Effective chain development requires active participation of its stakeholders. This case focuses on medicinal plants in the Himalayan region of Uttaranchal, India. KIT facilitated an interactive consultation process where stakeholders expressed, exchanged and discussed their views on how to develop a medicinal plant chain which is sustainable and equitable. Policy makers, practitioners, private industry, researchers, and farmers shared opinions and experiences, defining areas for collaboration and joint action.

This bulletin summarises the main outcomes of this process. It includes papers summarising the predominant issues related to the chain's impediments and opportunities, such as medicinal plant policies and institutions, technology development and diffusion, collectors' and farmers' livelihoods, marketing arrangements and industry's perspectives. All contributions were written by experts with ample practical experiences in their area. A unique, comprehensive overview of the medicinal plant chain in Uttaranchal is the result, providing clear and practical recommendations for improving its performance. The authors hope this publication contributes to guiding stakeholders' interventions that will help the chain to grow to its full potential.

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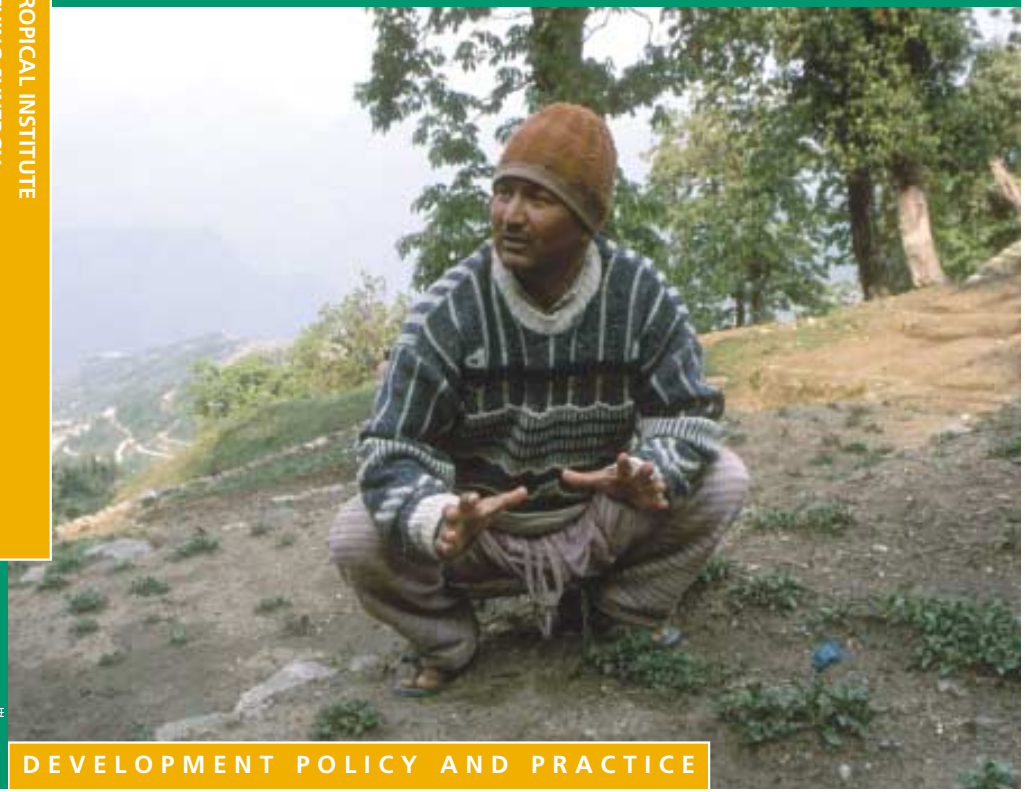
ROYAL TROPICAL INSTITUTE
SEARCHING SYNERGY

BULLETIN

359

Searching Synergy

Stakeholder views on developing a sustainable medicinal plant chain in Uttaranchal – India



DEVELOPMENT POLICY AND PRACTICE

SEARCHING SYNERGY

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Bulletin 359

KONINKLIJK INSTITUUT
VOOR DE TROPEN

ROYAL TROPICAL INSTITUTE

Development, Policy and Practice

Ghayur Alam
John Belt (eds.)

In collaboration with:

Institute of Applied Manpower Research
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Centre for Sustainable Development
Dehradun

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Abbreviations

CBD	Convention of Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSD	Centre for Sustainable Development
FES	Foundation for Ecological Security
FRLHT	Foundation for Revitalisation of Local Health Traditions
GAP	Good Agricultural Practices
GBPIHED	G.B. Pant Institute of Himalayan Environment and Development
GMP	Good Manufacturing Practices
HAPPRC	High Altitude Plant Physiology Research Centre
HRDI	Herbal Research and Development Institute
IAMR	Institute of Applied Manpower Research
IDRC	International Development Research Centre
INHERE	Institute of Himalayan Environmental Research and Education
JFM	Joint Forest Management
KIT	Royal Tropical Institute (Koninklijk Instituut voor de Tropen)
NGO	Non-Governmental Organisation
NTFP	Non-Timber Forest Product
Rs.	Indian Rupees
UMAPB	Uttaranchal Medicinal and Aromatic Plant Board
WHO	World Health Organisation
WWF	World Wildlife Fund

Weights and measures

1 lakh	=	100,000 Rs.
1 crone	=	10,000,000 Rs.
100 Rs.	=	2.13 Usd (November 2002)
1 Usd	=	47 Rs. (November 2003)
1 quintal	=	100 kg
1 nali	=	0.02 ha
1 ha	=	50 nalis

Foreword

One of the merits of liberalisation is that we question the traditional role patterns of institutions. Centrally lead development paradigms are no longer the undisputed source of solutions to locally perceived problems. In the quest for effective interventions in rural economies we have realised that the government is just one player in a diverse landscape of actors. Producers, private enterprises, knowledge centres, community representatives and governments form a human chain that allows for the flow of information, capital and produce. The chain connects people and institutions; if the connection is broken, the flow is interrupted.

Previous research by the KIT-IAMR partnership on the liberalisation of the agricultural sector in India indicated that the national policy of providing subsidies to major crops and the vested interests of states with higher agricultural productivity are major reasons for the stagnation of reforms in the agricultural sector. Rural areas in less advanced states have hardly benefited from liberalisation of the economy. However, in less explored and developed markets new opportunities emerge. Production of – and trade in – medicinal plants represent one of these opportunities. In contrast to the major crops, such as wheat, rice and sugarcane, this economic chain is characterised by a lack of coherent policy, organised interests and government investments.

A chain perspective to enhancing rural income generation forces us to redefine the roles of the actors. In other words, we have to assess who is good at what and how we match these functions in order to make the chain operate as smooth as possible. Is the government a good business partner? Do producers sufficiently understand how markets work? Do private enterprises take into account the sustainability of production? And who takes care of community development including less endowed social groups? No single actor can play all these roles optimally. Each stakeholder has his or her core expertise and by optimising this expertise we develop the chain.

Developing a chain should therefore start by a careful analysis of all major stakeholders involved. Step two is to bring them together to exchange information, views and ambitions. One has to be clear about this: there is no obvious mechanism to ensure compatibility of stakeholders' ambitions. We have to be conscious of potential conflict between stakeholders. Do traders and industry have the same ambition as small-scale producers? Do all stakeholders share the government's concern for environmental protection and conservation

of biodiversity? The most likely answer to this question is: no, they do not. That does not imply that these stakeholders cannot co-operate and that different ambitions cannot be matched. It only requires a process of strengthening transparency, defining roles and creating the conditions that will promote collective effort. Searching for common ground is an essential part of this process.

In the bulletin "*Cultivating a Healthy Enterprise*" the authors explored the potential of medicinal plants to contribute to the diversification of rural income generation in the state of Uttaranchal. The overall conclusion was positive, but many questions were raised about the markets for medicinal plants, initiatives to domesticate and grow them and the possible effects of enhanced trade on biodiversity conservation.

This bulletin gives the floor to the stakeholders themselves. The publication is a collection of views and perspectives as perceived by different actors. It is the fruit of stakeholder debate exploring the common ground for action. This publication clearly shows the merits of new modes of co-operation: a single actor could never have produced this variety of information. It proves that a human chain generates synergy and cross-fertilisation of knowledge. It is not by accident that we seem to have copied a process common in nature. Removing obstacles to the optimisation of roles and functions, thus emphasising the exchange of knowledge and generating common ground for action is to me one of the major merits of liberalisation. In that way, liberalisation makes sense to all of us.

Dr. Bart de Steenhuijsen Piters
Area Leader, Development Policy and Practice, KIT

1 Introduction

Medicinal plants are fascinating phenomena. Through the different dimensions of health care traditions, local cultural practices, biodiversity issues or their potential for employment and income generation, they have attracted increasing attention during the last decade. Worldwide, alternative herbal based health care, body care and food products are growing in popularity, leading to an increased demand for medicinal plant material.

With its ancient, extensive knowledge systems of the use of plants for health care purposes, India has frequently been a focal point of research as well as trade in medicinal plants. The central question in the joint research initiative of KIT, CSD and IAMR[1] has been whether the increased growth in demand for medicinal plant material can be linked to sustainable development in rural India, generating income and employment and enhancing agricultural diversification. To bring light to bear on these questions, field research was conducted in Uttaranchal, a Himalayan state that has recently been described as the "Herbal State of India" (for location of the field research sites see Figure 1.1).

During 2002 and 2003, an interdisciplinary team consisting of staff members of KIT, CSD and IAMR, collected information through detailed discussions with farmers, researchers, policy makers, NGOs, industry and trade representatives. Following a consultative Value or Market Chain approach, the main purpose was to identify opportunities as well as constraints in the chain, aiming at developing a prosperous, sustainable and equitable medicinal plant sector. The results of two field studies have recently been published.[2]

During the course of the study, it became increasingly clear that the medicinal plant sector in Uttaranchal faces a number of serious problems. These include, among others, excessive collection from the wild, the ineffectiveness of current policies in promoting cultivation and the small earnings of primary collectors.

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[1] The complete names of the collaborating institutes are: The Royal Tropical Institute (KIT), Netherlands, Centre for Sustainable Development (CSD), Dehradun and Institute of Applied Manpower Research (IAMR), New Delhi.

[2] KIT (2003): Cultivating a healthy enterprise: developing a sustainable medicinal plant chain in Uttaranchal – India, and KIT-CSD-IAMR (2003): Promoting a sustainable medicinal plant chain in Uttaranchal - India: I. Report of a field visit to Munsiyari Area, II. Annotated bibliography of medicinal plants in Uttaranchal, III. Description of seven priority species.

Figure 1.1 Map of Uttaranchal

Any improvement in the performance of the sector will require consultation and joint action by its actors, including farmers, technologists, policy makers, private industry and NGOs. It was felt that a stakeholder consultation, where the various actors involved could exchange views, share experiences and discuss possible action to remove constraints and materialise opportunities, would contribute to the building of this "healthy enterprise" in Uttaranchal.

It was certainly not the first workshop on medicinal plants in Uttaranchal. However, it was a unique event since *only* people directly involved and experienced in medicinal plants participated. The timing of the consultation was significant as Uttaranchal is poised to implement major policy changes to promote the conservation and cultivation of medicinal plants in the state. It is hoped that the consultation provided useful inputs for the policy makers. Furthermore, it was well timed, since it provided an excellent opportunity to present to a specialised audience the findings of some recent empirical research initiatives on medicinal plants in Uttaranchal.

The workshop was held in Dehradun on the 30th and 31st October, 2003. It was attended by about 30 participants. Papers, nine in total, were presented by their authors, followed by a 40 minutes discussion session. All the papers were prepared specially for the consultation and for a specific set of issues. These

issues included: policies, technology development and diffusion, farmers' experiences, marketing arrangements and industry's perspectives. As an important objective of the workshop was to encourage an exchange of views between the stakeholders, the concluding session was devoted to discussion. The focus of this session was to identify the initiatives necessary to provide impetus to a sustainable growth of the medicinal plant chain.

The proceedings of the consultation are presented in the following pages. It is expected that these will be of interest to medicinal plant specialists as well as a wider audience interested in development issues. The publication follows the sequence of the various sessions, and contains papers presented on the following themes:

- an overview of the salient issues of the medicinal plants chain in Uttaranchal;
- policy issues for the medicinal plant collection, cultivation and trade in Uttaranchal;
- policy and institutional reforms for the medicinal plant sector in Uttaranchal;
- a detailed participatory field study on the collection, cultivation and trade of medicinal plants in a high altitude area;
- initiatives in research and technology development for medicinal plants in Uttaranchal;
- an example of a contract farming arrangement promoting the cultivation and trade of medicinal plants;
- the perspective of the national medicinal plant industry;
- the perspective of a representative of the global industry utilising medicinal plant components;
- discussion.

The organisers would like to thank Prof. A.N. Purohit for his support in organising the workshop. We are also grateful to Dr. R.S. Tolia, Chief Secretary, Uttaranchal, who presented the keynote address. In addition, this work would have been impossible without the energetic efforts of the authors who agreed to prepare papers based on their expertise and experiences at a short notice. Cathelijne van Melle (KIT) and Pallavi Shukla (CSD) were responsible for organizational matters; they worked hard to ensure that the workshop ran smoothly.

We kindly acknowledge the support of the Dutch Ministry of Foreign Affairs, Directorate-General for International Cooperation (DGIS) for providing the necessary financial resources.

2 Medicinal plants sector in Uttaranchal: findings of a recent study

Ghayur Alam (CSD)[3]
John Belt (KIT)[4]

2.1 Introduction

For the last two years, KIT, CSD and IAMR have been researching the medicinal plant sector in Uttaranchal. The central objective of the research has been to examine how the sector functions and how it can be made more efficient. The research covers a number of issues, including the organisation of the medicinal plant business, the effectiveness of policies and institutions in conserving threatened species and the promotion of medicinal plant cultivation.

The study is based largely on primary data collected during two field trips, carried out in October 2002 and May 2003, in the Chamoli and Pithoragarh districts (see Figure 1.1).[5] These districts were chosen as they are important centres for the collection of many threatened species in Uttaranchal. More importantly, a study of literature and discussions with researchers suggested that many farmers were engaged in medicinal plant cultivation in these districts. The areas covered during the field work included Mana, Tapovan and Munsyari. Information was collected from a number of farmers, policy makers, researchers, NGOs and industry. We had detailed discussions with 17 farmers in these districts.

Although the research was undertaken in high altitude areas many of its findings are also valid for other areas, especially the problems found pertaining to technology and marketing. It is important to note that what we describe here was the situation until May 2003. We are aware that a number of new policy initiatives have been undertaken by the Uttaranchal government since then. It is likely that some of the problems described by us have been addressed by these policies.

