

**Taming the Wild Plant Trade in Great
Himalayan National Park, India**

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ACRONYMS AND ABBREVIATIONS

ACF	Assistant Conservator of Forests
CSIR	Council for Scientific and Industrial Research
EZ	Ecodevelopment Zone
DFO	Divisional Forest Officer
GHNP	Great Himalayan National Park
IHBT	Institute of Himalayan Biotechnology
IIPA	Indian Institute of Public Administration
INGO	International non-governmental organization
JFM	Joint Forest Management
LPS	Lahul Potato Society
NGO	Non-governmental organization
NTFPs	Non-timber forest products
ODA	British Overseas Development Administration
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SAVE	Society for the Advancement of Village Economy
TOR	Terms of Reference
VDC	Village Ecodevelopment Committee
WI	Wildlife Institute of India
DFFC	Department of Forest Farming & Conservation

ABOUT THIS REPORT

This report uses the terms “commercial wild plants”, “commercial flora”, and “botanicals” interchangeably to refer to the array of species and plant products being collected for purpose of trade. The term is more precise than the commonly-used terms “medicinal and aromatic plants” or “high-altitude herb”. In reality numerous plant parts are collected from GHNP for trade including roots, whole plants, fungus, leaves, lichens, fruits, and bark. And while many have medicinal and aromatic properties, some are used for food, dyes and for unrelated industrial purposes.

Baseline data on the wild plant trade are described in Tandon (1997) and IIPA (1997). The goal of this consultancy was to build on this research and make specific recommendation for action. The recommendations are meant not as a prescription, but rather as a point of departure for stimulating discussion and designing a tailored management plan. The report is divided into five main sections: Strategy Guidelines, The Potential for Participatory Management, Production and Conservation, Marketing, and Research. Research, analysis and report writing took place over the course of six weeks from October through November 1997.

The investigative framework used was based on NTFP Market Systems Analysis (RECOFTC 1996). Semi-structured interviews were held with the primary and secondary stakeholders including park staff, village collectors, roadhead traders, regional traders in Kullu, government officials, NGOs, scientists, and key informants. These were jointly conducted by the consultant and one or more of the WII researchers. Interview topics focused on markets and marketing, value addition opportunities, policy and resource management, and local technical knowledge (Appendix 1). A field trip was made to the CSIR facility, Institute for Himalayan Biotechnology (IHBT), in Palampur to investigate current advances in propagation, cultivation and value-addition processes for high altitude herbs.

EXECUTIVE SUMMARY

Uncontrolled commercial collection of wild flora in GHNP, especially of high-altitude species sought for their roots/reproductive parts, has reached a critical threshold and something must be done about it now. It is clearly the most serious threat to GHNP biodiversity at present.

Driven by intense market pressures and exacerbated by open access collection areas, the situation has become a free-for-all. Numerous local extirpations of several species have been reported, several of which are endemic to the western Himalayas or are rare, endangered, or threatened in the region as a whole (see Tandon 1997 for details). Collection increases in frequency and duration every year as collectors venture deeper and deeper into the park. Ratchet-effects are also considerable including destruction of wildlife habitat, hunting, fires, and excessive high-altitude fuelwood consumption.

Equally as tragic is the lost opportunity for a potentially sustainable and eco-friendly industry for local communities. Villagers are simply responding to the insatiable market demand for botanical products. Over 2000 families live in areas adjacent to the park, and their main source of cash income is wild plants. Since few alternatives exist they are taking advantage of the situation for as long as they can, regardless of the long-term consequences.

At the center of the issue is the lack of well-defined, secure, enforceable tenure rights and responsibilities. In GHNP, no one entity - be it the park, divisional forest office, or local villages - has the ability or authority to exercise control over the collection areas by themselves. Rights, roles and responsibilities associated with use and management are likewise ambiguous, complicated by the Anderson Forest Settlement Act of 1896 which permits certain villages in the area to collect medicinal plants. As far as prospects for sustainable management are concerned, if a villager does not feel reasonably secure that access will continue or that s/he will be able to reap the benefits of management investments, what motive is there to participate? This relates to the ability to protect the resource base and control access, which is a direct outgrowth of secure tenure rights.

The best plan, of course, is to eliminate local dependency on the trade altogether. The first and foremost step then is to improve cash benefits from agriculture and introduce viable income alternatives. Villagers repeatedly confirmed that if there were other sources of employment with amenable returns they would give up harvesting altogether.

But because this is several years from being realized and the market demand for wild plants will continue to grow, improving the management of the wild harvest should have equal priority. Yet this is not an easy or straight-forward task. Sustainable commercial use of wild flora has gained wide recognition in recent years as a promising means to regenerate degraded ecosystems and improve cash benefits for nearby communities through community forestry schemes. But as a biodiversity too, in conjunction with national parks and other nature preserves, it is still a somewhat untested assumption. Organizations like the Biodiversity Support Program have set up numerous pilot projects around the world to test this hypothesis and determine the conditions needed to turn collectors into conservationists. Results are still forthcoming, but what is clear is that is an extremely complicated undertaking and must be understood from various perspectives - social, ecological, and economic - if sound interventions are to be made. Failure to integrate these aspects can backfire, causing even more pressure on wild resources, or worse, destroying them forever.

The two management options that lay before GHNP are: banning all collection, or, working with local users to improve sustainability. A ban is only as good as it can be enforced. Under current circumstances a ban will have minimal results and will make the situation worse by driving the collection underground as the park does not have the capacity to enforce it. Cultivation and eliminating the middleman, other common prescriptions to increase local cash benefits and reduce the pressure on wild stocks, likewise may not have the intended results for reasons detailed inside this report. The only solution, then, is to work with local users - both collectors and traders - in a participatory fashion to improve the sustainability of the existing trade.

To do this effectively requires a well-coordinated long-term effort. Although there are several organizations working on the issue in the area and local interest in doing something is strong, there is no one organization/individual that links them together and provides the catalytic force needed to get things moving. Park-people relations are also strained, which represents a serious obstacle to participatory initiatives. Managing wild species is first and foremost a social proposition, and unless this can be addressed successfully, technical interventions will have little positive effect.

WII can play a strategic role in this respect by initiating, in conjunction with the park, a series of stakeholder workshops in each catchment of GHNP. These workshops are desperately needed to simply get people talking in a constructive fashion.

Sustainable management by definition is an interdisciplinary field and several types of information and expertise is required. The park cannot effectively do this alone. To meet this need, the workshops are designed to create strategic alliances with nearby resource organizations who can offer the kind of assistance required.

Based on these workshops local user groups or like organizations can be formed and tested via pilot projects based on the JFM model. Local traders are key players in the trade and should be included in these efforts as well. What can the park offer local users in return for their participation? Better cash returns from the existing trade, and a guaranteed exclusive right to future harvests if extraction can be managed on a sustainable basis.

A strategy for sustainable management of the wild plant trade in GHNP includes the following key recommendations:

- ◆ Reduce the number of collectors by determining who are the legitimate users and granting them exclusive access in exchange for management and protection.
- ◆ Improve the sustainability of the current trade through improvements in harvesting, processing and marketing.
- ◆ Focus on areas with a history of intensive use (thaches and villages forests) to reduce dependence on high quality sites and critical habitats.
- ◆ Legitimize the current trade in order to make it more transparent and easier to manage.
- ◆ Involve all the primary stakeholders as partners in participatory management.
- ◆ Catchment-based.
- ◆ Careful Species Selection.



STRATEGY GUIDELINES

Sustainable harvest of wild plants must integrate social, biological and economic aspects if it is to be successful. No where is this more important than in a place like GHNP, where market pressures are intense, where resource rights are unclear and insecure, and where biodiversity values are exceedingly high.

To meet these complexities a three-pronged strategy is proposed:

- ◆ reduce the numbers of collectors by granting exclusive access to local user groups and roadhead traders in exchange for management and protection.
- ◆ improve the sustainability of the current trade.
- ◆ increase cash benefits from low-altitude species to reduce dependence on high altitude species and keep collectors out of the core areas of the park.

A crucial aspect of this approach is legitimizing the trade and involving all the primary stakeholders including collectors, local traders, park and divisional forest staff, and local NGOs. At present the trade is uncoordinated and somewhat “underground”. Sustainable management requires transparency - a knowledge of the roles, constraints and preferences of all the stakeholders - to design viable policies and interventions.

This is not an easy or short-term task. It requires a long-term, focused commitment aimed at this problem alone. A field-based organization/individual is needed that can play a catalytic, facilitation role by bringing the stakeholders together in productive forums, providing technical advice, monitoring progress and trouble-shooting. This organization could also facilitate the creation of “strategic alliances” with outside organizations who can offer expert input and assistance. The park’s role becomes one of facilitation rather than strict enforcer.

The cornerstones of this approach are stakeholder workshops and carefully selected pilot projects, discussed below.

Primary Stakeholders in GHNP

Collectors • Local traders • GHNP administration • Seraj Divisional Forest Office • SAVE (local NGO) • local agricultural societies • WWF/Biodiversity Priority Mapping Project • Wildlife Institute of India



Potential Strategic Alliance Partners

G. B. Pant Institute, Kullu • Lahul Potato Society, Kullu • Indo-German Project, Chaangar • Institute of Himalayan Biotechnology, Palampur • ODA Forestry Project, Kullu • Ayurveda Department, Kullu

STAKEHOLDER WORKSHOPS

Two types of workshops are required in each catchment: one to clarify the problem and the other to explore potential solutions. These may need to be scheduled in various locations to make them equally accessible to all villagers in the EZ. A supplementary workshop is aimed at pilot project development and should be considered as a second phase activity. A preliminary list of workshop topics is included in Box 1.

The main objective of these workshops is to initiate a constructive dialogue between stakeholders and provide a non-threatening forum to clarify the issues, explore potential solutions and create awareness. Secondary objectives are to facilitate the creation of strategic alliances and village-based collector groups based on the JFM model. These workshops are envisioned to foster synergies between organizations as a force of change. Synergies create a network which can be used to access technical assistance in production, harvesting, processing, value addition, and marketing for primary users. eg collectors and local traders.

Several villagers contacted during this assignment felt that they had been asked enough questions about the wild plant trade and wanted to see some action. These workshops respond to that desire, and should be organized before the next collection season.

Above all, organizers should strive to involve the real users and avoid take-over by local elites. As such the meetings should be informal and relaxed, with flexible agendas.

WORKSHOP SERIES # 1: OPEN FORUM ON PROBLEM CLARIFICATION

Goals and Objectives:

- ◆ To identify the stakeholders
- ◆ To outline the goals (needs), roles, and responsibilities of each stakeholder
- ◆ identify commonalities and sources of conflict.
- ◆ To discuss potential future scenarios if the collection/trade is not properly managed (eg bans, plants become extinct, business suffers, etc.)
- ◆ To describe the problem(s) from the perspective of the various stakeholders.



