanical research along with experiments for implementation. Research started with baseline surveys on subjects identified as important during initial project planning sessions, such as overall women’s activities related to fuelwood and fodder management, tenure and ownership issues, overall impact of resource extraction on the National Park, to more precise subjects of investigation. The latter cover a large range of issues including decision making systems, formal and informal fining system, social relationships within collection groups, quantification of fodder and fuelwood consumption, land use and associated fodder production system in homestead areas, and floristic studies of fodder collection areas. The second phase of this project has largely focused on implementation especially with the expansion and reinforcing of social forestry approaches and social forestry including fuelwood efficient stoves. Promotion of a new grass fodder variety as well as improved maize seedlings has been undertaken as well as experimentation with the domestication of native medicinal plant species and exotic species. The results of the medicinal plant experiment are not presented here, as this experiment does not directly relate to the fodder and fuelwood management issues addressed in this working paper.

The findings and implementation of this project show that there are major issues of power that dominate the scene of fodder and fuelwood management at Ayubia National Park and in the surrounding areas. These issues relate for instance to the fact that women are interested in herb and grass diversity for fodder, but that men, especially those from the Forest Department and also influential men from the village, are especially concerned with conifer species such as pine or cedar. Those species are under the total control of the Forest Department or of groups of influential men. Women on the other hand have little if any decision-making power in the process of negotiating new solutions. This project has attempted though to work with women, and some alternatives or solutions to enhance fuelwood and fodder production outside the National Park have been proposed. These include tree nursery development with the aim of planting fuelwood and fodder-producing trees in private lands as well as in Guzara forests, and provision of fuel-efficient stoves to decrease the amount of fuelwood used and therefore the burden on women of fuelwood collection.

The work undertaken with summerhouses and hotels also shows that women may well be in competition with hotels for certain resources that the latter extract partly from the park, such as *Quercus incana* or *Taxus wallichiana* for fuelwood, whereas some women on the other hand tend to protect such species because they coppice readily and are an important source of leaf fodder. With the participation of hotel managers, the project attempted to develop ethical guidelines regarding use of fuelwood by hotels, but this particular activity was dropped with the realization that hotel consumption of fuelwood was not significant compared with the amounts used by the local population.

Since grass fodder collection inside the park cannot be controlled on a formal basis, an important question is raised of what biodiversity should be preserved inside the park. Indeed, although research has not been undertaken to demonstrate this very fact at Ayubia National Park, restricting access to women for fodder collection in the park could actually lead to the “invasion” by *Pinus wallichiana* or *Abies pindrow* of the floristically rich ‘women-made’ grassland areas in the park, with possible side effects also on other groups of species such as birds which readily use such ecotones or transitional vegetation. This is an important area of investigation which had also been suggested at the end of the first phase of the project. It would actually be very important in future to understand in some detail to what extent populations of resident and migratory birds use the different habitats in Ayubia National Park including the open fodder collection areas. At present, the informal and formal fining system actually allows fodder collection although it is legally totally restricted. This fining system benefits to some extent those who receive the ‘informal’ fines and possibly benefits biodiversity conservation as this helps to maintain fodder-collection areas inside the park. Women benefit the least from this more or less established system.

Free grazing remains an important unresolved issue because overall baseline vegetation surveys as well as surveys of damage levels of trees show that there is little regeneration of palatable tree species such as *Quercus* species or *Taxus wallichiana* inside the park. Providing alternatives to free grazing is a very tricky issue
as free grazing not only represents amounts of ‘biomass’ grazed which could be substituted by the production of the same biomass outside the park, but it also represents time that people may use for other activities while their livestock graze freely. Management of large Rakhan areas outside the park should be considered, especially given the fact that women already have some knowledge of ways to manage these highly productive grassland areas. This however implies the felling of pine trees to favor the growth of grass.

From a development perspective, the study of the overall fodder management system shows that there is both a complementarity and a seasonality in the use of fodder. During the winter season fodder is exclusively produced in the homestead areas as well as in Rakhan, whereas during spring and summer fodder comes mainly from the park. This is an integrated system which relates to issues of animal diet, and land availability in agricultural areas for producing fodder, as well as to the overall timing of agricultural activities.

The experiments in social forestry for fuelwood and fodder tree production as well as the adoption of fuelwood efficient stoves by many households in the area are very positive. The bottleneck resides in capacity in future if this project continues to develop joint agreements with the Forest Department for management of trees in Guzara and Reserved forests, with clear ownership of trees by either individual households or groups of users.

Lessons learned

The main lessons learned from the work in applied ethnobotany at Ayubia National Park are as follows.

Applied ethnobotany has been an effective tool at Ayubia to approach the complex issues of resource management. A multidisciplinary approach has been adopted, including botanical, sociological, and ecological approaches and the capacity to communicate with people in a situation of high conflict over resources.