The findings of the study are described in the following sections. Section 2 describes the importance of medicinal plant collection from the wild. The extent of cultivation of medicinal plants in Uttaranchal and the factors which affect the size of cultivation are discussed in sections 3 and 4 respectively. The conclusions of the study are described in Section 5.

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[3] CSD, 186/4 Rajpur Road, Dehradun.

[4] KIT, P.O. Box 95001, 1090 HA Amsterdam.

[5] See: KIT (2003) and KIT-CSD-IAMR (2003).

2.2 Collection

a. Research shows that collection from the wild continues to be the major source of supply. Legal collection is organized through the Bhaishaj Sangh. The Sangh does not undertake collection directly, but gives responsibility to local contractors. Many of these contractors are also traders. The collectors themselves are either wage labourers or farmers with small land-holdings. In some places they are labourers from outside the state, in many cases from Nepal. There is a general feeling that this system of contracting contributes to both illegal and excessive collection. There have been recent attempts to reduce the role of contractors in collection. For example, the contract to collect is now given only to village community organisations, called "samooh". Unfortunately, the contractors have set up their own "samaoohs", which has enabled them to maintain their control over collection activities.

   An important reason why contractors and middlemen exercise such strong control is the collectors' dependence on loans and marketing. As most collectors are poor, they need to borrow from the contractors. This keeps them tied to the local contractors. This practice is widespread, and how to break the contractors' hold over collection continues to be an important challenge.

b. Illegal collection continues to be common. The middlemen and local contractors are often involved in both legal and illegal collection. This furnishes them with the opportunity to market illegally collected material with legal material.

c. Large-scale collection has led to a serious depletion of important species in some areas. Farmers in the Johar Valley report that because of depletion the volume one person can collect has seriously declined in recent years. According to one collector, they used to collect about 200 grams of dry Atish *(Aconitum heterophyllum)* in one day. Now they do not get more than 70-100 grams in one day.

2.3 Cultivation

The Uttaranchal government has a policy to promote the cultivation of medicinal plants. This policy is motivated by the need to conserve forest resources and increase farmers' incomes through agricultural diversification. The effect of this policy is yet to be felt. Our research shows that there is no large-scale cultivation of medicinal plants. Only a few farmers are involved and the size of cultivation is small. For example, in the Chamoli and Pithoragarh districts, cultivation was found to be restricted to a few villages in the Niti and Johar valleys. Even in these places cultivation is being carried out on small plots near the farmers' houses. The size of these plots ranges between 2-4 nalis[6] only. This was reported to be the general pattern in the area.

[6] 1 nali = 0.02 ha.

What prevents farmers from taking up cultivation on a large scale? A number of reasons were found. Some of these are discussed in the following paragraphs.

2.4 Reasons why the cultivation of medicinal plants has not picked up

2.4.1 Economic factors

a. **High risk**. There is a general feeling among the farmers that the cultivation of medicinal plants is a high-risk activity. As a majority of farmers in Uttaranchal have small land-holdings, they are reluctant to convert large areas of land to medicinal plants. The tendency is either to adapt a small part of their land or use fallow land.
b. **Gestation period**. Many medicinal plants can be harvested only after three years or more. This is particularly true of the plants grown in high altitude areas. Most farmers are not prepared to wait this long for returns.
c. **Low prices**. Many farmers feel that the prices they receive do not compensate for the difficulties and uncertainties involved in the cultivation of medicinal plants. The prices are low for two important reasons. Firstly, the low cost of collection (both legal and illegal) puts a downward pressure on the price, making cultivation unattractive. Secondly, the primary producers have comparatively low bargaining power.

Although accurate information on the cost of cultivation is not available, there is a general feeling that it is higher than the cost of collection. Cultivation requires land, labour, planting material and other inputs. Also the returns from cultivation, in many cases, are available only after 3-4 years. On the other hand, the cost of collection is largely for labour, and the returns are available within a few months. Secondly, as the cultivation of medicinal plants is a comparatively new activity, yields are low. Therefore as long as large scale collection continues and improved cultivation technologies are not transferred to farmers, they may continue to be reluctant to grow medicinal plants.[7]

Increased competition from imports has also led to a decline of prices. With the increased liberalisation of import policies, the import of medicinal plants has grown significantly.[8] In many instances this has resulted in a lowering of prices to the extent that local cultivation has become economically non-viable. For example, the study found that the cultivation of Kala Zira *(Carum carvi)* has been seriously affected by its import in large quantities from China. The price has come down from Rs. 230/kg in 2000 to Rs. 150/kg in 2003. Many farmers in the Johar Valley, who grew Kala Zira on a large scale in the past, have now stopped.

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[7] It is sometimes argued that industry will pay premium prices for cultivated material as its quantity and quality can be better controlled. The study did not find any evidence to support this premise. It appears that the trade is well organized and the industry does not face any difficulty in meeting its requirements.

[8] Mainly from China and Nepal.

2.4.2 Regulatory and promotional policies

The government has introduced a number of regulatory and promotional polices to encourage the conservation and cultivation of medicinal plants. The effect of these policies has not been as expected.

The most important of the regulatory policies is the need to receive a permit for the cultivation of restricted species. In many areas farmers report that they face serious difficulties in obtaining these permits. At the time of our field work, there was widespread confusion regarding the authority empowered to issue these permits; the Forest Department, Bhaishaj Sangh and Herbal Research Development Institute had all been involved in this process. There was little coordination between these agencies, which had led to uncertainty and delays. For example, at the time of our visit to Chamoli, the farmers were still waiting for their permits. The situation was different in Pithoragarh where some farmers had received them. The policy regarding the issue of permits was undergoing major and rapid changes, but the officials in the field were unaware or uncertain about these changes. This situation has prevented many farmers from taking up cultivation.

Government promotional policies include popularising the cultivation of selected species. Many species have been selected because they are believed to be threatened, not because of the ease of cultivation, size of demand or availability of cultivation techniques. By and large, they are found in high altitude areas where adverse agro-climatic conditions make cultivation difficult.

The policy of promoting the cultivation of threatened species in high altitude areas has met with little success. The study finds that very little cultivation of medicinal plants is taking place in these areas. This is for a number of reasons. Many of these areas are inhabited by communities whose main economic activity is trading and not farming. Apart from harsh agro-climatic conditions, cultivation in high altitude villages suffers from a shortage of labour. The number of families who migrate to these villages has come down significantly.[9] As young people prefer to stay in cities, it is mainly the old who migrate. It is expensive to transport wage labour from lower areas as all provisions have to be carried. The cost of transporting from Munsyari to Milam village, for example, is Rs. 10/kg. This limits the number of labourers who can be taken, which in turn hampers any expansion of the area on which medicinal plants are grown.

An important premise of the policy to promote the cultivation of threatened species is that this will reduce the demand for material collected from the wild. The study suggests, however, that there is little direct link between collection and cultivation. Most collectors are either small land-holders or landless wage

[9] Many high altitude villages are inhabited by trading communities who traditionally migrated to lower altitude villages during the winter. In recent years, a large number of families have settled permanently in lower altitude areas. The number of families who continue to migrate to high altitude villages is small, and declining.

labourers, who have no other income opportunities. Even if cultivation is adopted by large farmers, others will continue to collect.

The conservation of threatened species can be achieved more effectively if a) local communities are given greater control over their resources and b) illegal collection is checked through stricter enforcement of the regulations. Cultivation should be seen primarily as a way of achieving agricultural diversification, leading to increased incomes for the largest number of farmers. This implies that the choice of species should not be based on the extent of environmental threat. It should be based on the size of demand, prices, ease of cultivation and availability of cultivation technology.

2.4.3 Lack of technological support

As they require specific soil, climate and moisture conditions and interaction with other species, medicinal plants are difficult to cultivate, especially those grown in high altitude areas. Farmers face serious difficulties that they have no experience in solving. There is a clear need for the development of technologies related to cultivation, harvesting, storage, transportation and quality control. Although many research institutes in Uttaranchal are doing research on medicinal plants, their work has contributed little to farmers. This is for a number of reasons:

1. **Sub-optimal use of resources.** The resources available for research on medicinal plants are distributed too thinly, as research is being done on a large number of species. This creates a situation where no research work is provided with sufficient resources. Research efficiency has also been reduced by a lack of collaboration between the various research institutes. For instance, many of them are working independently on the same species, such as Kutki *(Picrorhiza kurrooa)*, Atish *(Aconitum heterophyllum)*, Jatamansi *(Nardostachys jatamansi)* and Chirayita *(Swertia chirayita)*. This is clearly not the most efficient way of using limited resources. It would be better if research efforts were coordinated by one agency, and the various research institutes collaborated with each other.
2. Current **research efforts** are **mostly focused on the development of cultivation technologies**, and **problems related to packaging, storage, transportation and quality control** are almost totally **neglected**. As these processes are vitally important if a high quality product is to be achieved these problems must be addressed.
3. **The linkages between institutes and farmers are weak.** Most research is being done in laboratories. There is very little on-farm research and the farmers' participation in the research process is negligible. This has a number of implications. These include: (a) problems faced by farmers are not fully reflected in the research efforts; (b) researchers are unable to take advantage of farmers' experience[10]; (c) as farmers are not involved in the research process, the diffusion of technology is hampered.

[10] It must, however, be clarified that farmers' experience is largely limited to growing medicinal plants on small plots and kitchen gardens.

The research institutes do not have the resources and experience to undertake a large-scale diffusion of technologies. This gap needs to be filled. Institutes also lack necessary resources to train farmers. Some efforts to train farmers have been made, but they are few. There is also some doubt as to whether the research institutes have the experience to train farmers.

4. **The linkages between research institutes and industry are weak.** Barring a few exceptions, there is no collaboration between the institutes and industry. There is a general lack of appreciation of the advantages of collaboration. The industry is reluctant to support research as it is not sure of the commercial returns. The research priorities of institutes, on the other hand, are still largely dictated by the pressure of peer groups and academic compulsions.
5. **Research suggests that there is a serious shortage of planting material to set up cultivation in large areas.** Farmers complained that the planting material provided by governmental agencies is often of poor quality. In fact, many of them have lost interest in growing medicinal plants as they had been given poor quality planting material in the past. For example, a large number of farmers in the Niti valley reported a low germination rate of Kuth *(Saussurea lappa)* because of poor quality planting material. If the private sector becomes involved in the production and marketing of planting material the situation is likely to improve.
6. **The focus of current research activities is to develop cultivation technologies for threatened species.** This should be re-examined to include species with greater economic relevance for a large number of farmers. Research to develop methods of sustainable collection also needs to be given greater importance, as large scale collection from the wild is likely to continue for some time.

2.4.4 Supply chain and market related problems

An important component of our research was to examine the problems related to marketing the medicinal plants found in Uttaranchal. This included a detailed study of the supply chain of these plants. It was found that a large number of actors are involved in the supply chain. These include: primary collectors and producers, local contractors, local middlemen, regional wholesale markets, wholesale markets in large centres such as Delhi and specialized suppliers. In almost all cases the primary collectors and producers sell to local contractors and middlemen. As they are tied to these agents through debts and other obligations, their bargaining power is negligible. Also, as they have only small amounts to sell, they do not have the option of selling directly to wholesalers.

The study finds that the marketing of medicinal plants by farmers is one of the central problems. Collectors and farmers are completely dependent on local traders for the marketing of their products. As there are no open trading facilities (such as *mandis*) for medicinal plants, the market is controlled by a handful of traders in wholesale centres. None of these centres has more than 6-7 traders. This provides them with ample opportunity for price fixing.[11]

[11] The illegality of the system strengthens the position of the traders and discourages the development of open and efficient markets.

Primary producers also suffer from the fact that reliable information on demand and prices is not available. Considering that governmental agencies and research institutes have little contact with the industry, this is not surprising. Direct selling to industry by groups of farmers is sometimes suggested as one way to reduce the control of contractors and traders. However, as the traders play a crucial role in the smooth functioning of the supply chain, it is unlikely that direct selling to industry could become a practical option.

It has been suggested that buy-back arrangements between farmers and large user companies could result in increased farmers' earnings and reduce their risk. However, our study of the supply chain suggests that the current system of purchase is ideally suited to meet the industry's requirements. It is unlikely this will be changed in favour of direct purchase from farmers. Firms require many varieties of raw material, often as many as three to four hundred. An important consideration of their policy is to rationalise purchasing by buying from a limited number of suppliers and large wholesalers. Companies would find it nearly impossible to acquire everything they need directly from farmers. However there could be a role for buy-back arrangements with large traders and exporters.

Large traders may be interested in offering buy-back arrangements for species which are difficult to obtain, whose supply fluctuates or when an arrangement at a lower than market price can be made. Large exporters may also find buy-back arrangements attractive in the future, as the requirement of traceability will become increasingly important. At present it is impossible to trace the origin of any material, as there is little transparency and documentation. Contract farming and buy-back arrangements provide the only practical alternatives to exporters whose customers require traceability. However, as it is still possible to export without traceability, the full impact of this trend is yet to be felt in India.

It is important to stress that promotional activities among farmers should be undertaken only when all the components necessary for cultivation and marketing are in place. In the past, efforts to popularise cultivation have often failed because this was not done. For example, Bhaishaj Sangh distributed seed of Kuth *(Saussurea lappa)* in the Chamoli district without adequate resources to provide technical and marketing support. The result was that the farmers faced numerous difficulties in both growing and marketing. This has created scepticism among the farmers, and it will be difficult to get these farmers interested in the cultivation of medicinal plants again.

2.5 Conclusions

1. Although there are a number of programmes supported by the government and NGOs, very little cultivation of medicinal plants is taking place in Uttaranchal.
2. Most material is being collected from the wild. A significant proportion of this is illegal. Local contractors have a strong hold over local trade.

3. As collection will continue to be the major source of supply in the near future, it is important that more research is done on sustainable collection.
4. Increased cultivation of threatened species is unlikely to reduce their collection from the wild. For this local communities must have greater control over their resources. Stricter enforcement of the regulations is also necessary.
5. There is a need to find innovative ways to increase the earnings of primary collectors and producers. However, direct selling to the user industry, and buy-back arrangements, have only a limited scope at present.
6. The choice of species to be promoted for cultivation should not be based on environmental threat. Greater importance should be given to their potential to increase the income of a large number of farmers.
7. There are a number of reasons why cultivation over large areas is not taking place. These include difficulties in obtaining permits, a lack of suitable technologies and difficulties in marketing. Also, in some instances, wrong choices of species and areas have added to the problem.
8. Promotional activities among farmers should be undertaken only when all the components necessary for cultivation and marketing are in place.
9. The government has taken some new initiatives recently. It would be useful to examine these initiatives in the light of past experience. It is hoped that the discussion in the following sessions will provide suggestions, which will be useful in strengthening the medicinal plant sector.