- ◆ To convey the notion that rights equal responsibilities.
- ◆ To explore the feasibility of a mutually-agreed upon code of ethic for all stakeholders and mechanism for enforcing it, to become operative in the next collection season.
- ◆ To obtain general agreement on the need to do something and to work together for solutions, and set up a timetable to continue discussions at specific villages.
- ◆ To set the stage for the next workshop on problem-solving.

WORKSHOP SERIES # 2: EXPLORING POTENTIAL STRATEGIES AND SOLUTIONS

Goals and Objectives:

- ◆ To learn from the experiences of potential strategic alliance partners and brainstorm local solutions.
- ◆ To foster the development of strategic alliances and village user groups.
- ◆ To discuss and further refine the code of ethics, and if possible, publicly ratify it.
- ◆ To set the stage for village-based (or other appropriate unit) pilot projects in management, value-addition and marketing.

WORKSHOP SERIES # 3: INVESTIGATING AND NEGOTIATING PILOT PROJECTS

Goals and Objectives :

- ◆ To develop and train a team to conduct participatory research to establish pilot projects.
- ◆ To identify potential pilot project sites and objectives.

Note that NGOs such as SAVE and WWF may have already been identified sites and initiated activities in some villages of the EZ.. The goal is to establish one pilot project in each catchment, and if efforts all already underway the role of the park and other members of the strategic alliance should be to support and integrate them as part of a holistic program.

PILOT PROJECTS

Pilot projects are needed to test the approach and refine the techniques. The stakeholder workshops should set the stage for several pilot projects which may include (but are not limited to) user group formation, training and educational programs, marketing collectives, and reputable trader networks. They need to be undertaken with care, however, or else they could backfire. Setting up local processing units for high-altitude species, for example, should be avoided. Even if plants are being cultivated, this will only increase the pressure on the wild populations.

Traders should be involved in these efforts as well. They are key players in the process, and can provide critical inputs to research and management. Being shopkeepers, they are the only source of credit and



household necessities, and unless another entity can be engaged to provide these services, their dual role in village life cannot be ignored. Because they are fewer in number relative to collectors, they are also potentially easier to manage and monitor. A key incentive to getting them involved is to offer them **exclusive** rights to park produce in exchange for cooperating with management and training programs.

Essential conditions for choosing pilot project sites:

- ◆ Village must be located in or near large block of forest/thach containing (or previously containing) significant biodiversity values.
- ◆ Village must be permanent and not subject to significant out-migration or in-migration.
- ◆ There appears to be interest and demand for collaborative work in the village for wild plant management and value-addition.
- ◆ There appears to be a willingness to accept responsibilities and share costs associated with potential joint activities, including protection and enforcement.
- ◆ Village claims to a customary use area must have a legal or historical basis, and not conflict or contradict the claims of neighboring villages.
- ◆ There appears to be consensus across the range of interest groups within the village that a project is welcome.
- ◆ There is reasonable year-round access to the village
- ◆ There are no physical or social impediments that are unavoidable and would prevent the project from working safely in a open, relaxed, and participatory manner.
- ◆ Priority given to villages high in the catchment with less arable land and thus less options for agricultural improvements.



PROSPECTS FOR PARTICIPATORY MANAGEMENT AND SUSTAINABLE HARVESTS

There is a demonstrated tendency around the world for community management to emerge only after a period of obvious overuse and population decline. This is certainly the case for certain species in GHNP, but to what extent village collectors perceive this is not known. If collector opportunity costs remain low and it is still easiest to collect from wild populations, then they may not be motivated to adopt new forms of management.

That aside, there are indications that participatory initiatives would be well-received in the local villages. Several of the people interviewed expressed a keen desire to do something but were at a loss at where/how to begin. Local collectors in Shangarh Village (Sainj) believed that they could protect collection areas if given the authority. Mr. Budhi Singh, a trader/shopkeeper in Banjar who received extensive training in harvesting, processing and management, is enthusiastic about forming a local society. The Tirthan Valley Agricultural Society is forming their own plans on how to control the trade, and SAVE, a local NGO in the Sainj Valley has been researching the topic and organizing collectors for the last two years.

Other features are conducive to sustainable management as well. Since the park is naturally isolated with formidable geographic barriers, and has only a couple trails that enter the park from outside the EZ, plant poachers theoretically can be controlled. The vast majority of collectors come up through the EZ, and the vast majority of plants come down through it. Unlike collectors who are known to take numerous paths in and out of the collection areas, the plants funnel into discreet points including the go-downs of roadhead traders and the checkpost at Larji. There are also numerous under-utilized DFFC facilities which could be converted to community nurseries, demonstration sites, user group patrolling huts, or other appropriate uses. A schematic map of GHNP with main trails, roadheads, and DFFC facilities is included below in Figure 1.

REVIEW OF THE CURRENT SITUATION

Anderson Forest Settlement Act

The Anderson Settlement Act gives rights to the people of approximately eleven (?) revenue villages in the GHNP area to collect medicinal plants for 2 months annually, from 15 August. WII researcher Pradeep Choudhury has compiled a map detailing the villages and forest areas where original rights were granted, included in Annex 1. This information is summarized in tabular form in Table 1. There are approximately 120 villages in the EZ, however, and an estimated 70% of the households rely on collection as the main





source of income (Tandon 1997). The IIPA survey (1997) further indicates that most collectors believe (apparently) that they have rights but are ambiguous about the details.

Final notification of the national park requires that all historical rights to park resources are extinguished. The legalities of this process, however, will take many years to sort out, if ever. From a management perspective, the Anderson Settlement Act is clearly out-dated. It does not reflect the current situation with respect to large-scale commercial harvest of wild plants, nor is the goal of judicious use being realized. Market pressures have grown enormously in the last fifty years and the ability to distinguish, exercise and protect these rights in such remote areas and under such conditions has been severely compromised.

Valley	Official Right Holder Village/Hamlet	Forest Area
Jiwa	Majhan Majhan, Kunder Bhalan Sainsar Xxx	Gratipat Drasher Khandadhar Deun Panihuri
Sainj	Shangarh, Lapah, Dara Lapah, Dara Shakti, Maraur, Majhan Xxx Maraur Xxx	Kamba Humkhani Kalikanda Nilathota Parali Khir Ganga
Tirthan	Dhar, Shungcha, Sharnira, Dharan, Nahin, Lagcha, Ghat, Shilinga, Sahungah Xxx Kharangcha, Dingcha, Kaongcha, Raongcha, Lajeri, Talinga, Galinga Janijhar, Jalhari, Krungcha, Dingcha, Kaongcha, Tinder, Bruigcha, Brelga Galingcha, Galigar, Mashiyer, Phanti Mujhali, Kamara	Rakhundi Rolla Basu Gurkha Dheuridhar Bungdhar/Bhandar

Specific uses (eg timber, medicinal plants, fodder, tools) as outlined in Anderson's Act are not included here because in practice people collect all products

(From P. Choudhury)



Customary Rights

The IIPA research team reported that unlike grazing rights, local conceptions of rights to wild flora are ambiguous and ill-defined. They can change according to the needs of the situation and the individual, and have different interpretations in different communities (Vasan, pers. comm). Informants commonly replied that they had rights that to collect anywhere but had no responsibilities per se.

Many informants complained of “outsiders” collecting in their area, but who is an outsider? Nepali laborer gangs are commonly-cited culprits but they are hired by local right-holding traders. Outsiders may also refer to people the Outer Seraj, or someone from an adjacent catchment.

Strong inter-village relations through marriage, local deities (*devtas*) and other social institutions are another factor in access to commercial plant resources. It is difficult for a villager deny his friends and relatives the opportunity to make some money, especially when the future (with respect to access rights) is so uncertain.

Collection Patterns

The extent to which right holders stay in their own forests is not known, although previous research suggest that local residents tend to stay in their own valley (IIPA 1997). There are increasing reports of incursions into neighboring valleys, however, especially for mushrooms and high altitude herbs. Residents of Jivanal are reportedly using the forests and thatches of the upper Sainj, and Tirthan residents are collecting In Dela Thach (Sainj). Collectors from the Parbati Valley are also entering the park via the Manikaran route.

Collection areas are well known and systematically exploited based on the snowmelt. It begins in mid-April with morels and lasts through November (see Tandon 1997). Some plants such as lichens (*mendi*) are collected all year. Lower areas are exploited first and collection continues as long as there is no snow. Thaches are reportedly open for collection once the graziers have broken the path (Vasan, pers. comm). As productivity diminishes new areas are being searched out and exploited every year. These are deep in the core areas of the park, especially in the headwaters of the Sainj (Raktisar, Mundatapra) and Tirthan Rivers (Tirth). Some of the more well-known collection areas are included in Table 2.

Valley	Name of Area
Sainj	Naina, Kumba, Dhara, Dhela, Rekti, Munda Tapri
Tirthan	Tirth, Kukri, Jatholo, Kobri/Shaka, Pakni, Ghumtarao, Shankha, Chakrer



Routes taken by the collectors into the collection areas have not been well documented. Many collectors come via small or little used trails to avoid detection by park rangers. In Tirthan, IIPA (1997) reports that collectors enter the park via Kharongcha, Lagcha, and Dashmani.

Official Management

Park Administration

Administration and field staff are responsible for GHNP, the EZ, and the two wildlife sanctuaries adjacent to the park (Tirthan and Sainj). They are charged with two main tasks related to the wild plant harvest: monitoring and resource protection. These activities are mainly carried out by registering collectors as they pass through park checkpoints and patrolling the collection areas on a periodic basis.

Seraj DFO, Banjar

The DFO plays the greatest role in managing the trade, although efforts are mostly aimed at post-harvest activities. Main responsibilities: to issue export permits for products leaving the Seraj Division (of which GHNP is part), to collect royalties, and to enact periodic bans on threatened species. Recently, with the assistance of the ODA, they have also started a commercial plant management program using the JFM model. Propagation, growth, and harvesting experiments have been initiated with *Taxus baccata* (rokhal) and *Valeriana hardwickii* (nahanu). These appear to be have positive results.

Anyone requesting a permit must notify the DFO once the plants have been collected, the DFO dispatches a range officer to check the amount, collect the royalty, and issue the permit. A list of traders regularly taking permits for produce collected in GHNP is included in Annex 2.

Currently two species have special status. There is a collection ban on *Dioscorea deltoidea* (shingli mingli), a mid-altitude creeper whose roots are harvested for the chemical diosgenin. Dioscorea has been severely overexploited throughout the Seraj Division as a whole and has been extirpated from several Himalayan regions, including Nepal. It is listed in the CITES Appendix II. Due to the recent discovery of anti-cancer compounds in its bark and leaves, *Taxus baccata* (rokhal) has been heavily exploited across the temperate belt. It now requires a special permit to collect, issued by the central government in Delhi to select traders. In this area, only one trader (Hem Raj Traders of Mandi) has the license. Several other species are being considered for listing, but none have been finalized as yet (see Tandon 1997).