The methods and approaches adopted need to be gender-sensitive. Three out of four young botanists and sociologists who worked with the project were women. In the context of Pakistan this is essential.

A field office based at the project site has been essential to create links with the population.

In a situation of high conflict over resources, a minimum of three years is needed to identify possible solutions, as information related to resource management is revealed very gradually and the project accordingly has to readjust its objectives as it evolves.

The results confirm the value of a general survey at the beginning, to identify critical issues.

This project has highlighted the critical importance of land tenure and resource ownership issues, in relation to good management – these are matters which need further emphasis in Pakistan, and they also relate to the policy level.

Concrete propositions such as tree planting schemes, and trials of fuelwood-efficient stoves are important in a context of high poverty and where people have difficulties understanding more academic approaches.

It has proved useful to combine national training and site level demonstration.

It is uncertain at present as to how far spreading awareness will help. This seems to be a side issue – awareness is high among those who plan the use of resources (i.e. women). Awareness is critically lacking amongst hotel owners, summer residents and tourists, who also use the fuelwood resources if not the fodder. Fodder headloads contain some 37% of valuable medicinal plants (Shinwari, 2002), of which six plants are of tremendous economic value. Accordingly, the awareness program has to consider a wider perspective in future, including possibly comparing the medicinal and fodder values of the species which are collected.

This project shows the vital importance of establishing mechanisms for communication between relevant parties (communities, agencies; men, women). It also shows that a co-ordinated approach involving all the development and conservation agencies active at Ayubia National Park is required to ensure sustainability in conservation efforts.
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Acronyms and abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>ANP</td>
<td>Ayubia National Park</td>
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<tr>
<td>BACIP</td>
<td>Building and Construction Improvement Programme</td>
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<td>CBO</td>
<td>Community Based Organisation</td>
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<td>FES</td>
<td>Fuelwood Efficient Stove</td>
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<td>GTZ</td>
<td>German Agency for Technical Co-operation</td>
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<td>ICIMOD</td>
<td>International Centre for Integrated Mountain Development</td>
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<td>IUCN</td>
<td>World Conservation Union</td>
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<td>MSc</td>
<td>Master of Sciences</td>
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<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<td>NRCP</td>
<td>Natural Resource Conservation Project</td>
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<td>NTFP</td>
<td>Non-Timber Forest Product</td>
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<td>NWFP</td>
<td>North West Frontier Province</td>
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<td>Pakistan Research Institute</td>
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<td>ToP</td>
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<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<td>WWF</td>
<td>World Wide Fund for Nature</td>
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Already published in this series:

1. Cunningham, A. B. 1993. African medicinal plants: Setting priorities at the interface between conservation and primary healthcare. (This publication is also available in Spanish.)


3. Aumeeruddy, Y. 1994. Local representations and management of agroforests on the periphery of Kerinci Seblat National Park, Sumatra, Indonesia. (This publication is also available in French and Spanish.)

4. Cunningham, A. B. 1996. People, park and plant use: Recommendations for multiple-use zones and development alternatives around Bwindi Impenetrable National Park, Uganda. (This publication is also available in French.)

5. Wild, R. and Mutebi, J. 1996. Conservation through community use of plant resources: Establishing collaborative management at Bwindi Impenetrable and Mgahinga Gorilla National Parks, Uganda. (This publication is also available in French.)


The People and Plants Initiative

was started in July 1992 by WWF, UNESCO and the Royal Botanic Gardens, Kew to promote the sustainable and equitable use of plant resources through providing support to ethnobotanists from developing countries.

The initiative stems from the recognition that people in rural communities often have detailed and profound knowledge of the properties and ecology of locally occurring plants, and rely on them for many of their foods, medicines, fuel, building materials and other products. However, much of this knowledge is being lost with the transformation of local ecosystems and local cultures. Over-harvesting of non cultivated plants is increasingly common, caused by loss of habitat, increase in local use and the growing demands of trade. Long-term conservation of plant resources and the knowledge associated with them is needed for the benefit of the local people and for their potential use to local communities in other places.

The diversity of traditional plant-resource management practices runs through a spectrum from "cultivation" through to gathering "wild" plants, all of which are included in the People and Plants approach.

Ethnobotanists can work together with local people to study and record the uses of plant resources, identify cases of over-harvesting of non-cultivated plants, find sustainable harvesting methods and investigate alternatives such as cultivation.

The People and Plants initiative is building support for ethnobotanists from developing countries who work with local people on issues related to the conservation of both plant resources and traditional ecological knowledge. Key participants organize participatory workshops, undertake discussion and advisory visits to field projects and provide literature on ethnobotany, traditional ecological knowledge and sustainable plant resource use. It is hoped that a network of ethnobotanists working on these issues in different countries and regions can be developed to exchange information, share experience and collaborate on field projects.

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