3 Overview of state policies, plans and interventions to promote the medicinal plant sector in Uttaranchal

A.N. Purohit[12]

3.1 Introduction

Since time immemorial, people have gathered plant resources for their needs. Even today, hundreds of millions of people derive a significant part of their subsistence needs and income from gathered plant products. Medicinal plants play a central role in many cultures, not only as traditional medicines, but also as trade commodities which meet the demand of often distant markets. Demand for a wide variety of medicinal plants is increasing.

The World Health Organisation (WHO) enumerated 21,000 medicinal species in the late 1970s (Penso, 1980). In China around 19% of all native plant species are used in traditional medicine (Duke and Ayensu, 1985). In India 20 percent of available plant species are used for medicinal purposes (about 3,000 of a total of 15,000 plant species).

With the increased realization that some wild species are being over-exploited, a number of agencies are recommending that wild species be brought into cultivation, expecting that this will have an impact on conservation (WHO, IUCN and WWF, 1993). Cultivation can reduce the extent to which wild species are harvested, reducing environmental degradation and preventing loss of genetic diversity in nature. It is in this connection, that various policies, plans and interventions have been recommended worldwide at international, national and state levels.

This paper gives a brief review of global trends in changes in policies and practices regarding medicinal and aromatic plant species, focusing on policy changes in Uttaranchal. Some recommendations are made as to how these policies can be translated into practice, leading to a suitable balance between consumption, conservation and cultivation.

3.2 Global patterns in controlling the collection of medicinal plants

In many counties, the marketing of medicinal and aromatic plants has been liberalised and is in the hands of private enterprise. In other countries, such as China and Bhutan, harvesting from the wild is centralised in the hands of state-

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owned organisations. In Bulgaria the main national dealer in medicinal and aromatic plants is a cooperative enterprise of small family–owned businesses.

In most countries, the collection of medicinal plants is regulated. For example, in the United Kingdom the Wildlife and Countryside Act of 1981 prohibits the uprooting of any species of wild plant (except by landowners or other authorised people). In several Central European countries not only is the uprooting or the collection of subterranean parts of plants prohibited, but there are also restrictions on the gathering of aerial parts. In Switzerland a permit is required for the commercial collection of all wild plants, excluding the collection of medicinal herbs for home consumption. Bulgaria has set up a quota system for the gathering of medicinal plants that is reviewed annually. The collection of 23 plant species without prior authorisation, is illegal. Permits specify the name of the species, the quantities that may be collected and in which regions, the dates and places of collection and, sometimes, the methods of collection that may be used. Poland lists species of medicinal plants that cannot be collected without a permit. Italy passed a law in 1931 which regulates the collection of medicinal plants. This law stipulates that permits for the commercial collection of listed species will only be issued to people who hold degrees in herbalism from schools of pharmacy. However, the public may collect small (specified) quantities for personal or household use. Some Italian regions have enacted stricter rules. In France, a permit from the Ministry of the Environment is needed for the commercial collection of 31 taxa, including many medicinal plants. A permit is needed in the Democratic Republic of Congo for the collection of the species *Rauwolfia*. Permits are required for commercial collection of all species of vascular plants in the state of Western Australia, even by landowners. In all, 341 species of medicinal and aromatic plants are affected by the combined national legislation of Bulgaria, France, Germany, Hungary, Spain and Turkey, affording them either full or partial protection (Lange, 1998).

Habitat protection may be as important to the survival of a species as the setting of collection quotas and issuing permits. For example, an act passed in 1977 by the Italian Val d'Aosta region relates to the protection of alpine flora and stipulates that only certain implements, such as sickles, may be used for collection. The digging up of subterranean parts of medicinal plants is authorised only when it is these parts which have medicinal properties, but the survival of the species and the stability of the soil at the place of collection must not be impaired. The collector has to repair damage to the soil (de Klemm, 1988).

In many European countries enforcement is pursued intensively. The possession of quantities exceeding those that have been authorised is generally sufficient to establish that an offence has been committed. Penalties are usually fines and sometimes even imprisonment, but the most effective is the temporary withdrawal of the permit. Permits can be revoked permanently.

All the above contains some lessons for possible policy directions for Uttaranchal. Below, this is discussed in detail.

3.3 International regulations for the trade in medicinal plants

Opportunities for governments to monitor and control the harvesting and trade of medicinal plant species and to consider their conservation and sustainable use as a priority in establishing protected areas, have been greatly enhanced by two recent developments: the addition of medicinal plant species to the Convention on International Trade in Endangered Species (CITES) and the 1992 entry into force of the Convention on Biological Diversity (CBD).

The Convention on International Trade in Endangered Species (CITES) is the major global treaty regulating international trade in animals and plants. In force since 1976, it is implemented through its measures becoming national law in all 157 signatory countries. Its strength is that its provisions are mandatory and enforcement is pursued insistently. Appendix I of CITES contains species believed to be on the brink of extinction. Commercial trade in these species is prohibited, while non-commercial transactions require both import and export permits. Appendix II of CITES contains generally less endangered species and focuses more on considerations of biological sustainability and legal acquisition. Trade in species listed in Appendix II is only subject to the presentation of export permits, importing countries being required not to accept consignments lacking such permits.

The Convention on Biological Diversity (CBD) has three major goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from the use of genetic resources. All these goals are very relevant for medicinal plant resources.

3.4 Cultivation of medicinal plants: global situation

In addition to controlling collection from the wild, many countries promote the cultivation of medicinal plants. However, in spite of all these policies, the number of medicinal plant species currently in cultivation for commercial production worldwide does not exceed a few hundred. For example, out of more than 400 major plants species used for the production of medicine by the Indian herbal industry, fewer than 20 species are currently under cultivation in different parts of the country (Uniyal *et al*., 2000). In China, out of 1,000 more commonly used species only 100 to 250 are cultivated (Xiao Pei-Gen, 1991; He Shan-An and Ning Sheng, 1997). In Hungary, a country with a long tradition of medicinal plant cultivation, only 40 species are cultivated for commercial production (Bernáth, 1999; Palevitch, 1991). Out of 1,543 species traded in Germany, only 50–100 species (3–6 percent) are exclusively sourced from cultivation (Lange and Schippmann, 1997). In Europe as a whole, only 130–140 MAP species are cultivated (Pank, 1998; Verlet and Leclercq, 1999).

Why is the cultivation of medicinal plants not picking up? Firstly, domestication of the resource through farming is not always easy. Many species are difficult to cultivate because of their specific ecological characteristics and requirements, such as slow growth rate, special soil requirements, low

germination rates, susceptibility to pests, etc. On a time scale, the transition from wild harvesting to possible cultivation sometimes may take decades as it has to pass through various phases before the actual cultivation starts (Cunningham, 1994). These phases are:

1. **Discovery phase**. At this point the demand can be met by harvest from the wild. Extraction is done for local use or for barter with outsiders.
2. **Expansion Phase**. In this phase the demand is large, and is likely to increase. Harvesting is done for local or regional sale and eventually for international markets. In general, species with low natural densities are unlikely to become important sources of large-scale commercial trade.
3. **Stabilization phase**. The species is unlikely to be attractive to growers unless prices are high enough and wild-harvested resources are scarce enough. However, desirable species may be grown on farm land and planted around settlements.
4. **Decline phase**. Prices increase with scarcity caused by transport costs, search time and long-distance trade. Wild populations will have to decline further before cultivation is a viable option. The trade is characterized by fluctuations in supplies, often to the extent of disrupting the trade balance. For slow growing species, if controls on collection are not strictly enforced, wild populations will be more seriously eroded before cultivated material is available.
5. **Cultivation phase**. Formal cultivation systems are developed and institutionalized. The plants are domesticated and incorporated in agroforestry systems. If international market opportunities exist, commercial plantations are created with substantial investment and genetic selection, cloning, breeding and biotechnology may be applied. More resilient species may recover in their wild populations.

Economic feasibility is the main rationale for a decision to cultivate a species, but it is also a substantial limitation as long as sufficient volumes of material can still be obtained at a lower price from the wild. Cultivated material will be competing with material harvested from the wild that is supplied by commercial gatherers who have incurred no input costs for cultivation. Low prices for plant material, whether for local use or the international pharmaceutical trade, ensure that few species can be marketed at a high enough price to make cultivation profitable (Cunningham, 1994). Domestication of a species previously collected from the wild not only requires substantial investment of capital but also several years of investigation.

Notwithstanding the above, in all countries the general trend is towards a greater proportion of cultivated material. The majority of the pharmaceutical companies as well as the larger herb companies prefer cultivated material, particularly since cultivated material can be certified as biodynamic or organic (Laird and Pierce 2002). From the perspective of the market, domestication and cultivation provide a number of advantages over material harvested from the wild:

1. While wild collection often offers material adulterated with unwanted, sometimes harmful plant species, cultivation provides reliable botanical identification.
2. Volumes harvested from the wild are dependent on many factors that cannot be controlled, and an irregularity of supply is a common feature. Cultivation guarantees a steady source of raw material.
3. Wholesalers and pharmaceutical companies can agree on volumes and prices over time with the grower.
4. The selection and development of genotypes with commercially desirable traits from wild or managed populations may offer opportunities for the economic development of a medicinal plant species, it becomes a crop.
5. Cultivation allows controlled management practices and post-harvest handling, and therefore quality control can be better assured.
6. Product standards can be adjusted to regulations and consumer preferences.

Below is a review of relevant policy measures promoting the cultivation of medicinal plants in Uttaranchal.

3.5 Overview of medicinal plant policies in Uttaranchal

Worldwide laws and policies promoting the conservation and cultivation of medicinal plants are changed in reaction to new realities and insights. Uttaranchal is no exception. Since 1945 laws and policies have been modified 11 times. These modifications were influenced by subjective perceptions as well as objective realities. In the absence of a well-defined policy, sometimes these changes were made to suit the interests of specific stakeholders.
After 1930 all collection and marketing of minor forest products, including medicinal and aromatic plants, used to be been done by villagers. The State used to collect a tax on all wild harvested material that was traded. Soon after the independence of India, Gobind Ballabh Pant, the first Chief Minister of Uttar Pradesh State, realised the importance of medicinal plants for the livelihood and health security of the people of Uttarakhand (now a part of Uttaranchal State). He emphasised that the extraction of medicinal plants from the wild should be done in a scientific and sustainable way by local communities. This to provide local communities with employment and to ensure pure medicinal plant material is available for the industry.

Subsequently, from the early 1960s, the government of Uttar Pradesh (of which Uttaranchal was a part) put emphasis on medicinal plants' cultivation, besides the sustainable and scientific extraction of medicinal plants from forest areas. The aim was to contribute to the livelihood and health security of the people living in the region. The state did not have a written policy on medicinal plants but took several policy decisions from time to time to promote cultivation and commercialisation. The initiatives taken before the formation of the new State, Uttaranchal, are summarised in Table 3.1.

Table 3.1 Rules and institutional mechanisms for the collection, marketing and cultivation of medicinal plants in Uttar Pradesh: 1945-2001

Period	Salient features	Remarks
1945	*Bhesaj Vikas Yojna* (medicinal plant development scheme) under the Department of Cooperatives had monopolistic rights to harvest medicinal plants from forests.	There were complaints raised against the Department and therefore the right to harvest medicinal and aromatic plants was given to contractors in 1963.
1958-1964	Contract-based collection and responsibility for royalty realisation given to the U.P. Cooperative Federation, controlled by the State Government. Additional mandate was given to *Bhesaj Vikas Sanghs* to promote cultivation of medicinal plants.	The Forest Department could not control the contractors/agents. There were complaints about illegal collection. Cultivation was never started by *Bhesaj Vikas Sanghs*.
1970s	The government facilitated the cooperative movement to promote cultivation and sustainable and scientific harvesting from forests through the creation of District Medicinal Plant Cooperatives.	*Bhesaj* and *Jadi Booti Vikas Yojna*, Ranikhet, in spite of the mandate to do research in nursery techniques and agro-technologies has not made any worthwhile contribution in its 54 years of existence.
1965-1977	Contract based collection and realisation of royalty by Forest Department at check points.	No improvement was found in the situation.
1981	*Kumaon Mandal Vikas Nigam* along with District Medicinal Plant Cooperatives were assigned the task of sustainable harvest of medicinal and aromatic plants from forests.	This operated like the contract-based system, and the objective of sustainable harvest was never achieved.
1989	A separate institution, the Herbal Research and Development Institute (HRDI) was founded to carry out research, development and extension of medicinal and aromatic plants, in collaboration with all other concerned departments.	HRDI has started some initiatives after overcoming some major troubles. However, since it is under the administrative control of the Department of Horticulture, many have yet to accept the institute as the major nodal agency.
1990	The Joint Forest Management programme was launched for the protection and sustainable utilisation of resources.	This programme did not include medicinal and aromatic plants in its mandate.

Changes made in the rules subsequent to the formation of the new State are summarised in Table 3.2.

Table 3.2 Rules and institutional mechanisms for collection, marketing and cultivation of medicinal plants in Uttaranchal: 2001 – present

Period	Salient features	Remarks
2001	Contract-based collection only through members of *Bhesaj* Cooperative Federation which was also supposed to cultivate or promote cultivation of medicinal and aromatic plants. Royalty realisation by the State Forest Department. *Kumaon Mandal Vikas Nigam* was dropped.	Hardly any improvement was perceived.
2001	A high level Uttaranchal Medicinal Plant Board (UMPB) was constituted, and the Herbal Research and Development Institute (HRDI) was declared the implementing agency of UMPB.	Although UMPB has approved an action plan for the next 5 years it has yet to finalise its policy document.
2001	Registration of farmers for the cultivation of medicinal plants to be done by HRDI or any agency authorised by HRDI. HRDI is to issue Identity Cards to certified growers so that they can sell their produce to the market without paying royalty. Collectors to be issued with Identity Cards by HRDI or any agency it may authorise. A representative of the Forest Department will countersign the identity cards.	Some farmers have been registered, but it is not certain how many of them are actually cultivating medicinal plants. Some are complaining about the delay in getting Identity Cards and permits to sell their produce. However, it is too early to assess the success of the policy. If it generates some results it will be a landmark in the promotion of medicinal plant cultivation in the State.
2003	Conservation-Development-Harvest (CDH) Scheme has been launched. The initiative aims at a quantification of medicinal and aromatic plants in the state at regular intervals and identification of core conservation areas (harvesting from these areas will be completely prohibited). There will be periodical harvesting (following sustainable practices) from outside conservation areas by the Forest Development Corporation, with the help of their permanent staff and local villagers. The Forest Department is to establish nurseries for species whose collection from the wild is prohibited and to distribute planting material of restricted species to interested farmers for cultivation. The promotion of cultivation is to be the sole responsibility of HRDI.	Resentment from *Bhesaj Sanghs*. The policy was modified before it could take off. Now extraction from the forests will be done by the Forest Development Corporation as well as *Bhesaj Sanghs*, Forest *Panchayats*, *Kumaon* and *Gharwal Mandal Vikas Nigam*. The area for each extractor will be decided by a committee of all the claimants for extraction, to be chaired by the District Forest Officer of the respective area. No extractor will be allowed to collect through contractors or outside labourers.