Panchayat

Non-residents wishing to collect a large amount of plants from a village area directly (and perhaps using their own labor force) are required to pay a small fee to the community fund to gain access. This is done by traders, but it is not known to what extent and if it is a common practice.



Constraints

Lack of Well-Defined, Secure, Enforceable Use Rights and Responsibilities

One of the primary conditions for sustainable use is well-defined, secure, and enforceable use rights, including responsibilities associated with those rights. This clearly does not exist in GHNP. Wherever there are tenure ambiguities and market pressures, the resource/area almost certainly degrades.

In GHNP, several stakeholders claim to have rights to harvest commercial wild plants or control the collection, but none have the capacity or political will to manage it properly. And because continued access is questionable, villagers have no motivation to practice sustainable management; they are simply collecting as much as they can in anticipation of a total ban.

Open Access Collection Areas

Since rights are ambiguous and/or unrealistic, collection areas are essentially open-access. The park may perceive themselves to be the final authority in this matter, but since they cannot enforce their claim effectively the collection areas remain a virtual no man's land.

User Identification Problems

There is considerable ambiguity and contention over who are the users, especially who are the legitimate users. Several overlapping categories exist: legal rights holder, customary user, EZ resident, hired labor, etc.

Lack of Stakeholder Coordination

Stakeholder roles and objectives have not been clearly and publicly defined and there is virtually no coordination among them. Three government entities are responsible for monitoring aspects of the wild plant trade yet each operates independently. A local NGO, SAVE, has been working on the issue for two years but communications with park administration are strained.

Traders have also largely been ignored and treated as adversaries at best. From their side, traders believe that current regulations and procedures encouraged corruption and impeded productive relations with government agencies as well as other traders.

Lack of Streamlined Management Structure

The park and DFO are each charged with managing different aspects of the trade in GHNP yet there is virtually no coordination of tactics, procedures, regulation or enforcement. Also, the existence of wildlife



sanctuaries in or near key portions of the park, while making legal sense, makes no little management sense when it comes to the realities of the wild plant trade. Villagers view both areas as their customary resource use areas and do not distinguish between them.

Limitations of Field Staff

Park staff is limited in number and does not have the expertise or capacity to effectively manage the wild plant harvest alone. This also hampers their ability to implement Ecodevelopment Project activities effectively. Working productively with communities requires a certain professionalism that starts from the top level and includes a knowledge of institution-building and rural development along with a strong commitment to the process.

A permanent, village-level field presence is absolutely mandatory in this regard, yet checkpoints, patrolling huts and rest houses are irregularly staffed and rangers rarely go into the interior of the park. Some park records exist, but they are only a fraction of the actual collection activity due to the irregular posting problem and the existence of numerous alternate routes into the collection areas.

With the coming Ecodevelopment Program, park rangers feel as if their authority has been reduced due to the emphasis on "people's participation". As a result they are even more disinclined to carry out their jobs effectively. They also suffer from a lack of financial incentives, as individuals posted in more remote areas receive the same pay as those based in more accessible villages.

Centralized Decision-Making

The Park Director is constrained from taking timely action in the EZ because of the need to obtain permission from a governing body comprised of senior officials in the state forest department. This can be a slow process as many are based in distant locations and coordination is problematic. This seriously constrains his ability to be an effective manager.

Poor Understanding of Ecodevelopment Project Goals and Objectives

Both villagers and park field staff lack a clear understanding of the Ecodevelopment Project. Many believe it is simply a source of free money. There is little feeling of responsibility or partnership, the cornerstone of the ecodevelopment concept.

Lack of Effective Local Management Institutions

The VDCs (Village Ecodevelopment Committees) are minimally effective due to quick and improper development. In several cases they have been reduced to token organizations formed around political party lines and appropriated by village elites. They do not adequately represent the users and the range of village perspectives.



Party Politics

According to the Park Director the EZ is seriously divided on the basis of party politics. Those who favor the current government cooperate with the park, and those who favor the opposition do not. This has seriously hampered his ability to work effectively with local communities, especially in the Jivan Nala area.

Inadequate Enforcement of Permit Regulations, Bans, and other Policies

Several loopholes exist in the current export permit system. Amounts can be under-recorded (thereby requiring less royalty) in exchange for a gratuity and plants can be smuggled out with non-regulated produce. Even though all trucks must pass through a checkpoint at Larji before leaving the GHNP area, their contents are rarely checked.

In to reduce extraction rates and sequester a better portion of the cash benefits from the trade, the government recently increased the royalty rates by a substantial margin, especially for morel mushrooms (RS 10,000/quintal). It is difficult to gauge the effectiveness of this policy. Many traders feel that the rates are unjustified and that it has driven the trade even further underground.

Even though they are warranted, bans and other restrictions tend to have similar results. because of the lack of enforcement. *Dioscorea* is still begin collected, and even though pruning and deadfall of *Taxus baccata* are allowed to be collected, people are cutting whole trees down. A portion of the branches are sold as pruning and the remainder is stored until it dries out, after which it can be sold as deadfall.

RECOMMENDATIONS AND GUIDELINES

These actions are aimed at addressing the problems in an integrative manner involving all the stakeholders. Some of these ideas will work and some will not, and leakage will undoubtedly occur. But taken together, they offer a starting point to reduce the rampant over-exploitation now occurring and garner more benefits for local villagers in the process.

Develop Local Criteria for Determining Who is a Legitimate Collector

There is a considerable amount of confusion and ambiguity over who the actual collectors are. The key issue from a management perspective is: who are the **legitimate** collectors. Local criteria needs to developed to determine who legitimate collectors are so they can be involved in management activities in exchange for exclusive access. Some suggested criteria:



- ◆ Villager/s named in Anderson's act for medicinal plant collection.
- ◆ Villager/s named in Anderson's act for forest product collection.
- ◆ full-time residents.
- ◆ Villager/s who are willing/able to contribute to the proper management/protection of their customary use areas.
- ◆ Villagers who agree to collect only in valley of residence unless otherwise indicated.

Focus on De-facto Users and Use Areas

Identifying users and use areas is a fundamental step in participatory management as it provides the organizational basis for resource management in the field. It also clarifies the appropriate target group for interventions and assistance.

This can be accomplished in two ways: via the stakeholder workshops and follow-up activities in the village, and through concerted field research during the next collection season. Pradeep Choudhary, WII Researcher and the IIPA team have made some progress in this respect but it is far from complete. (Collated information in Appendix 2.)

Mapping of use patterns and use areas is the first priority. This should include geographical boundaries, vegetation, locations of commercial plant stands, areas from where plants have been extirpated, small and large trails, etc.

Local User Group Formation

These should be based on the legitimate users as described above, formed along the lines of JFM and self-help groups. These groups can be given **exclusive** rights to a customary use area - and the benefits derived thereof - in exchange for management assistance. They should be given rights on a spatial basis (specific locations) as opposed to an individual product as outlined in the Anderson Act. User groups can involve one village or several, depending on pre-existing use and access patterns. They should build off of traditional institutions as much as possible and not be externally imposed.

User groups should be coordinated to avoid overlap and conflicts, and to learn from each other's efforts. These groups should be truly representative of the users and not be appropriated by elites or politicians. Because of the mixed reputations of the VDCs at present they should be created as an independent entity. The Seraj DFO or other appropriate organization with expertise in this area should be enlisted to guide the process in GHNP.



A group of mushroom harvesters from Shangarh Village in the Sainj Valley

Co-Developing Management Plans

Once user groups and use areas are established, forest inventories and setting up of monitoring plots can be initiated using the Forest Block Assessment method (included under separate cover). This should be a joint effort and include WII researchers, park staff, and user group members. Based on this data of suitable management plan can be devised.

Each plan should have a strong provision for protection. User groups should be given the authority to patrol and enforce their own collection areas. This should be done in coordination with park or forest staff to lend credibility when faced outside collectors, as is surely to occur in the high-altitude collection areas.

Successful management planning is an iterative process and can require a substantial amount of time to become operational. They should start simple, focusing on one or two plants, and not requires to much input from villagers beyond protection and better harvesting methods. As time passes and people become more organized and interested, silvicultural treatments could be introduced to increase productivity, especially in degraded sites. These must be used with caution, however. Those that alter the structure and composition of the ecosystem should be avoided so as not to disturb wildlife habitat or negatively impact high quality sites.



Lessons from Mexico

Villagers in the highlands of Mexico are successfully managing commercial harvests of wild matsutake mushrooms, a species with similar markets to the morel. They have exclusive rights to the forest and have the authority to keep outsiders from entering. Before the collecting season begins, villagers who wish to harvest must register with a local management body. Once the registry is closed, harvesting takes place but only by those that have registered that year.

To increase productivity, villagers set up a small lab to produce mycorizhal inoculum with the help of outside experts. Plugs of wood are taken from the boles of trees and brought to the lab where they are injected with the fungi. The plugs are taken back to forest and replaced, which stimulates production on the forest floor.

Strategic Alliance Partnerships

To overcome the constraints posed by staff limitations and lack of expertise, emphasis should be given to creating partnerships with organizations and individuals to undertake various aspects of a sustainable management program. The park's role becomes one of coordinator, dispatching its staff to work with partners and forest user groups as needed.

Streamline Management

Successfully managing and monitoring the wild plant trade in the GHNP area is a regional effort. GHNP administration and the Seraj DFO must join forces in this task and coordinate their policies, tactics, and field staff. For starters, there needs to be an appropriate process for obtaining export permits from GHNP and better monitoring of the Larji checkpoint. As the DFO is already working with communities in a JFM system and is experimenting with technical aspects of commercial species management, he is an excellent resource and should be enlisted as a semi-permanent consultant to GHNP.

The presence of two administrative divisions (eg park and wildlife sanctuary) also is somewhat of a stumbling block with respect to the managing the wild plant harvest. In practice villagers do not distinguish between them and both are used in a similar fashion. From a management perspective they should be considered as one unit.



Trader Involvement

At some point in time, the vast majority of plants harvested from GHNP must pass through the hands of roadhead traders. There are approximately 20 of these traders in the GHNP area, far fewer than the number of collectors. As a group, they represent a critical stakeholder group and are potentially far easier to manage and monitor.

Each year, in exchange for exclusive access to GHNP products, roadhead traders should register with park. This should be coordinated with the DFO so anyone requesting an export permit should indicate which roadhead trader they are buying the produce from. If they do not register, they do not trade. The bargaining chip here is exclusive access; plants leaving the park or should be handled by them alone.