3.6 Reasons for the ineffectiveness of previous policies

As indicated above, the first scheme for conservation and development of medicinal plants was launched more than half a century ago. However, the Forest Policy and Action Plan prepared by the Forest Department (2002) clearly reveals that illegal and unscientific harvesting of medicinal plants from the forest has continued. This has resulted from a lack of knowledge of sustainable harvesting techniques, biotic pressure due to intense and unrestricted grazing and poor enforcement of regulations. The *Bhesaj Sangh* and *Jari Booti Vikash Yojna* (Ranikhet), in spite of the mandate given to them, could not develop and demonstrate suitable nursery technologies and agro-technologies for any medicinal plant species, probably because suitable leadership and trained manpower were absent.

As stated before, domestication of a species previously collected from the wild not only requires substantial investment of capital but also several years of investigation. Moreover, as long as a sufficient volume of material can still be obtained through wild harvest and supplied to the market at a low price by commercial gatherers, cultivation will not develop.

Major deficiencies in policies, leading to failure in uptake of cultivation were:
- An absence of a comprehensive policy in Uttar Pradesh and Uttaranchal. The approach was fragmentary. Decisions for modifications were influenced by subjective perceptions and pressures.
- Medicinal and aromatic plants were always considered to be part of the larger category of minor forest produce.
- Cultivation was not considered as important as conservation.
- There was a lack of emphasis on quantification of existing resources.
- There was a limited emphasis on technological know-how. Research was of secondary importance. Research Institutions were not headed by trained scientists.
- There was no attention to economic feasibility and market linkages.
- The rules and regulations formulated were always forest-centered and not farmer-oriented. Poor enforcement of the regulations.

After the formation of the new State some significant changes were made, such as the formation of the Uttaranchal Medicinal and Aromatic Plant Board, strengthening of Herbal Research and Development Institute (HRDI) and launching of Conservation-Development-Harvest (CDH) initiative. However, with the recent modification in CDH, it seems that the old policy under which a multitude of agencies were responsible for carrying out collection from the wild is being repeated.

3.7 What is new in the proposed policy?

The focus of the new Uttaranchal Medicinal and Aromatic Plant Policy is: "To maximise the benefits of protection and production of medicinal and aromatic plants, which so far form part of wild flora, for the region by forging an alliance

between conservation, cultivation and commercialisation and ensuring an effective ban on illicit trade of these plants from Uttaranchal". Its main goal is to obtain long-lasting benefits from national and international trade by becoming the value-added supplier of medicinal and aromatic plant and plant products, with authenticated material of known characteristics, taxonomic sophistication and strong assurance of regular supply. The following elements are expected to make the difference:

- clear emphasis on cultivation;
- central role of the Uttaranchal Medicinal and Aromatic Plant Board (UMPB) which has representation of all stakeholders;
- quantification of resources and establishment of Medicinal Plant Conservation Areas, development compartments in every range and identification of harvesting areas after quantification (responsibility of Forest Department);
- multiplication of restricted species by Forest Department and research institutions;
- extraction from the wild (on a sustainable basis) is co-ordinated by one agency only, the Forest Development Corporation; this will prevent illegal extraction;
- registration and issuance of transited permits by one agency only (Forest Department), and permits are only issued after verification;
- cultivation of restricted species only by registered growers (registered with HRDI or Forest Department);
- establishment of Herbal *Mandies* (rural markets), it is envisaged that the direct interaction between buyers and sellers will improve rural marketing of medicinal plants;
- setting-up of market information and quality control systems to improve market transparency;
- emphasis on quality;
- strong focus on research, technology development and training activities.

4 Policy and institutional reforms in the medicinal plant sector in Uttaranchal: lessons from an IDRC study

Madhav Karki[13]

4.1 Introduction

Medicinal and Aromatic Plants are nature's gifts to Uttaranchal. More than 1,000 species are believed to grow in the state, and about 150 are actively collected, cultivated and traded for both local and commercial users. Since October 1996, more than 11 state level meetings have been organised to deliberate on this topic, and a plethora of recommendations have been made ranging from conservation to industrialisation and identification of priority species. It is widely felt that if medicinal and aromatic plant resources are managed appropriately and sustainably through the establishment of: (i) proper backward and forward linkages; (ii) strategic public-private-civil society partnerships, and (iii) business oriented production and marketing systems, the economic potential of the sector can reach four to five billion Rs. (about US$ 100 million) annually for the state (IFAD, 2003). As reported by Maikhuri *et al.* (2003) and SHER (2003), the cultivation of medicinal and aromatic plants can be highly remunerative. Small-scale cultivation of Kalajeera *(Carumcarvi)*, Atis *(Aconitum heterophyllum)* and Jatamansi *(Nardostachys jatamansi)* are found to give a Cost-Benefit ratio of 20 to 25, while for Isabgol *(Plantago ovata)*, Kutki *(Picrorhiza kurrooa)* and for Kuth *(Sausurea costus)* the ratio is in the range of six to ten.

The medicinal and aromatic plant sector has the potential to raise local peoples' incomes through collection and cultivation. These activities can become an integral component of Uttaranchal's forest and biodiversity resource management. Through value adding processing at the local level and efficient marketing, the sector can create rural income, employment and wealth. Cultivation, development of small and micro-enterprises, especially for processing and marketing and the provision of health and tourism related services seem to have the most potential to generate income opportunities for the poor. Opportunities for local livelihoods also exist through seed production, nursery development, plantation management, post-harvest activities and the production of local health care products. Medicinal plant-based enterprises can be built on the strengths of the local people and their environment, characterised by indigenous traditional knowledge, social capital and a rich stock of bio-resources.

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In addition, bio-partnerships linking rural communities with industry could be a promising option. Multiple links can be established between different levels of a particular value/supply chain involving collectors, growers, traders, processors and consumers. Equitable arrangements between drug manufacturing and health-care companies and community-based organisations can ensure that producers can access reliable markets and industry receives quality supplies.

With its extensive medicinal plant biodiversity, Uttaranchal can also make a large contribution to India's export of medicinal and aromatic plant products. This could significantly raise India's current international market share of around 50,000 tonnes, worth between USD 80-100 millions (IDRC, 2003).

This paper aims at reviewing, analysing, and exploring the major policy, legal and administrative issues related to the medicinal and aromatic plant sector in Uttaranchal. It is largely based on the outcome of an IRDC commissioned study conducted by Jain and Bhatia (2003). The paper argues that policy and institutional reform processes are dynamic activities with high livelihood as well as economic stakes, and should be given priority. Good policies can generate accelerated economic activities, generate employment, increase household incomes, foster sustainable resource management and lead to improved collection, cultivation, conservation, utilisation, trade and value addition of medicinal plant resources.

4.2 Medicinal plants in Uttaranchal: the policy context

Policy and legal issues dominate all other issues in the medicinal plant sector, as they are the drivers of the whole process. Kanel (2002) classifies Non-Timber Forest Products (NTFPs) policies into four types:

a. **Regulatory policies**. These relate to the harvesting, transport and processing of NTFPs. For Uttaranchal the unsustainable harvesting of medicinal plants from the wild is a major regulatory policy concern.
b. **Fiscal policy**. The process of fixing and processing different types of taxes, levies, subsidies and royalties fall under this policy. In Uttaranchal the fiscal policy on medicinal and aromatic plants is still weak.
c. **Institutional policies**. The formation of *Van Panchayats* (VP), Joint Forest Management Committees (JFMC), Self-Help Groups (SHG), different types of cooperatives, *Bhesaj Sanghs* and a Growers' Forum are part of institutional policies. The structure, function and effectiveness of these institutions are based on the nature of their charters, rights, responsibilities etc. These institutions are key to implementing the devolution and decentralisation policy of the government. Their lack of effectiveness and efficiency is a major institutional policy issue.
d. **Marketing and trade policies**. The current commercialisation process is characterised by a high level of secrecy, a limited number of well-connected players and high price mark-ups. Policies regarding the extraction, processing and sales of banned species are not clear and unscrupulous elements in the system take advantage of the lack of enforcement by carrying out illegal trade (especially involving high-value, low-volume products).

Medicinal plants have been recognised as one of the key sources of livelihood and health security for the people of Uttarakhand (earlier part of Uttar Pradesh) since India's independence. Beginning in 1949, a *Bhesaj Vikas Yojna* (medicinal plant development scheme) was initiated under the Department of Cooperatives. More *Yojnas* (schemes) were subsequently added. The cultivation of medicinal plants has been promoted since the 1960s, and since the late 1970s the government has facilitated a cooperative movement by the name of *Bhesaj Sanghs* (BS) for collection from forest areas, emphasising sustainable and scientific harvesting. The Herbal Research and Development Institute (HRDI), falling under the Department of Horticulture, was created in 1989. In 2001, the government of the newly formed state of Uttaranchal decided to continue giving the medicinal plant sector a priority status (WII/VCPCRF, 2001). It created the Uttaranchal Medicinal Plant Board (UMPB) and declared HRDI the nodal agency for the development of the sector (including implementing the decisions made by the UMPB). The government also indicated its intention to develop partnerships with industry, private entrepreneurs, NGOs etc. This has materialised in a scheme to allot state horticulture farms to interested entities for horticultural and medicinal plant developmental activities. Recently, the state has designated six of its 13 districts as Agri-Export Zones with the policy intent of promoting the export of medicinal plant products from the state.

In spite of all the initiatives taken during the last fifty years, the medicinal and aromatic plant sector has not delivered major employment and economic gains to the local people. Meanwhile, unsustainable collection from the wild has resulted in a decreasing availability of several species. The overall issue confronting the medicinal and aromatic plant sector in Uttaranchal is a growing resource degradation and scarcity, leading to a serious imbalance between supply and demand, and livelihood loss to the poor people dependent on these resources.

There is currently a move to promote cultivation, ostensibly to protect the natural biodiversity of medicinal and aromatic plants, specifically focusing on endangered and threatened species (of which more than ten are found in the state). While this move is a welcome one, many NGOs and farmers' groups question whether this will address the current practice of harvesting from the wild in an economically and ecologically unsustainable manner. In particular, concerns are being raised about the effective implementation of the policies. The government has announced policies for decentralising management responsibility and devolving the authority for non-timber forest, medicinal and aromatic plant products to local communities, through *Van Panchayats*, Joint Forest Management and other schemes. While these steps are laudable, at the ground level there is still no perceptible change resulting from these policy changes. It is felt that there is a need to improve the basic process of policy formulation and implementation by following a multi-stakeholder approach in the development of the medicinal and aromatic plant sector of Uttaranchal. This approach could have the desired impact not only on local people's livelihoods and the actions of entrepreneurs but also on traditional health institutions and conservation. The new medicinal and aromatic plant policy

should enhance the development, access and use of appropriate technologies and promote efficient delivery of services and market information. The expected outcome could be increased land productivity and cash income for collectors and growers. An effective implementation of such a policy would require increased access to the community-based *(Civil Soyam* and *Van Panchayat)* land resources for *in-situ* and *ex-situ* cultivation of medicinal and aromatic plants by genuine local collectors and small-scale growers. This would require that communities are given the right to change the composition of forest species by incorporating more non-wood timber forest products, including medicinal and aromatic plant species, in the new forest plans.

It is expected that the lessons of past experience will be used to formulate and implement more effective policies in Uttaranchal. These should focus on: (i) enhancing the local community's access to resources; (ii) providing economic incentives to investment in cultivation and sustainable management practices; (iii) enterprise development, creating partnerships with the private sector and networking between community groups and organisations. Specific policies should address the following issues:

a. a lack of any rational policy on the collection, processing and export of banned species;
b. the absence of a system in which royalty fixing and the collection of permit fees in reserve and protected forests is reflected by market values and local usage;
c. the lack of full devolution of decision-making authority to community organisations. This refers to the rules and regulations of formulating micro plans or management plans for *Van Panchayats* and Joint Forest Management lands;
d. the need to reform the taxation system at national and local levels. This may include levying an export tax on medicinal plants collected from the wild in order to decrease pressure on forest resources, meanwhile giving incentives to local growers and enterprises.[14]

4.3 Outcomes of an IDRC commissioned policy study

IDRC recently commissioned detailed primary research on the main policy issues in Uttaranchal's medicinal and aromatic plant sector (Jain and Bhatia, 2003). More than 30 representatives of the key stakeholders were interviewed and secondary data comprised of more than 40 policy documents (including Government Orders and regulations) were reviewed. In addition, a detailed analysis was made of the suggestions, recommendations and decisions during the major medicinal plant meetings and workshops held since 1996.

The study reveals that the state does not yet have a formal written policy for the medicinal and aromatic plant sector. However, based on a detailed review of various government orders, circulars, official announcements (including a review of the Forest Policy 2001) and actions, it has been possible to reconstruct

[14] This has been pursued through the Agri Export Zone programme.

the deemed policy of the state. Discussions with key representatives of the major stakeholders further helped in understanding the present policy. The unwritten policy of Uttaranchal state can be summarised as:

- Uttaranchal is to be developed as an herbal state with vibrant domestic use, trade and export components;
- The Uttaranchal Medicinal Plant Board is expected to coordinate various governmental departments in order to ensure the continuous availability of medicinal plant materials, giving emphasis to an expansion of large-scale cultivation;
- The involvement of private enterprise in the development of the medicinal plant sector, in relation to both production and processing, should be promoted;
- Export is to be promoted through designating Agricultural Export Zones in six districts;
- Uttaranchal's cultural heritage is to be promoted through the development of *Ayurvedic* and other natural health care systems and indigenously produced food products.

The study also reviewed the major issues related to the implementation of the state's medicinal and aromatic plant policies. Two main stakeholders, the HRDI and the Forest Department (including the Uttaranchal Forest Development Corporation or UFDC) have the mandate to implement policies, programs and projects in the medicinal plant sector. Their mandated rights and responsibilities include the rights to issue permits, fix and collect royalty, regulate transit and control access to forest and civil lands. All of these are fundamental to the sustainable conservation and management of medicinal plant resources. The study further finds that:

- There is insufficient emphasis on understanding the interrelationships between cultivation, conservation and sustainable utilisation of medicinal and aromatic plants;
- The roles assigned to various governmental agencies and departments are not based on their given mandate and capacities;
- There has been no mechanism to draw adequate lessons from past failures;
- Appropriate and dynamic roles for government departments and agencies have not been defined;
- Adequate funds are not available for the implementation of development programmes, such as the Action Plan for Medicinal and Aromatic Plant Development in Uttaranchal;
- There is inadequate coordination between officials from both formal and informal sectors.

Table 4.1 highlights some policy issues, their status and suggested action.

Any medicinal plant policy reform process in Uttaranchal needs to recognise the following realities:

a. The Forest Department's strong formal territorial control is both a problem and an opportunity;

Table 4.1 Key policy issues, their analysis and their implications

Key concern	Related to	Consequences	Action required	Department involved
Uncertainty regarding cultivation, production and marketing of banned species and their products	- Wildlife Protection Act, 1972 - Forest Conservation Act, 1980 - Indian Forest Act 2001 (Uttaranchal amendment)	- Unauthorised and unsustainable collection is continuing - Underground trading has a negative impact on collectors' and small traders' profit margins - Cultivation is facing unfair price competition, as collected materials are available at cheaper prices in the market	- Remove the ban on the movement, marketing and processing of certified and organically produced species in VP forests - Improve and simplify the registration of cultivators - Monitoring of cultivation should be left to independent certifiers - Operationalise the system of VP/JFM committees developing micro plans under approval of the District Office - Give primacy to medicinal and aromatic plant species in Agri Export Zones - Reform the process of permits and royalties, to reflect market realities	- Forest - Horticulture - Revenue - Animal husbandry

b. The linkage between medicinal plants, non-timber forest products (NTFPs), forest resources and livelihoods is well established and recognised, yet policy support is inevitably required to meet the needs and aspirations of local people;
c. A process of decentralisation, devolution and democratisation reaching down to the community level, can have a significant and effective impact on policy implementation. Unfortunately the forces of centralisation have always confronted the process of decentralisation in forest resource governance. Only a continuous training and sensitisation of forest officials, especially at the lower levels, will achieve the positive change in attitude needed to implement the policy of decentralisation and devolution;
d. Policy reform is a dynamic but problematic process; changing the NTFP and medicinal plant policies may not be possible when continuing the traditional linear policy model. A policy approach that embraces flexibility, reflexivity and consultation with stakeholders is likely to work better; examples of clear linkages between policy measures and practical outcomes (e.g. conservation of specific species, improvements of livelihoods in tangible terms, increase in trade volumes and values) need to be utilised in this process.

Based on the above, some recommendations are described in the following section.

4.4 Policy recommendations

- The Forest Department, through its associated institutions (including the *Van Panchayats* and the Joint Forest Management committees) and with the active involvement of research institutions, NGOs and Community Based Organisations (CBOs) should be responsible for: (i) the conservation and sustainable utilisation of medicinal plants in forest areas; and (ii) raise quality planting materials, especially for *Van Panchayat* and community lands.

- The Uttaranchal Forest Development Corporation, in collaboration with HRDI and appropriate private sector agencies, should act as a nodal agency in facilitating and promoting the marketing of medicinal plants. It should develop a mechanism for the regular information gathering, monitoring and dissemination of market-related information. It should, in collaboration with HRDI, facilitate direct contracting and buy-back arrangements between collectors, farmers and trade and industry, specifically to implement the provisions of the Agri Export Zones.

- The HRDI, in collaboration with the Forest Department, should initiate essential research and training programs, involving forest and non-forest areas. Key research topics are: (i) *in-situ* and *ex-situ* cultivation and conservation; (ii) sustainable utilisation; (iii) organic production and certification; (iv) value addition and marketing of medicinal plants.

- Micro-plans for each *Van Panchayat* and Joint Forest Management area should be prepared on a site-specific basis with a focus on augmenting medicinal and aromatic plant populations, maximising benefits to communities, respecting the principles of conservation and sustainable use.

- The HRDI and the Forest Department should jointly implement decisions taken by the UMPB. The recent initiative to develop and monitor sustainable harvesting plans for non-banned species is a good example of this approach.

- The Forest Development Corporation, in collaboration with HRDI, should promote business-oriented platforms at state, regional and district levels, focusing on marketing and processing related issues. Pro-active collaboration with key NGOs, the private sector and other governmental agencies will be required.

- Training in the principles and practices of organic, certified medicinal plant production is required for the staff of HRDI, the Forest Department, the UFDC and *Bhesaj Sanghs*. The HRDI and the UFDC should coordinate activities in relation to organic production, cooperative development and capacity building of farmers as well as facilitating certification, encompassing organic, fair-trade and sustainable management concepts.

- The HRDI and the UFDC should encourage bio-partnerships or buy-back arrangements between and among traders, exporters, industry and local communities, ensuring an equitable sharing of benefits.

- The functioning of the *Bhesaj Sanghs* and *Jadi Booti Vikas Yojna Samities* should be critically reviewed. Their linkages with the HRDI, Forest Department and UFDC need to be made clear.

- Government departments and agencies should jointly prepare programmes and projects for the development of the medicinal plant sector in the state. Implementation should be characterised by partnerships, involvement and collaboration with research organisations, CBOs, NGOs and private enterprise. All programmes and projects should include evaluation and impact assessment, to be carried out by HRDI and the Forest Department.

- The Government of Uttaranchal should initiate an annual award scheme for outstanding individuals or institutions for their contribution to the development of medicinal plants in the state.

- The Government of Uttaranchal should finalise a robust policy on medicinal plants development, by issuing necessary acts, rules and regulations and allotting adequate funds to the concerned government departments and agencies, so as to enable a successful implementation of the policy decisions.

- The Department of India Systems of Medicine (ISM) should: (i) consolidate and integrate the state's health infrastructure and human resources base in order to revitalise the classical and traditional healthcare systems, beginning at the primary health care level; (ii) organise and regulate standardisation and quality control in the production of herbal products, and (iii) give top priority to the preparation of phyto-pharmceuticals and extracts as per GOI/ISM and WHO/GACP guidelines[15].

- A transparent and accreditable certification and quality assurance system should be put in place in order to: (i) ensure that production is based on recognised national and international standards, good practices and quality criteria; (ii) identify safe and effective traditional medicine related therapies and products; (iii) assess, optimise and upgrade the skills of providers of traditional medicines, and (iv) record in a participatory manner the existing knowledge and skills in traditional herbal-based health care.

4.5 Conclusion

A robust medicinal plant sector policy in Uttaranchal should be people-centred, livelihood-focused and biodiversity-enriching. The policy philosophy should be based on a long-term vision of providing equitable access, a fair share of

[15] This refers to the WHO (World Health Organisation) Guidelines on Good Agricultural and Collection Practices (under preparation).

benefits and conservation of medicinal plant and NTFPs through sustainable use. Some of the underlying principles of the policy making process should be as follow:

a. The assignment of roles and responsibility to different stakeholders should be in a manner commensurate to the demand for their services, institutional capacity and track record of past performance and potential to deliver outputs;
b. The monitoring and evaluation of the agencies' performance should be evidence-based, including verifiable progress indicators;
c. The new policy measures should be focused on the processes and methodologies required to achieve long-term sectoral development objectives;
d. The actions and activities of various stakeholders need to be defined and monitored in a transparent, participatory and time bound manner;
e. As medicinal plant resources are the most critical resource for the achievement of the well-being for poor local communities, the outcome and relevance of any policy reform should be evaluated against tangible improvement gained in achieving better rural livelihoods and improved status of medicinal and aromatic plant biodiversity.

There are no simple, easy answers to be found in complex policy debates and discussions such as those taking place in the medicinal and aromatic plant sector. Ultimately, all rests on the decisions and actions of the thousands of people who depend on medicinal plant resources, who have undertaken the responsibility of protecting their biodiversity and livelihoods through their community organisations and government agencies. Through them we will come to understand the nature and extent of the problems as well as the outcome of the policy solutions extended by the government.

5 Wild plants as resource: new opportunities or last resort? Some dimensions of the collection, cultivation and trade of medicinal plants in the Gori Basin

Malika Virdi[16]

5.1 Introduction

This paper is based on a study[17] undertaken during 2000-2001 on the collection and trade of medicinal plants in the Gori river basin. For this study 12 representative villages[18] were surveyed intensively, and 103 villages extensively. The finer grain to the picture comes from my having lived in the area for eleven years.

The paper delves into rather varied aspects of the workshop discussions. Some issues raised here are contentious, which should be no surprise since we are discussing the dialectics of a contested domain – the control and use of biological resources – where local livelihoods, commercial interests, and state control intersect.

The landscape that is being discussed in this paper is the Gori river basin. It lies in the far east of Uttaranchal, and is bordered by Tibet in the North, and Nepal in the South-East. Its high-altitude region, which has a number of alpine villages, is known as Johar. These villages are the hub of wild plant collection.

Two factors in combination make the Gori basin an area of intense collection and trade in medicinal and aromatic plants. The first is that the landscape within the basin is unusually varied and harbours a great diversity of plant life. The second is that the dwindling livelihood options of the local communities

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[17] Conducted for the Foundation for Ecological Security (FES) and the Wildlife Institute of India (WII).

[18] The twelve villages selected for intensive data collection and analysis were chosen for their representative nature in terms of location within the basin (altitude representation, bio-geographic location, proximity to different Reserve Forest Blocks), their ethnic composition, their social histories, the proportion of their Van Panchayats, and their economic levels. An intensive household survey covered 518 households to evaluate volumes of medicinal plants collected from the wild and the level of dependence as well as the extent of cultivation. Volumes traded in the study area were also estimated through interviews with the local traders.

make them respond in the way they do to any opportunities presented by market impulses.

The Gori river basin is 120 km long, roughly 25 km wide, and covers an area of 2,240 sq km or about 4% of the state of Uttaranchal. The altitude gradients are most unusual, ranging from 590 metres above sea level at Jauljibi to 7,434 metres at Nanda Devi East. To add to the diverse conditions that such a range of altitudes yield, the basin lies in a transition zone between the flora of the Eastern Himalaya and the Western Himalaya. In the North-South axis of the area is another layer with a diversity of conditions; there are three bio-geographic zones within the basin: the Trans-Himalaya, the Greater Himalaya, and the Lesser Himalaya. These transitions yield climate types that range from Polar, Sub-Polar, Boreal, Cool Temperate, Temperate and Sub-Tropical, as well as corresponding habitats.

The land use and tenure categories are equally significant. 64% (1,439 sq km) of the entire basin is under the tenure of local communities through *Van Panchayats*. Reserve Forests cover only 9% of the area. Alpine and sub-alpine areas within the Gori basin, where most of the valuable medicinal plants grow, constitute about 62% of the total land area. Such a configuration of conditions is rare anywhere in the Himalaya, and most unusual in Uttaranchal.

Broadly speaking, the plants collected and sold legally come from the lower altitude villages. The higher value plants (some of which are also protected by law), are collected from the high altitude alpine areas of the Gori basin. In Malla Johar, which constitutes the upper region of this valley, the communities migrating to their alpine summer dwellings do all their collection from the wild from their extensive *Van Panchayats*. In the rest of the Gori basin, villages located relatively close to the alpine areas extract plant material from both their *Van Panchayats* and Reserved Forest areas.

Collection from the wild is becoming more intensive every year. Large numbers of people have begun to migrate to the alpine villages seasonally, primarily to collect *Cordyceps sinensis* (Yarsagambu). In autumn they move on to other plant species for which they have a definite demand and a declared price and for which they would have already taken an advance.

5.2 The scale of collection and trade in wild plants

Large-scale trade in medicinal plants that have been collected from the wild has not been a traditional occupation of the people of the Gori basin. Very small quantities of a few plants were always collected for occasional household use as amelioratives and minor drugs. Small quantities of three high-altitude plants: Kutki *(Picrorhiza kurrooa)*, Atish *(Aconitum heterophyllum)* and Hathjari *(Dactylorhiza hathagirea)* have also been traded since the 1950s, but commercial scales of collection and trade are very recent. Starting about fifty years ago, this activity has increased exponentially over the past two decades.

Today, intensive trade in wild plant material for both the pharmaceutical and aromatics industry takes place in the Gori basin. Collection from the wild takes place on a large scale, though from a limited area. Of the 103 villages surveyed in the basin, 82 were involved with collection and trade of plants from the wild. However, the data from an intensive study of twelve representative villages showed that while income from the collection of medicinal plants from the wild are significant, they are by no means the dominant source of earnings; only 13% of the total earnings of the 518 surveyed households are from the collection of medicinal plants. This is roughly the same percentage as they earn from casual labour, employment in programmes under the Jawahar Rozgar Yojana (JRY) [19], and shop-keeping put together. The contributions of agriculture, natural resource based livelihoods such as livestock rearing, wool and bamboo based handicraft, and earnings from employment in service, are significantly larger than the contribution of medicinal plants collection to a family's economy.

There is a large difference in the intensity of medicinal plant collection across villages. For instance two villages from the sample of twelve, Ralam and Golfa, together account for 63% and 19% of the earnings from the collection of medicinal plants in the sample villages. The other ten villages together accounted for only 18%. It was also found that low altitude villages have high incomes from cash crops, such as potatoes and kidney beans. For example, in the villages Gaila, Kwiri and Jimiya cash crops account for 30%, 26% and 22% respectively. The incomes from medicinal plant collection were the lowest in these villages. Again, in villages like Shankhadhura and Sarmoli which are close to the bazaar at block headquarters, the scale of collection was small and of species that were legal to collect. They have other livelihood options because of their location.

The actual amounts earned from the extraction of medicinal plants in each village for an average household vary greatly. These were highest in Ralam: Rs. 812,525 (US$ 17,000) and Rs. 15,047 (US$ 300) per household respectively. Milam and Ralam, the two alpine villages, form two very illustrative opposites in the spectrum of livelihood options, as well as in their trajectories with regard to sustainability. As figures in Table 5.1 show, the people of Milam rely heavily on agriculture, whereas those in Ralam largely depend on the collection and trade of medicinal plants. Despite an abundance of farmland, there is no agriculture in this village.

Table 5.1 Importance of agriculture and the collection of medicinal plants in the villages Milam and Ralam

	Milam	Ralam
Per capita land under cultivation (ha)	0.148	0.008
Contribution of agriculture to total earnings	70%	0.9%
Earnings from collection of medicinal plants from the wild as a percentage of total earnings	0.3%	88%

Source: FES, 2002.

[19] This is a scheme run by the central government to promote employment in rural areas.

The people of Ralam continue to depend heavily on the collection of medicinal plants from the wild. The intense and wide scale extraction of plants from the wild in this village is clearly unsustainable and has led to a decrease in plant populations. This is a serious cause of threat to their livelihood. The people of Milam, on the other hand, are diversifying and intensifying their agriculture. They are also making attempts to cultivate medicinal and aromatic plants. As a result of these activities, the per capita income of the people of Milam is much higher.[20] Furthermore, their incomes are more predictable.