In exchange for exclusive access traders should collectively devise a code of mutually-agreed upon practices and quality standards, and penalties for not observing them. This code could include:

- ◆ rejecting, or paying considerably less for sub-standard material (immature, poorly harvested).
- ◆ rejecting plants out of season.
- ◆ willingness to participate in research.

Yearly price standards for all roadheads in the region to reduce exploitative price controls and improve bargaining power for all.

Work with local traders, not against them.



Negotiated Regulations and Enforcement Procedures

As stop-gap measure, stakeholders need to arrive at a common understanding about the problems and the ways they can be solved, as noted in the workshop section. This should involve some specific measure to be observed by each group individually and by the stakeholders as a whole. Some suggested measures are described below.

Collection Moratorium on Specific Plants/Areas

Some areas, and possibly some plants, need to be restricted for two to three years to allow the populations to recover. This is especially true for some high altitude meadows and thaches. "No Collection Zones" should also be established to act as genetic repositories and in-situ conservation sites. These are best suited to core areas with relatively less biotic pressure. Enforcement mechanisms and penalties will need to be devised by the stakeholders in a consultative fashion.

Potential plants include *Jurinea macrocephala* (dhoop) and *Picrorhiza kurrooa* (karu). The ban on *Dioscorea deltoidea* has not been well-enforced and it is still being harvested.

Collecting seasons and Harvesting Practices.

Stakeholders should design a collection schedule and harvest methods that integrate the biological needs of each plants with the realities of trade and labor availability. (See section on Harvesting for guidelines.)

No Drying or Purchasing at the Collection Sites.

A disturbing new trend is that traders are going up to the collection areas with porters or pack animals and buying plants on site. They also re-supply the collectors with rations which allows them to continue collecting until an area is exhausted. While this practice is more efficient from their point of view, it seriously threatens the resource base and reduces the quality (market value) of the plant due to improper cleaning and drying. One trader reported that he did this sixty times last season alone. This practice must be stopped at once.

No Outside Collectors or Hired Labor.

Only people in the EZ (or appropriate nearby areas) who can contribute to the protection and management of collection areas should be allowed to collect. For traders, no hired labor.



Full-time Staffing of Checkposts during Collection Season.

Park Staff should be given incentives to stay full-time at park checkposts especially during the months of June, July, August. They can be enlisted as research assistants for collecting data on users and use areas while acting as an official presence to discourage illegal collection.

Pack animals with *Jurinea macrocephala* (dhoop) from Raktisar, heading to a go-down in Neuli (Sainj Valley). Roadhead traders can send them to high altitude collection areas over sixty times during the course of one season.

Awareness and Capacity Building

Any educational program should incorporate local needs and preferences under the umbrella of conservation and sustainable management. These programs should target collectors, traders, or both.

- ◆ General Information about each plant (commercial use, local use, markets, biology and ecology, qualities, prices, conservation status, and other relevant topics)
- ◆ Protection strategies
- ◆ Harvesting, processing and storing methods
- ◆ Marketing: market information systems, quality improvements, collectives, small-scale manufacturing, and other relevant topics.



A local trader with mendi (species unknown), a common lichen throughout the forests of GHNP. It is reportedly used as a fixative in the perfume industry and as a dye.



PRODUCTION AND CONSERVATION

Production and conservation can be enhanced in two ways: improving the wild harvest, and cultivation. This section covers the wild harvest and focuses on silvicultural treatments, harvesting, processing, and cultivation.

Poor harvesting and processing represent the single-most factor in reducing the both the value and the sustainability of the wild harvest. Not only does it negatively affect cash returns per unit of time and effort invested, but it leaves nothing to build on in terms of value addition and local economic development.

SPECIES SELECTION

In the fall of 1997, there were approximately 17 plants being harvested for the commercial market in large volumes (Table 3). As each plant has its own biological requirements and socio-economic life, not all can be addressed in a uniform fashion or at the same time. Each requires a tailored approach, evaluated from a social, economic and biological perspective. Careful selection is required to target the ones that a) are locally endangered, and b) have potential for development. Some of the criteria to consider when selecting plants are conservation status, the availability of agrotechnology, their sustainable management potential, local interest, and market demand. Peters (1994) suggested the following guidelines, included below.

Table 4. Overall management potential of different non-timber forest products



The easiest way to use the table as a selection tool is to assign a numerical value of each category. All parameters with low, medium or high management potential, for example, should be recorded as 0, 1, or 2 respectively. Summing the total score for each species provides a rough “biological sustainability potential” index that can be used to compare and rank different species. All other factors being equal (eg economic and social considerations), the species with the highest sustainability index should be selected. (For more information on social and economic parameters,

Table. 3 Main plants traded from GHNP in 1997 (in order of relative volumes)

Altitudes are relative to ecodevelopment zone: Hi: >3000m, mainly sub-alpine and alpine meadows/thaches, scrublands. Low : <3000m. low and med elevation forest areas and grasslands.

Hi alt (>3000 m)			
Species (common name)	Part Used	Type	Comments
<i>Jurinea macrocephala</i> (dhup)	Rhizome	Perennial herb	Consistently collected in largest volume. Root size dramatically reduced.
<i>Picrorhiza kurrooa</i> (karu)	Tuber	"	Critically endangered NW Himalayan species
<i>Dactylorhiza hatagirea</i> (salaam panja)	Tuber	"	Critically endangered NW Himalayan species
<i>Aconitum heterophyllum</i> (patish)	Tuber	"	Critically endangered NW Himalayan species
<i>Valeriana jatamansi</i> (nyani)	Rhizome	"	Nardostachys grandiflora?
<i>Podophyllum hexandrum</i> (galakada, bankakri)	Root	"	CITES App. II
<i>Angelica glauca</i> (chora)	Root	"	
Low/med alt (<3000 m)			
Species (common name)	Part Used	Type	Comments
<i>Valeriana hardwickii</i> (nahanu)	Rhizomes	Perennial herb	GHNP area has reputation for having good produce.
<i>Parmelia spp. (?)</i> (mendi)	Whole plant	Lichen	Collected all year in forests near village.
<i>Viola odorata, serpens</i> (banafsha)	Aerial parts	Perennial herb	Mentioned in Anderson, 1896
<i>Dioscorea deltoidea</i> (shingli mingli)	Rhizomes	Perennial creeper	CITES App. II . Locally extinct due to overharvesting. Ban on collection.
<i>Taxus baccata</i> (rakhal)	Leaves, bark	Tree	DFO has implemented a 4-year rotation system based on pruning. Difficult to monitor - whole trees cut down instead of branches. Branches stored until dry and sold as ground fall.
<i>Morchella esculenta</i> (guchi)	Whole plant	Mushroom	Two varieties - chatri, 2- ulti (Varpa spp?)
<i>Hypericum perforatum</i> (basanti)	Aerial parts	Perennial herb	Known as St. John's Wort in English. Recently discovered for use as anti-depressant in US and Europe. 1997.



As noted earlier, mainly low altitude species should be targeted for value addition, and only those that are found in abundance in disturbed areas or in village forests. Unless otherwise noted, interventions with should focus on harvesting, drying, marketing and general resource management improvements only.

When selecting a species for value-addition, plants with long-standing domestic markets are best. Many of the commercial species in GHNP are common constituents in Ayurveda, which is a major plus point. International markets tend to boom and bust due to changes in consumer preference, chemical synthesis, cultivation, or new supply areas. The scales are vastly out of proportion to support sustainable harvesting in small producer societies, and can wreak havoc on both the environment and the local economic base. That said, villagers should also be able to take advantage of new opportunities, but only as an adjunct to a program based on species with demonstrated long-term value.

Tables 5a and 5b provide a preliminary list of species to consider for management interventions in GHNP.

Table 5 a. Recommended species for value addition

Species	Type/Part Used	Activity	Justification
<i>Morchella esculenta</i> (guchi)	mushroom/ fruiting body	Marketing Co-ops, harvesting and processing improvements	Low-altitude, high value, stable market, natural productivity high, good management potential as collection has low impact on reproduction.
<i>Viola serpens</i> (banafsha)	perennial herb/ aerial parts	Increase production through enrichment planting, increase value through better harvesting, processing and marketing.	Low altitude, steady domestic market but undeveloped in GHNP, common and abundant, good management potential.
<i>Valeriana hardwickii</i> (nahanu)	perennial herb/ roots	Increase production through enrichment planting, increase value through better harvesting, processing and marketing.	Low altitude, steady market, silvicultural information available.
<i>Parmelia spp ?</i> (mendi)	lichen/all	Increase value through better harvesting, processing and marketing. Cottage industry development based on fruit processing.	Low altitude, abundant, steady domestic market but undeveloped in GHNP.
<i>Prunus spp.</i> Wild apricots	tree/fruit	Cottage industry based on weaving cloth	Low altitude, abundant, currently harvested for seed oil only, agroforestry technology available, niche market (compete with apples).
<i>Cannabis sativa</i> (bhang, hemp)	perennial herb/aerial portions		Low altitude, abundant, excellent fiber, growing market in cloth, builds on local weaving skills, good management potential.

**Table 5 b. Recommended species for value addition**

Species	Type/Part Used	Activity	Justification
<i>Hypericum perforatum</i> (basanti)	Perennial herb/ aerial parts	Increase value/ sustainability through better harvesting, processing and marketing.	Capitalize on a new market. Low-mid altitude, abundant, grows in disturbed areas, competitive price, good management potential.
<i>Aconitum heterophyllum</i> (patish)	perennial herb/tuber	Increase sustainability through rotational harvesting and processing improvements.	Critically endangered NW Himalayan species. Populations declining in GHNP also. Good management potential: grows in dense clusters, compatible with grazing.
<i>Jurinea macrocephala</i> (dhoop)	Perennial herb/ Rhizomes	Increase sustainability through rotational harvesting and processing improvements.	Grows in dense clusters, compatible with grazing, decreasing quality (size) and population size requires action CITES App. II listing
<i>Podophyllum hexandrum</i> (bankakri, galakada)	Perennial herb/root	Reintroduce and continue ban	CITES App. II listing
<i>Dioscorea deltoidea</i> (shingli mingli)	Perennial creeper/root	May be candidate for moratorium	Depleted in GHNP. Critically endangered NW Himalayan species.
<i>Picorhiza kurrooa</i> (karu)	Perennial herb/root	Improve harvesting and processing. Monitor.	Critically endangered NW Himalayan species.
<i>Dactyrorhiza hatagirea</i> (salaam panja)	Perennial herb/tuber		



SILVICULTURE

Integrating non-wood economic species into the overall regime of ecosystem management is a young and rapidly evolving science. India, in fact, has made great strides in this area via the JFM program (Rathore and Campbell 1995). In the context of protected areas, however, any environmental manipulations should be applied with caution given the biodiversity values at stake. They are best suited to low to medium altitude village forests, degraded areas, and thatches and should not be undertaken in critical wildlife habitats.