5.3 Collection of wild plants

5.3.1 Earnings and time spent

In our sample, 40% of the households were engaged in wild plant collection. The figure for Ralam is highest at 93%, but substantial numbers also participate in Laspa (72%), the third alpine village studied, and in Dhilam (71%). The total earnings from wild plant collection by each household depends on two factors: how many days they spend in collection, and how much they earn per day. In the sample, households put in an average of 24 days in medicinal plants collection.[21] The number of days spent on collection was highest for Ralam: 139 days. Clearly, Ralam's high per capita income from the collection of medicinal plants is largely because villagers here spent the most days on this activity.

Earnings per day from collection vary widely across villages, from an average of Rs. 29 per day in Milam to Rs. 217 in Golfa. With the exception of a few villages, average daily earnings from collection are far below an average daily wage earned through casual labour, which is Rs. 70 to 80. The relatively high earnings in Golfa are because of the collection of one plant that has seen a boom in recent years, Yarsagambu *Cordyceps sinensis*. Substantial sums are being earned in a short time through *Cordyceps* collection. Indeed, more and more households across the region are being drawn into this activity. This is something of an aberration, however, and earnings from *Cordyceps* should not be considered representative of earnings from medicinal plant collection in general.

5.3.2 What determines the propensity to collect from the wild?

The study examined the impact of various determinants on the propensity of various groups to be engaged in the collection of medicinal plants. These determinants include poverty, caste, occupation and the number of adults in the household. If, as our data indicates, the collection of medicinal plants is not very lucrative (with the exception of *Cordyceps)*, we would expect that the poorer sections of the population, who lack other options, will be more involved in this activity. A clear pattern emerges:

- The villagers who work for the most days as a casual labourer have fewer

[20] The per capita income in Ralam is lower despite a sharp increase in the incomes from the extraction and sale of Yarsagambu *(Cordyceps sinensis)*, which sell for up to Rs. 50,000 (about US$ 1,000) a kilo.

[21] This average is computed over all households, not just those involved in medicinal plant collection.

resources than others and a higher level of poverty. As the number of days of casual labour increases, the involvement in medicinal plant collection also increases. The households that spend between 0 to 10 days in casual labour per year spend an average of only 17 days in wild plant collection. On the other hand, households that supply between 10 and 50 days of casual labour spend an average of 24 days in medicinal collection. Households that are heavy suppliers of casual labour (more than 100 days) spend an average of 54 days in medicinal plant collection in a year.

- The households with larger land holdings spend less time in medicinal plant collection. In fact, households which own more than 2 acres of land spend just 1.5 days a year on medicinal plant collection.
- When there is at least one family member employed in a job outside the immediate family economy, the others spend on average just 3 days in medicinal plants collection. In contrast, households that have no members in outside jobs spend 29 days in medicinal plant collection.
- Households that earn more from natural resource-based occupations such as livestock rearing, wool bamboo or wood-based handicrafts, spend less time in medicinal plant collection.
- On average, it seems that the proportion of villagers belonging to the Scheduled Tribes involved in medicinal plant collection is higher than for the other castes. However, this only reflects the existing pattern of caste in the villages, suggesting that caste has little effect on the villagers' tendency to be engaged in collection activities.

The results also suggest that there are village-specific factors that play a very important role in determining how much a household is involved in medicinal plants collection. These determining factors include the location of the village and recent historical progressions and episodes that have broadly influenced the livelihood options of the village community.

These results are consistent with the view that people tend to resort to the collection of medicinal plants from the wild when they do not have other livelihood options. It is, therefore, not surprising that it is the poor who are more involved with collection.

Women constitute a significant proportion of the collectors from the wild, though only of a select number of species. The collection of lichens and *Chaerophyllum* is mostly done by women. In Ralam, however, women were seen going to the high alps to collect *Picrorhiza kurrooa* (Kutki) in volumes comparable to the highest in the village. Almost 35% of the total earnings from wild collections is brought in by women.[22]

5.3.3 What are the volumes traded?

The highest volume and tonnage of herbs extracted and traded legally are for the perfumes and aromatics industries. They include Lichens, Cinnamon, Acorus, Bergenia, Heydechium, and *Zanthoxylum alatum*. For an idea of the

[22] In our study we found 13% of the households were headed by women.

size of the trade from this area, the volumes traded legally from the basin during the year 2001 are given below:
- 275 quintals of lichens were collected and sold from 29 villages;
- 805 quintals of Cinnamon leaves from 4 villages;
- 6.5 quintals of *Bergenia* roots from 1 village;
- 8 quintals of *Zanthoxylum alatum* from 8 villages;
- 1.3 quintals of *Acorus calamus* roots from 2 villages.

It is, however, the illegally extracted material that brings in the greatest remuneration. Although listed and banned, these species have nonetheless been regularly extracted and traded. These include *Picrorhiza kurrooa*, *Aconitum heterophyllum*, and *Dactylorhiza hatagirea*, for which there has been a steady demand in the market for the past 40 years.

5.3.4 How does the trade work?

The Shaukhas or Bhotiyas of the Gori basin traded with Tibet prior to the 1962 Sino-Indian conflict, and enjoyed a special status that permitted them to trade at any of the Tibetan *mandis* (trading camps). They also had active trade relations with the wholesalers from the northern plains of India, which facilitated their trade in animal parts, in wild herbs (namely *D. hathagirea*, *P. kurrooa* and *A. heterophyllum)* and of course in wool. When the hunting of bear and musk deer was made illegal, the trade in animal parts like bear bile and musk pods became dangerous and went underground. The same traders then shifted their focus to the growing demand for medicinal plants. They responded to the changing demands of the market and organized the large scale collection and extraction of plant parts like walnut root bark, incense or Dhoop (from *Jurinea macrocephala)*, Dioscorea roots through the 70s and 80s, and in the mid 90s *Taxus baccata* leaves – pushing the volumes till bans made overt operations too risky. In attempting to piece together the trading history of these contraband plant materials we were able to reconstruct the following levels of participation:
- From 1975 to 1990, there were on an average 4 contractors or road head traders actively buying medicinal plants from the basin each year.
- In the last decade, the number of road-head traders rose dramatically. The increase was particularly sharp after 1997. Their number had increased to 21 by 2000-01. The Schedule Tribes dominated the trade: 2/3rds (14) of the contractors belonged to this caste. One fourth were Scheduled Caste, and only a tenth were from the General Castes. Apart from the sharp increase in demand for plant material, *Cordyceps* breaking on to the scene triggered a rush of speculators and traders into the valley.
- Our survey found that while half of the contractors purchased medicinal plants worth Rs.1 lakh, the remaining half purchased plant material up to Rs.4 lakh each, 5 of them being the major buyers. These major contractors have carved out regions for themselves with a tacit agreement to keep their own domains.
- Road-head traders or local *thekedar* are the vital link between the Gori basin and the wholesale markets downstream in the towns of Ramnagar, Haldwani and Tanakpur. They provide capital for the purchase of the plant material collected throughout the season, extend consumption loans and often work through local commission agents operating in their own villages or in a

Table 5.2 Collection of medicinal plants from the surveyed villages

High altitude medicinal plants collected in the year 2001											
Medicinal Plant	Quantities* collected during the period 1997 to 2001 in the 12 study villages								Quantities collected in 2001 (villages included in the general survey)		
	97-98	98-99	99-00	00-01					00-01		
High altitude	Kgs	Kgs	Kgs	**Kgs**	Villages	House holds	Value (Rs.)	Collector earned (Rs./kg)	**Kgs**	Number of villages	Value of collection (Rs.)
1 *Picrorhiza kurrua*	2,975	3,272	3,940	**5,939**	9	79	386,035	50-60	**10,151**	22	632,000
2 *Aconitum heterophyllum*	15.5	9	31.5	**3**	1	3	2,100	NA	**10**	2	NA
3 *Dactylorhiza hathagirea*	86.1	75.5	134	**30.4**	6	31	17,962	550	**179.5**	15	NA
4 *Plerospermum angelicoides*	529	729	439	**108**	4	14	6,660	60-65	**1,633**	10	NA
5 *Chaerophyllum villosum*	1,673	1,734	1,719	**1,870**	3	58	121,550	62-85	**2,770**	5	171,000
6 *Cordyceps sinensis*	-	-	-	**18.5**	5	122	646,236	35-40,000	**47.57**	24	1,775,000
Cold temperate											
7 *Parmelia spp.*	4,059	3,892	4,596	**4,331**	8	70	95,282	25	**30,152**	29	599,000

* Volumes of banned species are somewhat under-reported.

cluster of nearby villages. These agents or *munshi* often own pack animals like mules and pack-goats which they use to transport rations to places where no roads go and to bring down to the roadhead the season's collection of medicinal plants. They earn a small commission per kilo of material brought to the roadhead. For instance in one of the alpine villages, for the purchase of *D. hatageria*, the *munshi* operated purely as a commission agent and got to keep Rs. 25 for every kilogram purchased at Rs. 625. (The rate at the road-head being Rs. 650/kg). Similarly in the case of lichens, a commission of Rs.5/kg is charged on delivery at the road head.

- The scale as well as rate of increase of wild plant extraction can also be gauged by the increase in the number of local commission agents as well as road-head traders, who vie with each other to purchase as much of the raw plant material as they can. While 11 contractors bought directly from the villagers, 6 employed 1 or 2 *munshi*. The major road-head traders employed up to 5 local agents each to ensure capturing a major share of the market. In a village like Ralam, in the year 2001, we found 7 of the main contractors buying from as many commission agents.
- It is also noteworthy that 12 traders were interested in just one medicinal plant in 2001: *Cordyceps*. These were new entrants to the valley, and along with the old hands, 21 road-head traders were reported to have bought *Cordyceps sinensis* in 2000.

5.4 Cultivation of medicinal plants in Malla Johar

There is today an exaggerated view of the cultivation of medicinal plants in the alpine villages of Johar. While efforts at cultivation by farmers have been sincere and laudable, they have met with only meager success so far. If we are to make any headway with promoting cultivation we must come to grips with realities. To start with, only about 0.11% of the area in Malla Johar comprises of agriculture land. Crops are grown on only 16%, or about 21 hectares. Of this, only 0.2 hectares of land in the entire Malla Johar is actually under the cultivation of medicinal plants (1% of the total agriculture land under cultivation)[23].

Only 494 people from 185 households migrate seasonally up to Malla Johar. 80% of these households are involved in agriculture, but other than 2 families, each cultivates less than 2.5 acres. Food crops account for 76% of all cultivation (Table 5.3). Spices (which include *Allium strachyii* and *Carum carvi)* account for another 23%, and medicinal plants occupy just about 0.1% of the total cropped area. The cultivation of medicinal plants is done by only 11 families and generates a mere Rs. 9,000 annually. Farmers have experimented with the translocation of wild specimens, as well as germination from seed of a few high value medicinal plants, but have succeeded in only a few cases, such as Chipi or Gandrayani *(Pleurospermum angelicoides)*, Ban kakdi *(Podophyllum hexandrum)*, and, very recently, in Atis *(Aconitum heterophyllum)*. Of this, up to the time of the completion of this study, not more than 5 kilos of Atis would

[23] Source: FES, 2002.

have been extracted from their fields and sold. So, cultivation on a commercial scale is still a long way off.

The cultivation of the following medicinal plants is being attempted (mostly through transplanting from the wild to farmers' fields):
- *Aconitum heterophyllum* (Atis)
- *Dactylorhiza hatagirea* (Hathajadi)
- *Picrorhiza kurrooa* (Kutki)
- *Pleurospermum angelicoides* (Chipi or Gandrayani)[24]
- *Podophyllum hexandrum* (Ban kakdi)
- *Sausurrea lappa* (Kuth)
- *Rheum emodi* (Dolu)[25]

Table 5.3 Cultivation of various crops in Malla Johar

	Crop	Production in 2001 (kgs)	Area cultivated in 2002 (ha)	% of total area cultivated
	Food crops		15.795	75.85
	Spices (*Allium strachyii* and *Carum carvi*)		4.827	23.18
1	*Pleurospermum angelicoides* (Chipi or Gandrayani)	15.0	0.137	0.66
2	*Aconitum heterophyllum* (Atis)	1.5	0.024	0.12
3	*Rheum emodi* (Dolu)	6.0	0.005	0.02
4	*Sausurrea lappa* (Kuth)	Negligible	0.030	0.15
5	*Picrorhiza kurrooa* (Kutki)	Negligible	0.005	0.02
6	*Dactylorhiza hatagirea* (Hathajadi)	Negligible	-	-
7	*Podophyllum hexandrum* (Ban kakdi)	Negligible	-	-
	Medicinal plants (sub total)		0.201	0.96
	Grand Total		20.823	100.00

5.5 Discussion and policy recommendations

5.5.1 How can rational collection be promoted?

This question lies at the crux of all our discussions, be they about the sustainable livelihoods of local communities, the viability of the trade in rare and endangered species, or the continued existence of those species. We need to consider the whole system right from land tenures and how they work, to what constitutes 'rational behaviour' for different actors under greatly varying circumstances, and the dictates of varying interests.

It is a widely held tenet that secure tenure is perhaps the most important determinant for rational behaviour, both collectively and individually. While there is no doubt that it is often an important determinant, this is not always true. The interpretation of 'security' of tenure, and indeed the external distortions in tenure make this a complex issue. Let us look at the *Van*

[24] A spice and a minor ameliorative home remedy.

[25] Used to colour wool locally and as a minor ameliorative home remedy.

Panchayats of the Johar valley. As mentioned earlier, the largest volumes of medicinal plants collected from the wild in Uttaranchal come from the alpine and sub-alpine areas of Johar. A large proportion of the area in the valley belongs to local communities as *Van Panchayats*, which cover about 64% of the whole basin. Reserve Forests cover less than 9% of the area. This is significant as almost all the high-value medicinal plants were collected from the high-altitude *Van Panchayat* areas. It can clearly be seen that the volumes being collected and traded, as well as the manner and intensity of collection, are leading to a progressive and serious reduction in the populations of the plant species being collected. This is not deduced from the total quantities that are traded in a particular year, but from the increasing distances and larger areas of collection that must be resorted to progressively year after year. Are we seeing irrational behaviour here, or are we seeing a phenomenon where rational behaviour is different for different actors at different times?

The communities holding tenure of land under *Van Panchayats* do so in perpetuity. The tenure they hold is perhaps the most secure tenure any community has over Commons anywhere in the country. The collection of medicinal plants for trade is 'regulated' in these *Van Panchayat* areas in a most rudimentary sense. However we do not see adequate and careful regulation in place that is based on an intensity, timing and frequency of collection that could be called 'rational' in the context of those plant populations surviving for any length of time. Perhaps the only regulation that was common across many *Van Panchayats* of the alpine villages of Johar, was that only *haqdaar* or right-holders were permitted to collect from a particular *Van Panchayat*. Less destructive or 'sustainable' methods of collection fly out of the window in a situation where the resource is becoming increasingly scarce and more intensively competed for. The push of poverty is driving people ever increasingly into a cycle of more intensive collection.

'Sustainable methods' are often cited as a panacea for the over-harvesting of species at risk. How far can such talk go with the collector when either the root or the entire plant is being collected (this is the case for most of the high-value species from the area)? Or the collector may feel it is 'irrational' to leave a plant to set and shed seed before he or she digs it out, because by that time their seasonal migration would see them in their lower villages, out of the way of heavy snow. Leaving the plant till even a little later would only ensure that it would be 'lost' to competing diggers.

There is another rationality at work here on the Commons. It is the rational equivalent of interlocking tenancy arrangements, such as sharecropping, between landlord-creditor-employer and tenant-debtor-employee on private agriculture land. Here the tenancy of the Commons, in the case of the alpine *Van Panchayats*, is altered in such a manner that the co-owners of a *Van Panchayat* become debtor-employees of a village-level or road-head trader who is the creditor-employer. The secure tenure of a *Van Panchayat* member is used as collateral to get credit to survive a major slack season. The loan is then repaid in the form of future labour services, through medicinal plant collection.

Our data has shown that it is the poorest who mostly collect medicinal plants. The promised sale of the collected plants and their parts acts as collateral for a large number of collectors, as cash advances or food grain and other necessities they will require for the winter as well as the period of stay in the remote alpine villages. These advances or '*bayana*' as they are locally referred to, are given out by the local roadhead traders, thereby establishing an assured supply for the trading season, and as 'rational' and efficient mode of compensation for unmonitored efforts of the labourers so employed in an often (legally) risky occupation. This advance or loan of up to Rs. 5,000 per family, as well as in food grain, provides for the subsistence of families who have no other means of earning for certain months of the year. These people obviously have very few assets that can be used as collateral in the formal credit market. Groups of such collectors, in some cases almost a whole community migrating to a particular village, are thereby relegated to the role of labourers on their own commons, radically transforming the essential nature of the commons and how they are governed and used. Low intensity subsistence use of their commons gives way to desperate and intensive extractive use.

'Rational' collection will need to be seen in the context of such systemic alterations wrought by the market. When the scale of demand of the global market is not rational with regard to existing plant populations, and when the rationale of the market barely compensates the collector for his or her labour, the behaviour of those at the bottom of the scale can not be judged in abstraction.

Who are the stakeholders?

Another term that we need to define clearly is 'stakeholders': who are the stakeholders and how do we propose to position people or parties so designated, especially with regard to who should negotiate and determine policy. The reason we need to do this is because the term 'stakeholders' is often used to include all interested parties, or all the different 'actors' and 'players' in the medicinal plants business. If we wish to speak about them together, the designation of 'interested parties' should suffice. The grouping of different players under the common designation of 'stakeholders' provides them all with a mantle of legitimacy, of beneficial association, a mutuality of concerns, and indeed overtones of natural 'ownership'. These attributes may not be applicable to all interested parties involved in the collection and trade of medicinal plants. I would suggest that in our enumeration of the various stakeholders in our discourse we see the nature and the separateness of the stakes of the various players, and not lump them together as one homogenous interest-group.

The true stakeholders for the medicinal plants of a particular landscape, seen in the context of the larger ecosystem they exist in, are at the primary level, the people who directly own and use the landscape. The other actors, including the various tiers of traders, the processing industry, the consumers, the taxing and regulating bodies, do have stakes. They all play a very important and legitimate role too, but their stakes must be seen as limited to their spheres of transactions, and not across the spectrum. The disproportion of the stakes, and often mutually opposing interests must also be kept in mind.

Regulation by the state

The government has a clear and critical role to play in laying down and ensuring compliance with broad ground-rules for the sustainable and democratic governance of natural resources. Governance itself involves a host of partners and stewards at different levels. Our data, cited here, corroborates data from others[26] that indicate that the poorest are the most involved with the collection and sale of medicinal and other wild plants. In the absence of the state and society at large addressing the root-problem of poverty, or providing alternative livelihood options, it is unrealistic to expect the collector to desist simply because of bans that come and go from time to time. However, though the bans may not be effective in stopping collection completely, they do have a significant effect in stemming the scale of collection and trade. Their value must also be acknowledged.

It must be reiterated that the rapid depletion of the resource base can be reversed only when the people involved in collection have viable livelihood alternatives. This implies comprehensive intervention, both in terms of policy and action, ranging from access to better education, better land use, to better infrastructure. The market alone is incapable of making this happen, and it is the responsibility of both the state and society at large. However, while alternative opportunities of employment are being created, the market opportunity will continue to dominate reality, and the poor will continue to collect and sell. In order to prevent any further depletion of resources, meaningful and enforceable regulations need to be in place. Below are a few suggestions:

- The collection and trade in those species which are not threatened can continue. An assessment of threat status and causative factors must be done region-wise, and re-assessed periodically. The basis for prioritising species for protection can be along the lines suggested by the World Conservation and Monitoring Centre (WCMC). The guiding elements can be:
  - commonness or rarity;
  - means and ease of propagation;
  - sensitivity to disturbance;
  - which part of the plant is used, and consequent effect on populations;
  - properties and medicinal use;
  - community knowledge and use.

  Presently, laws differ from state to state. This allows the fudging of documents regarding the source of origin, while extraction and sale from regions that require protection continues. It may be necessary to have time-bound bans and quota restrictions that are uniform across broad eco-regions that co-host threatened plant communities, until state governments have procedures in place to issue certification of origin.

- Appropriate mechanisms need be devised and put in place so that the distribution of margins and the 'equity' equation be spread across all tiers of

[26] Holley and Cherla, 1998.

trade and the processing industry. Presently the question of equity is discussed only in the limited context of distribution between collectors and the primary middleman or village-level *munshi* or road-head trader. Could appropriate taxes and cesses be levied at different levels and used to make the distribution of benefits more equitable?

5.5.2 Promoting cultivation

The cultivation of any species, medicinal or otherwise, that can be grown and will fetch a stable and remunerative price for the cultivator, should be promoted. There is today, as we have seen, a rhetorical inflation of what, and how much, can and is being cultivated. The large number of programmes by government, research institutions and NGOs and efforts by struggling cultivators, may be a prime reason for this. Also, overstating cultivated production helps to mask the quantities collected and traded from the wild. Research papers that have done empirical work on handkerchief-sized plots (sincere, because that is how much there was) have extrapolated production figures in hectares and in quintals. Such extrapolations have the perhaps unintended effect of creating a delusion that cultivation is successful on a scale that does not exist.

It must, however, be stressed that some cultivators have made headway with a few species such as *Aconitum heterophyllum* and *Pleurospermum angelicoides*, and larger scale cultivation will happen if the demand persists and prices remain remunerative.[27] The government can help to even out the artificial fluxes in the market of the few species that are being cultivated successfully. Should it undertake such a peripheral but important market intervention, the cultivators of medicinal plants would be reassured and encouraged to plan and invest on a longer term basis. Aconites for example, would be ready for harvest only in the third year after seeding, and assurance of a market would go a long way towards giving them confidence in its cultivation.

The government has attempted to provide some farmers with Cultivators' Certificates. This is certainly a step in the right direction. Initially, the procedure was not administered well in Munsiari. It is hoped that this situation will change.

The provision of capital and loans to promote the cultivation of medicinal plants may not have the desired effect. The reasons being:

- The scale of cultivation today is miniscule, and will build-up gradually year after year. This is because of the nature of the crop (not being harvested annually), low success rate in germination and unsuitability of flat agricultural fields.
- Most of the land that is actually under medicinal plant cultivation is not owned by the cultivators themselves, and so major investments may not be made because of uncertainty.

[27] There are location specific impediments such as theft of the crop after the village migrates to the lower villages for winter, but communities have dealt with such situations in the past, and indeed are doing so in neighbouring valleys even today.

- The large-scale cultivation of medicinal plants which have been grown successfully by farmers does not require large input of capital. It requires land and planting material, which can easily be collected by farmers from the wild.

As has been learned from some other government programmes, cultivators do project requirement of capital, which is then used for purposes other than farming. Officials readily adopt programmes involving financial support despite being aware of this, because it not only helps perpetuate their authority, but also the dispensation of money provides power. While this may not have a direct negative impact on the cultivation of medicinal plants, it can substantially undermine the culture and credibility of real partnerships between development agencies and village communities.

Some medicinal plants grow in the wild in very specialized micro-habitats and associations. It goes against the grain of local knowledge as well as common sense to try to cultivate them on flat agricultural fields. Conducive conditions for certain plants can be arranged, but almost always at a great cost. Capital intensive techniques, such as polyhouses, can reach only a few individuals, and the cost effectiveness in the case of high altitude medicinal plants is yet to be proven. Such investment and modes of production are best left to the industry, which can better afford them.

Perhaps the most essential condition for the cultivation of medicinal plants in high altitude areas is soil moisture. The fields in these areas are subject to high solar radiation and dessicating winds and require regular irrigation. Rather than giving individual loans and grants, the government could consider assisting cultivation by providing irrigation facilities as a common village amenity. The expense would be beyond the reach of individual farmers.

It must be stressed that *in-situ* regeneration and use may be the best way ahead. Here, different species can exist and be propagated in conditions that meet all their requirements.[28] Many alpine villages in Johar, for example, have over a hundred square kilometres of common land under *Van Panchayats*. It is here that the wild plants are collected from in the first place. If collection and trade from the wild could be regulated, it could not only contribute substantially and in a sustained manner to local livelihoods, but also perhaps to the conservation of the plant populations themselves. There are two potential complications that would need to be resolved for in any such design of commons governance. Firstly, the free-rider problem. The communities would need to work out ways to share the costs to bring about the change that will enable *in-situ* regeneration. Secondly, the bargaining problem. This implies that disputes about sharing the potential benefits from the change may lead to a breakdown of the necessary coordination that may have been achieved.

[28] These include: suitable substrate, photoperiodicity, mycorhizal associations, soil moisture, chilling, and other aspects. Many of these are not well understood by science.

6 Research and technological implications for sustainable development of medicinal and aromatic plants in Uttaranchal

J.S. Rawat and Manisha Upadhyay[29]

6.1 Introduction

The Indian Himalaya region supports over 1,785 (or 23%) of India's plant species (Samant *et al*., 1998). These medicinal plants are represented in varying life forms at various altitudes and habitats. Their economic potential is well recognized. Out of 500 plant species used in pharmaceutical preparations, 175 species are found in the Indian Himalayas. There is an increasing degree of threat to this natural population of medicinal plants. More than 90% of the raw material supplied to herbal industries in India, and exported, is drawn from natural habitats. In order to ensure their long-term conservation, it is necessary to develop a medicinal plant resource base through cultivation, to prevent over-exploitation and to regulate export.

Uttaranchal is a newly established Himalayan state with a characteristic climate, geology, flora and fauna. It encompasses an area of 53,485 sq. km, with a total forest area of more than 3.5 million hectares. The greatest *Ayurvedic* text, "*Charak Samhita*", holds this region in high esteem and describes it as the best habitat of herbal wealth. The temperate climate of the state is a rich source of biodiversity. This sustains an abundant medicinal plant wealth that has tremendous commercial potential, both at the national and global level.

The people of the state are economically poor, partly because of predominance of subsistence agriculture and small land holdings. Poor industrial and economic development has led to a lack of employment opportunities. Rural communities are dependent on natural resources for a variety of uses, and these resources are depleting at an alarming rate. Further, poor conditions such as undulating land, uncertain rainfall as well as a scarcity of irrigation facilities, generates uncertainty in agricultural production. A large part of Uttaranchal's territory consists of wasteland, and other land forms that make the cultivation of for instance food grains unprofitable. Notwithstanding, these types of land have tremendous potential for cultivating medicinal and aromatic plants. Note that these plants are the natural plant communities of the region. It is expected that their cultivation would not only provide farmers with greater economic resilience, but would also help to conserve natural resources, ultimately making these fragile ecosystems more sustainable.

[29] Herbal Research and Development Institute, Gopeshwar, Chamoli - 246 401.

This paper examines the research and development initiatives of the major research and development institutions in Uttaranchal. It analyses the available information on various aspects of medicinal plants, meanwhile identifying technology and knowledge gaps and discussing research priorities for a sustainable development of medicinal plant resources in Uttaranchal.

6.2 Information and technology gaps

Table 6.1 highlights the existing information and technology gaps in the development of medicinal and aromatic plants. The following broad categories are distinguished:

1. Distribution and availability
2. Identification and uses
3. Extraction and collection
4. Storage
5. Value addition and trade
6. Quality control
7. Cultivation and propagation
8. Conservation

Information on the distribution and availability of Himalayan medicinal plants appears to be adequate. However, lack of location specific and abundance data in most inventories limits their utility. Further quantitative information on the status of natural populations, determining relative degrees of risk to species, is either unavailable or limited to a few taxa. Likewise the deficiency of data on extraction trends and demand supply details, even for listed critical taxa, makes it difficult to prioritise species for conservation (Dhar *et al*., 2000). There is no reliable data on the number of plant species that are currently traded in high volume. This information is urgently needed.

Further, there is a lack of (i) transparency in sharing information, (ii) coordination among the various agencies involved in the collection of raw materials from natural habitats, and (iii) information on trade and marketing routes. This impedes any objective assessment of perceived threats. As a consequence focused conservation efforts are wanting (Dhar *et al*., 2000).