The key component of any silvicultural investment is protection. As such, any treatment should only be attempted in conjunction with a local user group. Since many high-altitude herbs take at least three years to mature, fast-growing species should be combined with those needing longer maturation times to help convince people of the benefits. Enrichment plantings should follow the natural successional pattern of the forest or grassland, and not be attempted in areas where the plant did not previously grow unless requested by local user groups. Under no circumstances should exotic species be used at any time.

The most promising innovations that could be employed in GHNP are:

- ◆ enrichment planting of herbaceous species such as *Valeriana hardwickii* and *Viola serpens*.
- ◆ introducing shade tolerant understory shrubs and trees that previously occurred there, such as *Cinnamomum tamala* or *Taxus bacata*.
- ◆ managing the forest floor to increase mushroom productivity.
- ◆ enhancing productivity of degraded lands near village with quick-growing colonizers such *Tagetes minuta*, *Hypericum perforatum*.
- ◆ restoring degraded thaches with extirpated species.
- ◆ rotational harvests of *Jurinea*, *Aconitum*, and other high altitude herbs.

Valeriana hardwickii (nahanu) has excellent potential. It is easily cultivated as enrichment crop in forest or in sunny, moist conditions from seed or rhizome and has a reliable market. The DFO in Seraj initiated an experimental program three years ago and has had excellent results. Joining forces and sharing of expertise could be the beginning division-wide effort which could enhance the marketing potential through the formation of collectives and the development of a positive market image based on quality production.

Rotational systems and restoration areas have potential but are only effective in so much as the areas can be protected. A rotational systems has been set up for *Taxus bacata* by the Seraj DFO, but the extent to which it is successful is not known. One strategy that has not been attempted thus far but may have excellent potential in GHNP in this restoration of degraded thaches and other collection areas. This



would serve two purposes: re-creating historical biodiversity levels, and giving picking direct economic benefits from the park through sustainable extraction. This is compatible with a similar recommendation made by Tandon (1997) to set up Medicinal Plant Development Areas.

HARVESTING

Three features characterize the harvest in GHNP at present:

- ◆ Competitive early extraction. Plants are not given a chance to reproduce so there is no natural regeneration. Because they are immature, the size is small and percentage of desired chemical is low, which reduces their market value.
- ◆ High collection frequency/intensity. Individual collectors can make over twenty trips to high altitude areas during the season. Others simply stay in one area for weeks at a time periodically re-supplied by traders who purchase poorly processed products on site.
- ◆ Destructive methods. Wholesale removal of root stocks with none left for vegetative reproduction. Morels are crudely hand-plucked which may reduce reproductive viability. Ground cover highly disturbed.

Recommendations

Technical improvements to the harvest are summarized in Table 6.

Season

Each plant has a specific time period when the desired chemical constituent or quality is highest. This is related to the stage in reproduction. Tubers, for example (*Aconitum* and *Dactylorhiza*) are best collected right before the plant seeds. Whole plants, including stems, flowers and leaves (*Viola*, *Hypericum*) are best collected after the plant flowers and before it seeds. Rhizomious plants (*Picrorhiza*, *Valeriana* and *Jurinea*) can reportedly be harvested anytime without a serious loss in chemical constituents (Vivek Kumar pers comm). If done properly it will stimulate the plant into further growth through root coppicing.

Quality may or may not be compatible with sustainability, and there are inevitable trade-offs. Plants whose reproductive parts are completely removed before the plant has seeded will be destroyed not regenerate (*Aconitum* and *Dactylorhiza*), whereas plants where only the aerial parts are removed and have perennial root systems can be harvested with little negative effect (*Viola*, *Hypericum*).



Method

There are several specific harvesting methods for each type of plant (perennial, annual) and plant part. Some general considerations are given below.

- ◆ Do not high-grade. Leave healthiest plants to reproduce.
- ◆ Do not harvest immature plants*.
- ◆ Leave at least 1/4 of a population left in any given area.
- ◆ Shake flower heads in general area to release seeds.
- ◆ Refill holes.
- ◆ Roots: annuals should dug just before flowering stage, biennial and perennial gathered in late fall or early spring starting in third year. For taproots, replace top 2 inches of root crown.

*How to tell a plant's age? Count the cicatrices (scars) left by the leaves and stems on the root after drying. Can be used as a quality/sustainability indicator to check for immature harvests.

Table 6. Guidelines for harvesting selected commercial plants in GHNP

GHNP Example	Part	Time	Method
<i>Nardostachys jatamansi</i> (?) (nyani), <i>Valeriana hardwickii</i> (nahanu), <i>Jurinea macrocephala</i> (dhoop), <i>Picrorhiza kurroa</i> (karu), <i>Dioscorea deltoidea</i> (shingli mingli), <i>Angelica glauca</i> (chora)	Rhizomes	Fall, when seeds are ripe and ready to be disseminated. Plant should be at least 3 year old to reach proper size, weight, and amount of desired chemical properties.	Take only older part of rhizome, eg the part with no shoots. Leave 10-12 cm of younger root to regenerate.
<i>Dactylorhiza hatagirea</i> (salaam panja) <i>Aconitum heterophyllum</i> (patish)	Tubers	Fall, after ripening of seeds.	Shake flower head to disseminate seeds after harvesting.
<i>Parmelia</i> spp.? (mendi)	Lichens	??	copy deer browsing patterns; harvest from lower branches only.
<i>Taxus baccata</i>	Bark	During dormant season when sap is not flowing: fall (after leaves turn) or spring (after buds open).	Remove in strips. No girdling. Whole trees can be harvested as part of an agroforestry system.
<i>Taxus baccata</i> (rokhali)	Leaves	When photosynthesis is highest - before fruits mature.	Prune branches.
<i>Viola serpens</i> , <i>V. odorata</i> (banafsha) <i>Hypericum perforatum</i> (basanti)	Aerial parts	Harvest when in bloom but before the seed head forms and stem turns woody. In dry weather only, after morning dew has dissipated.	Leave roots to regenerate.
<i>Morchella esculenta</i> (guchi)	Fruiting body	After spores have been produced (very difficult to determine in practice)	Do not rake the ground surface with hands or tools. Cut at base of stem with sharp knife or razor.

**Box: Morel Notes**

Very little is known about morel mushrooms (*Morchella* spp). They are not cultivated anywhere and all production comes from wild sources. They are a pan-temperate species occurring in the Central Himalayas, North America, Mexico, and maybe southwest China. Presumably they were in Europe also, but have become extinct due to the high degree of air/soil pollution. Morels are highly sensitive to environmental contaminants.

Morels have a complicated lifecycle (See Appendix 3 for detailed information). Several studies have shown, that collecting the sporocarps (fruiting bodies) have no adverse effect on the mycelia in the soil or on mycorrhiza. S. Singh (pers comm) believes that in GHNP, both production and size are slowly decreasing due to overharvesting. The long term effect of removal of spore-producing fruiting bodies on forest ecology has not been determined either, and it is very difficult to measure. One major obstacle is that it is difficult to determine which fruiting bodies are sporulating and when.

PROCESSING

All plants collected from GHNP are crudely cleaned, dried, and stored. This causes plants to lose the major part of the medicinal or aromatic value for which they were harvested. It also may change the color (especially for morels). All this translates to reduced market value.

Adulteration is not uncommon and is used to increase the weight (cash value). The tubers of *Dactylorhiza* and *Aconitum* can be soaked in milk, morels can be imbedded with sticks, stones and other substances, and similar-looking plants can be mixed in with the commercial species.

For high altitude species much of the cleaning and drying takes place in the collection areas themselves. Plants are washed in the stream or manually picked free of dirt. They are then dried as whole pieces in direct sunlight or over a campfire for several days. Morels are likewise dried, then strung on thread for storing and sale.

Plants are sold to local traders soon after harvesting. Collectors sell everything they have and local traders buy all, although at reduced rates if the quality is poor. Grading (according to gross categories) is done by the roadhead traders. When enough has accumulated to warrant a shipment (approximately one truck/6000 kg.) the regional trader sends a truck to pick up the goods. This happens several times over the course of one season.

Morels are usually shipped out more quickly because they are a high value plant and improper storage cannot be risked. A few years ago collectors stored the mushrooms in bags that had previously held fertilizers, food grain, and insecticides. This contaminated the shipment and it was rejected by buyers.

Drying over a fire greatly reduces the valuable alkaloids for which wild plants are collected.. Picture above, *Dactylorhiza hatagirea* (salam panja)

Recommendations

Raw materials should not be processed in the collection areas. They should be transported to the village for proper cleaning and drying, to be done on an individual household level or through cooperative effort. This will greatly improve the quality and cash value while making the flow of products easier to monitor.

Cleaning

Plants should be washed in running water to eliminate soil clinging to roots, dust, pebbles and any extraneous materials. Soaking plants in milk, hiding sticks or pebbles in the tissue, or taking any other measure to increase weight should be avoided at all costs. This and will only lead to a loss in reputation and potential high quality/high value sales.

Separate the main roots from the advantageous roots, stems, leaves and other minor underground parts of the plant. Save them — they often can be sold as a lower grade.

Dactylorhiza should be scalded in boiling water before drying. This helps to retain the desired alkaloids and speeds drying.



Two grades of *Valeriana hardwickii* (nahanu). Top grade (held by trader) has the advantageous roots, dirt and other debris removed. Prices differences between the two can be substantial.



Drying

After harvesting, drying is the most important procedure done for commercial botanicals. Improper drying can reduce the value of the harvest by as much as 50%! Plants that are not properly dried are subject to mold and parasites, the amount of alkaloids is also greatly reduced as is color, smell and other indicators of quality. A quick and intense drying method takes away both water AND useful substances, and should be avoided; a method that is too slow leaves the plant subject to parasites even though the desired qualities may be retained.

Plants should be dried only in the sun and immediately after they are washed. Take care that this is done on a sunny day so the drying process can be started as soon as possible. Before drying, roots should be sliced into pieces and bark chipped. They should be placed on woven mats, screens or any other material that can be suspended, allowing air to circulate freely. They should be turned at regular intervals, at least 2x/day.

They should then be placed in direct sunlight for two to three days, maybe more depending on the water content. Afterwards they should be moved to a hot, shady but well ventilated place to finish the procedure. Leaves and essential oil-bearing plants should not be kept in the sun for very long as they brown quickly and lose their quality. Shade drying is better in these cases. When humidity increases (at night or if it rains) plants must be kept inside the house. A simple dryer suitable for use at the village level is diagrammed in Figure 2.

Storage

Prolonged storage in damp conditions and/or long transport times to a plant's final destination also decreases the desired chemical properties. Good storage practices preserves plants in their best condition and protects them from mold, insects and small animals like mice and rats. It also gives collectors the option to sell at a later date and allows them to capitalize on the best market prices/outlets.

Once dried, the plants can tolerate a certain amount of humidity. The best way to store them is in bamboo baskets or jute sacks suspended from the ceiling/wall in a well ventilated place. If hanging is not possible, they should be stacked on wooden pallets. They should not be placed on the ground or floor directly as this causes moisture to build and mold to grow, and makes it easier for animals to get in to the plants.

Medium sized baskets/sacks work best. Large ones may hold more, but the plants inside can rot easier. They should be checked periodically (by examining produce in the middle) to see if there is any mold. If there is, throw away the infested piece, place the remainder in the sun, and clean the container.





CULTIVATION

Cultivation, while warranted, should not be undertaken without careful consideration of the objectives, impacts, and beneficiaries. In the final analysis, will it really reduce the pressure on wild flora? At this juncture It should be viewed as a supplementary activity to wild harvest management for the following reasons:

- ◆ Only the people with sufficient land, labor capital and time will benefit. These individuals may not be the same as those who are engaged in the wild harvests.
- ◆ Cultivation may not lead to conservation. In fact, it may create even more of a local demand for the species as the lines of commerce are formalized and there are no effective means of controlling wild collection.
- ◆ At present there is no verifiable mechanism to distinguish cultivated from wild species.
- ◆ It may take several years to obtain a merchantable crop.

Species Selection

Plant selection should take into consideration the following criteria:

- ◆ high-value/high altitude plants with reliable markets.
- ◆ plants with local value that may be diminishing.
- ◆ imperiled species.
- ◆ plants for which agro-tech is available (see Tandon 1997).
- ◆ plants which can be grown and harvested in one year to encourage people's interest.
- ◆ low and medium altitude plants with consistent markets, to be used for enrichment planting and other silvicultural treatments.
- ◆ requested by local people.

Potential candidates

- ◆ *Dactylorhiza hatagirea* (salam panja)
- ◆ *Aconitum heterophyllum* (Patees)
- ◆ *Jurinea macrocephala* (dhoop)
- ◆ *Angelica glauca* (chora)
- ◆ *Valeriana hardwickii* (nahanu)
- ◆ *Podophyllum hexandrum* (bankakri)
- ◆ *Viola serpens, V. odorata* (banafsha)
- ◆ *Dioscorea deltoidea* (singli mingli)



Recommendations

Seed Collection Program

The National Seed Corporation (NSC) Office in Sainj, in conjunction with Park Staff, could jointly undertake a seed collection program for commercial species. This could be conducted as an income generating project for villages in the EZ. The NSC can test seeds for viability, then give them free of charge to local farmers and forest user groups.

On-Farm Trials

On-farm trials are the preferred method to experiment in propagation and growth because they represent the same conditions that plants are intended to eventually grow. These can be conducted with entrepreneurial farmers in a program sponsored by the park but implemented through an expert organization such as the Institute of Himalayan Biotechnology, G. B. Pant Institute, and Department of Ayurveda.

Propagation and production experiments with morels could also be undertaken in this fashion. Inter-cropping with corn has proven successful with other kinds of wild mushrooms and could be possible with morels.

Community Nurseries and Demonstration Plots

Nurseries are needed to produce seeds and seedlings for enrichment planting, restoration and farmer trials. They can also act as a kind of ex-situ conservation for endangered plants and as demonstration sites for local communities.

There are several Park and DFFC rest houses with terraced fields that are not being used at present and are ideally situated for this purpose. Plants can be grown in areas that approximate their natural habitat in terms of soil, climate, altitude, aspect, light conditions, and related factors. More importantly, they can be seen by villagers on a daily basis. The current experimental nursery in Sai Ropa is far away from the majority of villages and too low to grow high or even medium altitude species.

These activities should be undertaken as a community-based project with initial support from the park but managed by communities themselves with assistance from outside experts.

Involve Experts in the Area

Lahul Potato Society. Akhara Bazaar, Kullu. The success of the LPS is legendary. Their experience and insights into cooperative formation, collective marketing, and domestication would be invaluable to the Ecodevelopment Project component of GHNP.



Himalayan Institute of Biotechnology/CSIR. Palampur. Clearly they are one of the country's leading organizations in the cultivation of medicinal and aromatic plants, but their approach may not be compatible with the conservation objectives in GHNP. They are mainly concerned with industrial production and large scale farming, which is not the level for which expertise is being sought. They also do not deal with natural or in-situ production. Their expertise could be utilized valuable for nursery establishment, on-farm trials and training, however.

Agricultural Experiment Department. Kinnaur (Kalpa). At present they are conducting trials with *Aconitum heterophyllum* (patish) and other high altitude plants.

Department of Ayurveda, H. P. They have been setting up medicinal plant gardens in various parts of HP and could be engaged in nursery establishment, training, etc.

Y. S. Parmar University. Solan. Horticultural research on various wild species.

G. B. Pant Institute. Shamshi. Engaged in various aspects of medicinal plants throughout the Himalayan region.



MARKETING

OVERVIEW OF THE CURRENT SITUATION IN GHNP

The wild plant trade in the GHNP has an extensive infrastructure linked to even larger networks in the region and across the country. Large scale trade is reported to be around 40 years old beginning with *Jurinea macrocephala*, but it can be assumed that some level of collection has occurred for centuries. The trade in morel mushrooms is a more recent phenomena beginning in the early 1980s and really booming in the last five years. *Taxus bacchata* is also a relatively new addition. Even newer (this year) is *Hypericum perforatum*, or St. John's Wort, recently discovered in the west as possessing a natural anti-depressant.

Even though the infrastructure is extensive, it is largely uncoordinated and runs on personal contacts. It is more "above ground" than other parts of the Himalayas, but collusion among traders and corruption is commonly reported. An unknown portion is traded unofficially and is not recorded via the permit system.

The market is essentially volume-based. Traders buy everything regardless of quality because the demand is so great. There are signs that this is changing, however. Buyers are becoming more discriminating, and the opportunity for significant value-addition through quality improvements is increasing. Quality is very much a product of proper harvesting and drying, both of which can help to improve the sustainability and judicious use of a given species.

Table 7. The difference between selling and marketing

Selling	Marketing
Product-oriented	Customer-oriented
Volume-oriented	Profit-oriented
Looks for new opportunities to sell products	Focus on technology/cost of making products
Promotes how products are made	Promotes how products meet customer oriented demand
Customer service is secondary	Customer service is part of product
Little planning and feedback	Integrated planning and feedback

(from RECOFTC 1997)

THE MARKET CHAIN

The market chain is diagrammed in Figure 3a and 3b below. There are between three and six levels in the regional trade and four more at the national level, depending on the specific arrangements of each trader. Levels include collectors, village traders/agents, roadhead traders/agents, one sub-regional trader,



regional traders, wholesalers and industry. The lines do not necessarily represent the flow of products. Because GHNP is located to the south of Kullu, traders there often hire trucks to drive to the roadheads, pick up the products and go directly to the end-market in Amritsar. Some species, especially morels go mainly to Delhi. A list of traders regularly exporting products from the GHNP area is included in Appendix 4.

Roadhead Traders

There are approximately 20 roadhead traders in the GHNP area based in eight roadhead villages. Products leaving GHNP must all pass at some time through their hands. Roadhead traders are typically shop owners who act as a local agent for bigger traders in the region during the collection season. They do this as a side business, although it probably represents a considerable part of their income. In recent years some have developed their own links to Amritsar and Delhi, and operate somewhat independently from Kullu traders.

Roadhead traders buy directly from village collectors and store the plants for later pick-up by one of the large traders. They are the most critical link in the chain. Without them the flow of products to the market and money into the hands of local collectors would be severely constrained. Equally important, they also act as local creditors for cash, food and household items in times of shortage (a common situation in the project area).

Most are relatively new to this business, although one individual in Sainj reported that his father and grandfather were both traders as well. Their level of sophistication and knowledge about the plants, markets and marketing options, qualities, processing the plants, and qualities varies, but for many it is quite limited. They are simply supplying the bigger traders.

Note that two roadheads - Bagipul and Manikaran - are not in the EZ. They are located at the bottom of the only two outside access point to the park. Bagipul exports products from the Tirthan area, and Manikaran pulls products out of the upper Sainj and Jivan Nal areas. All the others roadheads are in the EZ. As part of the negotiation process collectors should agree to sell only to traders in the EZ and there should be some mechanism (checkpost?) for controlling access in these areas.

Regional Traders

Regional traders are usually full-time dealers. In the Kullu area alone (including Kullu, Bhuntar and Shamshi) there are at least 30 (Vivek Kumar pers. comm.) There has been a large influx of both seasonal and full-time traders over the past decade. Previously only a handful existed in the area, the oldest of which is DM Ajay Vivek Kumar (son) and Kuldish Rai (father) in Kullu. This family has been in the business for over sixty years. Regional traders receive products from all over the Kullu Valley, Lahul, and quite possibly Ladakh. They can be quite professional and sophisticated in the knowledge of the plants and market dynamics. They handle the export permits, pay royalties, market fees (1% to state marketing board), and road taxes, and arrange transport.

In Bhanjar, there is a sub-regional trader who functions as a regional trader but is situated at a roadhead. Several informants reported that this trader controls a large portion of the GHNP trade (especially from the Sainj Valley) and uses his political connections to maintain it.







End Markets

The main end-market for products coming out of the GHNP area is Amritsar. Some products may go directly to industries in nearby Mandi or in major cities like Delhi and Bangalore but this was not confirmed. The clear exception is morels, which go only to Delhi where there are reportedly four wholesalers who export virtually all the produce to international markets. The main international market for morels is the US, followed by Europe, Japan, and Canada. Because of the strict import standards, the Indian morels are believed to go first to Europe for better processing, then shipped onward to America and other countries

The major domestic uses for wild plants are Ayurvedic medicines and essential oils. The herbal medicine industry has over 7000 manufacturing units with an annual turnover of more than USD 250,000,000.00. The largest of these companies are listed in Table 8. There are also over 400,000 registered practitioners. Essential oils are used to make fragrances, cosmetics, dyes, incense, soaps, pesticides and other natural products. This is a rapidly expanding market throughout the world, growing at least 7% a year. (Edwards, 1996)

Table 8. Major manufacturers of Ayurvedic medicines in India

Name	Location (main)	Annual Turnover USD (1994)
Dabur International	Sahibabad	83,000,000
Baidyanath	Calcutta	19,000,000
Verdinath	Allahabad	n/a
Jandu	Sahibabad	n/a

(From Edwards 1996)

India is one the world's largest suppliers of raw and semi-processed plant materials. France and Germany are the largest European consumers. In America, the natural products industry has exploded in the past decade, and was estimated in 1994 as totaling USD 1,000,000,000.00 (Brevoort 1996).

Market Information

Each season, roadhead traders get information on prices, products and demands from their contacts in Kullu or Amritsar. This information is based on a published rate sheet but the details of this list (who compiles it, etc.) were not able to be ascertained over the course of this assignment. Traders in larger town such as Bhanjar and Sainj are in constant contact with their buyers throughout the season by telephone, fax, and letters. More distant traders have less access to up-to-date market information.



Collectors get market information from local traders and other villagers. This is mainly a parochial assessment, and is of little use if there is only one buyer in their area and transportation to other places is difficult.

Collector-Trader Relations

Contrary to popular conceptions, not all traders are exploitative. The level of exploitation usually depends on the level of competition in the immediate area and the availability of other sources of credit and household supplies for local collectors. Some traders have hereditary or familial ties to a particular village or area, which can positively effect relations with village collectors. On the other hand, at least two of the more well-known traders are politically-powerful individuals who can use their influence to control prices and sequester more of the produce for their own use. One of these individuals is a leading member of a local VDC and the other is a *negi*.

Advances, a typical source of collector debt, are also left up to the individual discretion of each trader. Roadhead traders reported that they do not like to take them from the larger traders or wholesalers because they entail high interest rates. Advances also do not guarantee that collectors will sell their produce to them even if they have taken one.

Even so, there appears to be a high degree of dependency on local traders which allows him a certain amount of leverage when negotiating payments. If there is only one trader in the area who also is the only shopkeeper, villagers are obliged to sell to him to stay in good favor in case they need a loan, food or other supplies.

Competition and Bargaining Power

Competition is the key to equitable returns for collectors. In the Tirthan Valley, for example, there are several traders who actively compete with each other for collector's plants. Prices are consistently higher than in the Sainj Valley. This may reflect more collusion among traders there and/or the lack of alternate markets, credit, supplies, etc.

The regional trade in Kullu, Shamshi and elsewhere appears quite competitive. In the last twenty years numerous traders have moved in the area which keeps prices for collectors high. In this case, it is a sellers market. Simply getting the produce to Kullu might offer substantial gains for collectors.

Collector bargaining power is mainly related to the level of competition, but with morels it is a different story. The demand and prices are so exceedingly high for this species, and the plants themselves are so lightweight and easy to transport, that a collector has a relatively high degree of bargaining power. On the other hand, regional traders reported that in some cases they felt obliged to buy poor quality products only to maintain good relations with the collectors and to keep their channels of access open.

Prices, Profits and Risk

By definition, the wild plant trade is a volatile business. Prices can go up and down significantly over the course of one season and can boom/bust in a short period. Overall, however, the prices for most species are rising and the demand is steady, especially as wild supplies dwindle. Table 9 describes seasonal and overall price changes during the last five years. The data is drawn from personal field work and existing reports including Gaston (1992), IIPA (1997), Choudhury (1996) and Tandon (1997).

It must be stressed that this is a very sketchy assessment, but some interesting patterns are indicated none the less. There is substantial price variation over a season which could be due to the inherent volatility of the trade, the level of local competition, or other unknown factors. The usual pattern in the wild plant trade is that high altitude equals high value, but this is not the case in GHNP. *Jurinea* is very cheap and *Picrorhiza* is not as high as one would expect (as compared to the other high altitude species) given its critically threatened status. *Dioscorea*, the only officially banned product, is the cheapest of all. Perhaps this is a function of the regulations, but more likely it is due to the fact that the market experienced a region-wide boom/bust several years ago and there is not much demand for it today.

Table 9. Preliminary findings on yearly price changes and seasonal fluctuations, 1992-1997 (IRs/kg)

Species	1992-93	1996	1997
<i>Jurinea macrocephala</i> (dhoop)	20-50	40	40-100
<i>Valeriana jatamansi</i> (nyani)	50-62	70-100	50
<i>Valeriana hardwickii</i> (nahanu, muskubala)	10	18-30	30-50
<i>Dactylorhiza hatagirea</i> (salaam panja)	250	365-400	400-750
<i>Parmelia spp. (?)</i> (mendi)	xx	16-22	20-40
<i>Viola V. odorata, serpens</i> (banafsha)	xx	100-213	80
<i>Aconitum heterophyllum</i> (patish)	400-600	300-800	800-1100
<i>Picrorhiza kurrooa</i> (karu)	50-62	75-164	60-110
<i>Morchella esculenta</i> (guchi)	1200-3300	1800-2500	1800-2500
<i>Hypericum perforatum</i> (basanti)	xx	xx	75-100
<i>Dioscorea deltoidea</i> (shingli mingli)	10-12	20	xx
<i>Podophyllum hexandrum</i> (bankakri, galakada)	25	200	200



The difference between roadhead prices and end-market prices was not able to be obtained during the short time period in the field. In a case study of four regional traders in the area, Bajaj (1997) found out that once overhead (mainly transportation, royalties, and road taxes) was factored out the profit margin was less than 30%. Profit margins may be considerably higher for roadhead traders because the permitting and transportation are commonly taken care of by larger traders leaving them with little overhead.

The main issue here is equitable pricing. Are prices paid to collectors commensurate with current market prices, labor/technical inputs, and the amount of financial risk they assume? At present, collectors bear little financial risk as the market accepts everything they collect, regardless of quality. Traders, however, can bear substantial risk in this regard. One trader reported that he is stuck with the price initially agreed upon regardless of fluctuations. If the price goes down this could result in a loss, as he has already paid local collectors on the basis of the initial rates. The relative degree of these losses, however, are not known (when compared to the price paid to the collector). This situation occurred a few years back with the morel trade, as noted earlier. Collectors were paid approximately IRs 2000/kg (dried), but the whole shipment was rejected by the wholesalers because the products were contaminated. This undoubtedly resulted in a considerable loss.

...More on Mushrooms

Wild mushrooms, especially morels, are big business. In the US, harvesters earned about \$4/lb (\$9/kg) in 1992, but many restaurants (the primary consumer) paid in excess of \$25/lb (\$55 /kg) for fresh morels. In India, collectors currently earn over \$50/kg for dried morels.



The main market varieties of of wild morels in GHNP : ulti (small) and chatri (large). Chatri is the most costly.



Main Constraints to Marketing

For collectors, selling is not a problem in GHNP. But marketing - getting top value for their produce - is. The main constraints in this regard are:

- ◆ uncoordinated collection (small quantities, many collectors)
- ◆ services provided by roadhead and regional traders
- ◆ lack of marketing options and monopsonies (in some areas)
- ◆ lack of current market information (plants, prices, qualities, processing, other markets)
- ◆ poor and/or unreliable quality
- ◆ lack of technical know-how to improve value

Recommendations

Buyers are interested in two things: quality and quantity. The quality does not have to be the highest, nor does volume have to be the greatest. The main issue is consistency. If a product of a reasonable quality and quantity every year can be reliably produced each year, selling power in the marketplace can be significantly enhanced. At present the market demand is so high that quantity is the main driving force. Even so, there are significant variations in local prices based on crude differences which could be used as a basis to enhance the cash value of the trade. Regional traders in Kullu reported that they would pay more for better or more reliable quality (Vivek Kumar, pers. comm) and several industries using wild plants have opened in various parts of the state.

In the wild plant trade, numerous areas have unofficial "specialties", eg plants of exceptional quality. Regional traders try to made good connection with suppliers in these area to gain access. An obvious example is Lahul, which has a monopoly on the market on *Saussurea spp.*(kuth). Their niche is protected by the species having a Red Data Book listing, and since they are cultivating and marketing it through their society, they are the only legal suppliers. The GHNP area is known for its morel mushrooms, *Jurinea macrocephala*, *Valeriana hardwickii*, and *Aconitum heterophyllum*. These species could be used as the basis of a strategic marketing plan to capture the trade in high quality produce.

In GNHP, the key is to focus on quality over quantity. If plants are collected in the right season and in the proper manner, and are dried and stored in the proper way, and some small marketing investments are made, the returns will increase substantially. Before undertaking any value addition activities, however, more research needs to be conducted on the nature of the market and to determine if will pay more for these improvements.



Marketing Collectives/Societies

There is strong local interest for this and there several good resources in the region to assist in organization and development, in particular the Lahul Potato Society and the G.B. Pant Institute.

It would be prudent to start small with a project based on one or two plant products only. This is needed to test and refine the organizational framework and make it appropriate to the local context so it can be replicated later. Ideally, as the organization becomes more functional, other communities will want to join and the program will take off on its own. Given that morels fetch the highest prices and have excellent potential to be sustainably harvested, it is recommended that a pilot marketing project be initiated based on this species alone.

One should be careful to avoid a situation where the collective become a case of subsidizing the middlemen, which has happened all too often in similar schemes. Most informants felt that government-sponsored collectives should be avoided due to the extensive bureaucratic demands and potential for corruption.

Market Information Systems and Market Plans

Research in various rural settings in Asia strongly suggest that supplying villagers with reliable, up-to-date information on pricing, seasonality, quality, value-addition options and market outlets can greatly enhance employment opportunities, income generation and bargaining power (FAO, 1995). Developing a system to obtain, store and deliver market information that is founded on people's participation may also enhance return for GHNP collectors and well as reputable roadhead traders.

It is important to keep in mind the production and marketing go hand-in-hand. The USA, for example, spends at least half of every dollar spent on marketing costs alone. To increase returns, the collector, trader or cooperative must put the buyer first in all aspects of his operations. He needs to actively seek out new markets and strategically position himself to capture them. One way to do this is to contact potential buyers directly and be ready to provide representative samples of quality with quantity estimates. Based on this they can place an order and a contract can be drawn up based on a mutually agreeable price.

Direct or Bulk Marketing?

There are two marketing options for wild plants: direct marketing to consumers or industry, or bulk marketing to raw material wholesalers. Direct marketing to consumers (at *melas* and such) is time consuming and less efficient. Only a few families can profit from such activities because the demand is small.



Direct marketing to industry, especially regional industry, has various advantages and should be explored thoroughly. It can provide a reliable market for high quality produce and therefore encourage sustainable harvesting. It also reduces dependence on intermediaries and brings the buyer and the seller together mutually supportive fashion.

Potential industrial markets in the area include:

- ◆ Mediroma Nirgalits International (essential oils). Shamshi, Kullu. Manish Kapoor, Owner
- ◆ Essential Oil Factory. Bagimondi, Mandi

Bulk marketing to raw material wholesalers describes the current system. Because wholesalers receive plants from all over the country there is less chance that value addition improvements will be effective. This needs further market research.

Cash returns on bulk marketing could be enhanced through:

- ◆ developing a reputation with regional traders for supplying high quality raw materials
- ◆ in anticipation of a international/national ban on selected products, develop a good reputation (through cultivation or sustainable collection) and be posed to corner the market like the Lahulis did with kuth.

Work with Roadhead Traders

The most common prescription in the wild plant trade is to eliminate the middleman. Those who take this position reason that all traders are exploitative, and that by-passing them would mean higher prices to the collector. This assumption is not necessarily true. The trader performs several critical functions in getting the produce to market such as transportation, warehousing, storage, buying and selling activities, credit, marketing research and management advice. The issue, rather, is whether or not the trade is competitive and if the players are receiving a fair share given their services they provide and the risk they bear.

In GHNP, significant gains for local collectors could be made by developing prices standards and facilitating reliable, equitable relations with roadhead traders. In exchange for continued access to GHNP produce, traders should be required to set yearly price and quality standards (with some degree of flexibility to allow for fluctuations) so that collectors are not exploited because of the lack of local competition.

In controlling any aspect of the wild plant trade, roadhead traders could be a manager's greatest asset or worse enemy. Until such time when collectors can be organized to provide their own credit and household supplies, it is highly recommended that traders be involved in any intervention.

RESEARCH

GUIDELINES

Management of wild species requires both technical and social knowledge. Since protection is often a key to sound management a clear definition of GHNP users and their rights, and a mechanism to enforce these rights, is a key research priority. Without understanding the social and institutional factors behind successful (or failed) management, technical improvements may be ill-conceived and thus never adopted. A study should be initiated next year that focuses on this issue alone.

In terms of technical knowledge, two broad areas of research are needed: (1) ecological requirements of major commercial plant species in the park, and (2) harvesting and production information. Much of the autoecology work has already been done and needs only to be collated from organizations such as IHBT, G.B. Pant Institute for High Altitude Plant Physiology in Srinagar (Garhwal), and Center for Minor Forest Products, Dehra Dun.

The main types of ecological data needed are: density, distribution, population structure, and impact of different harvest levels.

Comparative Studies vs. Permanent Plots

Comprehensive population studies of commercial species present many challenges to researchers given the lack of site security and the extensive exploitation which has already taken place. Exclosures and permanent plots, while preferred, are best suited to areas where collection pressures are low or where local users have agreed to not disturb them. Comparative studies may be more useful, providing data on population size and viability according to habitat and use history/intensity.

Since the main biotic pressure currently comes from over-exploitation, it is the harvesting variable, as opposed to grazing, that should be the focus of study. The actual effect of grazing is more difficult to tease out because of the confounding effects of the commercial harvest.

An example of a comparative study is to measure population size and vigor (including # of inds., regeneration, and age classes) in areas of three collection intensity classes in the same ecological community type. Collection intensities can be divided into three classes: high (every year, many people), medium (fewer people, less often) and low (rarely collected, too remote or inaccessible). These should be conducted in areas with roughly the same amount of grazing pressure.



Data Base

A comprehensive data base is a crucial component of any sustainable management program and should include social, economic, and biological data. Several smaller studies on plant use in GHNP exist (S. Vahson, pers. comm.), but they are not available in any centralized data base nor with any one organization.

It is highly recommended that locating and collating this information into a centralized data base be initiated immediately. This data can eventually be integrated into the GIS being developed for the park, and updated as new field information becomes available.

Forming a Research Network

To build the data base, an organization like WII could facilitate the formation of a research network in the park to coordinate existing studies, encourage collaboration and the sharing of results and methods through informal forums, and provide technical expertise. This is needed to avoid duplication and obtain comparable results for developing a park-wide perspective. At present at least two other organizations are conducting research on the wild plant trade in the a GHNP area including SAVE, a local NGO and WWF/Biodiversity Priority Mapping Project.

Incorporating Local Technical Knowledge

Local technical knowledge and management practices can contain important information on species biology, productivity, range, habitat, density and abundance. In the absence of long term research it can provide crucial social and technical input management planning. This is especially true in the case of medicinal and aromatic plants, as several species have yet to be domesticated and their biology/ecology is relatively unknown.

There are reports that some communities practiced rotational harvest methods (IIPA) but the details of these systems are not known. Vasan (pers. comm) describes two additional practices from the Rela Panchayat in Sainj where collectors would leave (whether intentional or not) a portion of the root of *Jurinea macrocephala* (dhoop) to encourage vegetative regeneration. They also had a local rule forbidding collection during certain phases of the moon. Again, the details of these systems are sketchy.

Traditional practices that encourage judicious unfortunately tend to be forgotten with intense market pressures and lack of authority and capacity to enforce them. They need to be documented, however, and, if effective, revitalized as part of a community-based management system.



Some Ethnobotanical Aspects of Morel Mushrooms

Since morels are the most valuable product in the area and very little is known about them in the scientific literature, an attempt was made to collect local technical knowledge of this species. One thing to remember is that technical knowledge is an outcome of long-term interaction. Morels have been used by most people in GHNP for less than one generation.

Two types: Chatri (larger and more valuable) and Ulti.

Water content/shrinkage: higher in Chatri.

Productivity

- fires set in fall increase productivity the following spring (this has been scientifically proven as well).
- "If you see it, it won't get bigger." Perhaps related to the amount of duff/leaf litter coverage on forest floor required for growth. (This has been demonstrated for other wild mushrooms)
- highest after rainstorms with lightning and thunder
- reproduces by spores
- harvesting does not reduce population levels

Distribution: very broad. Occurs in broadleaf and conifer forests as well as farmer's fields. In broadleaf forests, found in abundance near Jamun trees (*Prunus* spp.?)

Local cultivation experiments:

- transplanting plug of productive soil not successful (V. Singh pers. comm.)
- discarded plant parts cast on pile of woody debris yielded a flush the next season (Raju Bharti, pers. comm.)

SUGGESTED METHODS

Five methods are described in brief here which can be used to design methods appropriate to GHNP. Edwards (1995) provides a method to assess regional productivity (actual and potential) of individual species based on roadhead trade catchments. Devised for an NTFP/Protected Area project in Laos, McKone (1996) uses forest block profiles to identify, measure, and monitor indicators of existing environmental conditions of forests and selected economic species. This approach has excellent potential in GHNP and is included in full as a companion volume to this report. Hall and Bawa (1993) suggest rapid bioassessment for measuring the impact of extraction. Piltz et al (1996) provide a method for inventorying, predicting and comparing productivity of wild mushroom in different sites. A method employing permanent plots to characterize ecological requirements, monitor species, and experiment with treatments for mushroom is described Villarreal and Gomez (in Palm and Chapela 1997).



Volume Studies (Edwards 1995)

The three steps described below provide volume estimates (potential and actual amounts) for a selected species. It is based on the geographical unit of a trade catchment, but can be extrapolated to cover an entire drainage using land use or vegetation maps. A trade catchment encompasses the source area for all the produce that drains into one roadhead similar in concept to a hydrological catchment. The total actual harvest is obtained by interviewing the roadhead traders who handle the produce being extracted from the catchment. The total potential harvest is gained through adding the estimated production of the various habitat categories in a specific catchment. If actual harvest is appreciably less than the potential harvest then the species is most likely threatened.

Three steps comprise this method.

- (1) Areas from which the species is harvested are identified, classified into habitat categories, and mapped using PRA techniques. Relevant variables are examined and recorded for each habitat category which may include canopy closure, canopy height, altitude, aspect, distance from village, roadhead or trader (# of walking days).
- (2) Determine potential yield/ha for each site. Before harvesting begins, mature plants are counted within a number of quadrants (10m x 10m) positioned on several representative and protected sites. These counts should be repeated at intervals up to seed dispersal. The increase in potential yield throughout the season is thus quantified. Quadrants may also serve as a demonstration to villagers of the benefits of protection.
- (3) The weight per hectare harvested from each habitat category is estimated. This can be done through PRA-type discussions with collectors using the map of potential habitat types and locations. Estimates of annual harvests (kg/ha) can then be made for each habitat category and compared with the information on potential yield.

Forest Block and NTFP Profiles (McKone 1996)

This method was developed as a means to monitor and evaluate indicators of the environmental impact of a project in NTFP development. The methodology is based on a set of profiles that measure and document existing environmental conditions of forests and selected non-timber forest products and the ways in which they are being used/managed. They are repeated over the life of a project to help gain insights into the environmental impacts of project interventions. This method can easily be adapted to different ecosystems and can be used as a basis for a park monitoring program.

Forest block profiles provide a variety of biophysical information on specific forest areas and species, done in area of interest to both users and researchers/project implementers. The method is participatory



and synthetic in that it gathers baseline population data and management information at the same time, both which are needed to develop protocols for sustainable use and monitoring. It has six major components: forest block descriptions; use/treatment history; forest block surveys using temporary sample plots or point-centered quarter method; NTFP species profiles; NTFP use/treatment history; selected NTFP species inventory, census, and off-take surveys.

Assessing the impact of extraction on target plant populations (Hall and Bawa 1993)

The third method is actually a nested set of methods used to determine distribution and abundance of a single species, to measure effects of harvesting on population dynamics, and to assess the sustainability of extraction. The methods can easily be adapted to temperate forest species even though they were originally developed for tropical areas. The main components are Sustainability Assessment, Sampling for Distribution and Abundance, Determining Effects of Harvesting through Rapid Assessment, and Long Term Assessment (Appendix 5).

Permanent Plots to Determine Ecological Requirement, Monitor Productivity, Experiment with Treatment for Wild Mushroom (Villarreal and Gomez 1997)

Plots should be established in fairly accessible areas as they need to be visited frequently, especially during the growing season. Two 1 ha plots (50x 200m) should be established in each forest type. In each plot, a 10x10 meter area should be marked and subdivided into four 5x5 subquadrants. The subquadrants should be fenced with barbed wire to keep out large animals. Samples should be collected on a regular basis in each plot over a period of four years (weekly in each plot during the rainy season). One plot can be used as a control/baseline, the other used to monitor the effect of different treatments.

SPECIFIC RESEARCH NEEDS IN GHNP

The WII researchers have a good understanding of park biota and management issues. What they require now is a formalized structure/method to transform their research into management prescriptions. Action should be directed at setting up a process whereby research results can be systematically conveyed to park administration, field staff, and local communities in a process of mutual learning. This needs to be followed up by the development and implementation of appropriate management prescriptions with continued WII input.

Customary Users and Use Areas

This data is the cornerstone of participatory management and is a priority research need. IIPA (1997) and Choudhury (1996) have collected some information in this respect which can be used as a starting point for more intensive, systematic research. Collection areas and use patterns need to be mapped and evaluated for potential joint management sites or no collection zones. The data needs to be triangulated with other villages to see if there are overlapping notions of propriety and hence, potential management conflicts.





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