The fact that most medicinal plants used by the traditional practitioners and manufacturers of *Ayurvedic* products are collected from the wild presents problems for identification and obtaining material of uniform quality. This is for a number of reasons. Sometimes a plant name may refer to more than one species: the name 'Brahmi' can refer to either *Bacopa monneiri* or *Centelia asiatica*, which have entirely different phyto-chemical compositions. Also the effect of agro-climatic conditions on the chemical composition and therapeutic properties of a medicinal plant species is well-known: seven varieties of *Terminalia chebula* originating in different parts of India are known to have different therapeutic properties. Another complication is that the concentration of required chemical constituents in a plant is strongly influenced by its stage of growth as well as the season. A study of the total alkaloid content of the

Table 6.1 Information and technology gaps in the development of medicinal and aromatic plants

Key issues	Achievements and available technologies	Gaps
Distribution and availability	- Enumeration techniques - Area specific enumeration	- Adaptation of uniform survey methodology - Consolidated list for Uttaranchal
Identification and uses	- General information for identification and potential uses - Attempts to group by utility	- Objective information and techniques for identification - Information on adulterants and potential uses of medicinal plants
Extraction and collection	- General information on harvesting and collection - Cyclic harvesting from the wild	- Lack of sustainable harvesting techniques - Extraction and harvesting trends - Impact assessment
Storage	- Technologies available for few species - Attempts to develop post harvest technologies	- Adequate storage techniques for retention of active principles
Value addition and trade	- General information on value addition and trade of selected medicinal plants - External demand and supply	- Lack of advanced technologies for value addition at local level - Information on internal demand and supply
Quality control	- Attempts for a few species, especially for aromatic plants	- Quality standards, especially for medicinal plants - Testing protocols and techniques - Identification of active ingredients - Determination of shelf life
Cultivation and propagation	- Prospects for selected area and taxa - Propagation techniques for a few species - Attempts in micro-propagation	- Agro-technological details for potential species - Pilot scale tested technology for cultivation - Uniform and high quality planting material - Domestication of most species - Lack of economic data for most species, especially for high altitude plants - Cost-effective technology for production of planting material - Agronomic and post harvest techniques
Conservation	- Subjective attempts in setting priorities - A network of protected areas - Enforcing law for extraction of endangered plant species - Attempts in ex- situ conservation such as herbal gardens	- Appropriate technology for *in-situ* conservation as well *ex-situ* conservation (e.g. herbal gardens) - Lack of information on status of threatened medicinal and aromatic plants - Focused approach for conservation of priority taxa - Extraction norms for medicinal and aromatic plants

Modified from: Dhar *et al.*, 2000.

leaves of *Adothoda vasica* during different periods of the year revealed that the highest yield (2.5%) is obtained in the months between July and October, when the flowering period is over and the fruit is at a later stage of maturation. The stage of maturation of the plant parts to be collected is another important factor: the root of *Wihania ashwaganda* is dug out just 8-10 months after planting, while the stem of *Tinospora cortifolia* is collected at full maturity. All these factors mean that uniform quality cannot be guaranteed, and there are serious constraints regarding verification of authenticity for material collected from the wild. The physiology of high altitude species has been a subject of research for several years (Purohit, 1997) and investigations are underway to provide solutions to these questions, especially for high altitude plant species.

Only a few medicinal plant species are being cultivated (Nautiyal *et al*., 1997) mainly because of a shortage of planting material, insufficient knowledge about cultivation and lack of operational farmer organisations. Techniques for the cultivation are yet to be developed of a number of species. Slow seed formation, low seed production, poor seed viability, high dormancy rate and a low percentage of seed germination remain unsolved problems for high altitude plant species. In relation to this, seed propagation research in medicinal plants has been almost negligible. Quality planting material for most species is also unavailable, in spite of progress made in biotechnology (Bajaj, 1995).

Inadequate post harvest techniques as well as the lack of a market information system are other key factors in the limited motivation of farmers to take up medicinal plant cultivation on a large scale. In addition, the absence of suitable and remunerative technologies for on-farm cultivation, or development of sustainable techniques for harvesting from natural forests, have aggravated the situation further and led to continuous over-exploitation of natural habitats.

6.3 Research constraints

Despite their long history, research and development activities on medicinal and aromatic plants have not been very successful in meeting the needs of the sector. This has been caused by a number of constraints:

a. **Low priority**
   An important constraint in the operation of the research system has been a lack of priorities, because there was no state medicinal plant policy. Now, the State Government has prepared the "Vision 2020 and Action Plan" for the development of medicinal plants, in which the importance of prioritising areas for research and extension has been emphasised.
b. **Type of research**
   Much of the research being carried out by the institutes in the state is basic; there is a need to redirect these efforts to solve practical problems. Greater attention should be paid to agro-technology development, especially for those species whose collection from the wild has been banned.
c. **Institutional constraints**
   Coordination between different research agencies and the users of results is not always effective. In addition, there is little collaboration on research

between the public and private sectors, whilst the research skills available in the universities are not used to the best possible advantage. Individual research institutions within the region have different mandates and priorities and are not responding adequately to the needs of the sector. The repetition of research results is rampant. Most institutes are working in isolation: for example *Picrorhiza kurrooa* and *Aconitum heterophyllum* have been a subject of research simultaneously in many institutes, but the appropriate technologies for their large-scale cultivation are still non-existent. The state nodal agency (HRDI) has short-listed ten medicinal and aromatic plants for production under the Agro-Export Zone for Medicinal and Aromatic plants, but no coordinated efforts are under way to develop the various components needed for their successful cultivation.

d. **Facilities**
Generally, there is no shortage of competent scientists or researchers in the various institutes. However, they have to be provided with adequate training and opportunities for interaction with other research organisations in the country and abroad. Many institutions suffer from inadequate facilities and poorly maintained equipment; and the lack of past investment means that much existing laboratory and field equipment is not functioning properly or is obsolete. This is an increasing constraint as research becomes more sophisticated.

e. **Linking research efforts**
There is inadequate interaction between research organizations within and outside the state and little interaction with research organisations abroad. Researchers trying to keep abreast of international development receive little support or recognition. Some NGOs and private companies have been collecting information regarding seed source and germination, nursery handling, and tissue culture, etc. of several valuable medicinal and aromatic plants. Only recently attempts have been made to involve them directly in carrying out action-oriented research.

f. **Research-extension linkages**
New technologies are seldom extended to field workers. The lack of formal or even informal linkages between institutes, universities and developmental agencies and departments is responsible for the lack of dissemination of research results. Agro-technologies are available for some medicinal plants, but their commercial production has still not been picking up mainly because of this lack of research – extension linkages.

g. **Funding**
Expenditure on research in medicinal and aromatic plants has been negligible. The allocation from the state budget to HRDI during 2002-2003 was only Rs 20 Lakh. Similarly, HAPPRC has only received about Rs. 65 Lakhs for research and development work during the last five years. Considering that many institutes lack essential research facilities, this lack of funds seriously limits their efficiency. Most research on medicinal plants is being carried out through research projects funded by a variety of agencies. These projects are generally granted for achieving short-term objectives. The absence of any long-term financial commitment restricts developing a viable technology package. To address technology gaps in

knowledge and also to overcome research constraints, a long-term support scheme for research and development in each species is required. In general, much of the research work in most research institutes is being carried out through Central Government financing. There is very little direct funding from the state government. The State Medicinal Plants Board should provide funds for research as a part of their mandate to implement programmes on medicinal and aromatic plants.

It is notable that there is no involvement of the private sector (including the medicinal plant industry) in research activities. For the long-term viability of any research institution, it will be necessary to develop public – private partnerships in research and development so as to provide a focused approach to technology development and sustainability. The industrial sector has to be roped into the process as it will be the ultimate beneficiary of at least part of the research results.

The "client" or user of research results has to be given top priority when any research project is conceptualised. The typical approach in agricultural research and development is that a research programme is organised around the following sequence: (i) identification of the client; (ii) hypothesis development; (iii) research and diagnosis, and (iv) technological prescriptions. If this focused approach is followed, tackling specific problems faced by clients, then technology dissemination will be much easier and research results will achieve sustainability by virtue of their usefulness to the clients.

6.4 Agencies carrying out research and development

The major strengths of the research institutes working on medicinal plants in Uttaranchal are:
1. well established institutions;
2. trained researchers;
3. access to rich biodiversity and abundant traditional knowledge;
4. large-scale use of medicinal plant material;
5. competitive advantages for technology development and dissemination.

Uttaranchal has a large number of research institutes. According to information available with the Herbal Research Development Institute (HRDI), there are 22 research institutes conducting work on medicinal plants. However, only four of these carry out a significant amount of research in this area: the Herbal Research and Development Institute (HRDI); High Altitude Plant Physiology Research Centre (HAPPRC); G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) and the Forest Research Institute (FRI). Of these, only HRDI focuses exclusively on medicinal plants. It is also the nodal agency for medicinal plants in the state.

The research on medicinal plants in Uttaranchal can be divided into the following categories:

- conservation research;
- botanical research;
- medical research;
- medicinal plant database;
- herbal product development;
- agro-technology development;
- propagation & cultivation.

Data on the focus of research activities in Uttaranchal is shown in Table 6.2. It indicates that more than three fourth of the institutes are working on botanical research. This is followed by the development of cultivation technology (68%) and conservation research (63%). Only a handful (9%) of the institutes are working on the development of herbal products.

Table 6.2 Research preferences of various medicinal plant research institutes in Uttaranchal

Area of work	Number of institutions involved (%)
1. Conservation research (threat assessment, distribution, species recovery)	63
2. Botanical research (inventory, herbarium development, raw drug repository)	86
3. Medical research (pharmacology, pharmacognosy, clinical research)	27
4. Medicinal plant database	40
5. Herbal product development	9
6. Agro-technology development (propagation, cultivation)	68
7. Other types of research on medicinal plants	54

Note: this information was collected from 22 research institutes.

The main research and extension activities on medicinal and aromatic plants by the four major research and development institutes in the state are presented in Appendix 4.

6.5 Conclusions

The following conclusions can be drawn from the information provided in the previous sections:

- Research, and dissemination of research results, is the key to the development of medicinal and aromatic plants, especially in the poverty stricken but biodiversity rich state of Uttaranchal.
- There are many information gaps and research constraints in the on-going medicinal and aromatic plant research activities in Uttaranchal.
- The information gaps can be filled by prioritising the issues, raising more awareness, ensuring interaction between researchers and implementing coordinated research projects.

- Research constraints can be addressed through capacity building of researchers, clear priority setting of research activities and providing institutions with adequate facilities and funds.
- Strengthening research – extension linkages is essential. Technology diffusion needs the involvement of non-governmental organisations and the private sector.
- The involvement of the industrial sector in supporting research projects will be required to enhance the sustainability of research.
- Reorientation of research is necessary, not only to avoid duplication but also to generate appropriate technologies for relevant field problems.

Research efforts to strengthen the medicinal and aromatic plant resource base are required. The following should be considered priority research areas, to be investigated immediately:
- Protocol development for resource assessment and quantification;
- Determination of sustainable harvesting limits for various medicinal plants (both from the wild and plantations);
- Development of protocols for the cultivation of priority species;
- Development of genetically superior clones and varieties (e.g. rich in active constituents);
- Finger printing technique for the identification of species;
- Determination of the economics of cultivation for priority species;
- Field demonstration models for technology transfer;
- Determination of the appropriate timing, low cost methods and equipment for harvesting;
- Standardisation of storage conditions for the retention of active principles and determination of active shelf life;
- Development of testing laboratories and protocols for quality control;
- Development of low cost processing, enhancing local value addition;
- Documentation of knowledge and patent awareness;
- Study market trends at regional, national and global levels, and develop a market information system;
- Development of pilot scale seed and seedling production facilities to improve the distribution of quality planting material.

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7 Collaboration between farmers, research institutions and industry: experiences of *Picrorhiza kurrooa* cultivation at Gheshe village in Chamoli district, Uttaranchal

M.C. Nautiyal and B.P. Nautiyal[30]

7.1 Introduction

Increasing demand for herbal medicines from modern pharmaceutical industry and growing faith in herbal based health care has led to tremendous interest in medicinal plants in the recent past. India possesses a large repository of medicinal plants and has a rich tradition of herbal medicine. The country has become a centre of attention because of its health care traditions and supply of raw plant material. It is estimated that the world demand for medicinal and aromatic plant products is growing at the rate of 7% per annum. If this trend continues it is expected that by 2005 India's export could reach Rs 5,000 crore.

In Uttaranchal approximately 500 medicinal plant species are being traded. Nearly 160 of these have been identified as threatened, and if these are not saved during the next five years, nearly 10% reduction in the present turnover can be expected. According to cumulative estimate, Uttaranchal has nearly Rs.1.5 billion (about US$ 30 million) per annum trade through the hidden market, as most species collected from the wild are protected, and there is no proper trade controlling authority. Our concern is therefore to conserve these plants in the wild and to identify means for their sustainable utilisation.

Uttaranchal has relatively little fertile land, with an average land holding of less than 4 nalis (0.08 ha.) per family. Its topography and environment could never sustain large industrial and agricultural set-ups because of the predominance of hilly terrain in the state. The medicinal and aromatic plant sector is, however, suited to the agro-climatic conditions of the state and can make a large contribution to its economy. The sector can generate employment and find substitutes for low yielding traditional crops.

Although the potential of medicinal and aromatic plants is widely recognised, only 20 species are under commercial cultivation in India. Nearly 90% of the medicinal plant raw material supplied to the market is harvested illegally from the wild, often in a destructive and irrational manner. In Uttaranchal, except for a few species that are grown in kitchen gardens, the cultivation of medicinal plants is not even in an initial stage. However, as the state wishes to be recognised as a herbal state, large-scale cultivation of wild, threatened

[30] High Altitude Plant Physiology Research Centre, H.N.B. Garhwal University, Srinagar Garhwal – 246174 (UA).

medicinal and aromatic plant species is needed urgently. Most of the population of Uttaranchal lives at middle to high altitude (1,000-2,500 m). Many of them are looking for alternative enterprises as their traditional crops are getting less productive. They earn little from growing cash crops like potato, and rajma, mainly because of high transport costs. Cultivation of medicinal plant species suitable for high altitudes could be an option. However for a number of reasons, which include lack of technology, this has not happened.

The High Altitude Plant Physiology Research Centre (HAPPRC) has been working on various aspects of high altitude medicinal plant species for the past two decades. It has developed cultivation technology for a number of species. Once cultivation technology for a species is available, it needs to be transferred to the field to be tested and subsequently supplied to interested farmers. This was the main objective of HAPPRC for initiating a scheme to promote the commercial cultivation of *Picrorhiza kurrooa* (Kutki) in the remote village of Gheshe in the Chamoli district of the Garhwal Himalaya.

7.2 Initial stage of HAPPRC's collaboration in Gheshe village

Gheshe village is spread over a large area (6-8 km in length) and individual families have relatively large holdings; a factor which eased the launching of the programme. The people's interest was immense. Most of the men are retired army personnel who are open to new ideas. Also, they are very worried about their future because of the remoteness of the area (the road head at Dewal is a 26 km long trek) and limited options.

HAPPRC's involvement with farmers in Gheshe began in the late 1990s. During 1998-99, the founder Director of HAPPRC, Prof. A.N. Purohit implemented a project promoting vegetable crops in a number of villages, at different altitudes, in the Pinder Valley of Chamoli district. During this exercise Captain K.S. Bisht, a retired army man from Gheshe village, came into contact with HAPPRC. After several meetings and discussions on the importance of high altitude medicinal plants, scientists from HAPPRC visited Gheshe village in June 2000 to make a general survey and meet the villagers. It was found that the climatic and soil conditions (especially soil moisture and organic content) were suitable for the cultivation of high altitude medicinal plant species. Encouraged by this, a second visit was made in September 2000. The purpose of this visit was to make the villagers aware of the potential of medicinal plants and demonstrate some preliminary techniques in the cultivation of selected species. During the demonstrations both men and women participated actively and showed a keen interest in the cultivation of medicinal plants. Convincing the villagers of the benefits of a cultivation programme, HAPPRC distributed seeds and seedlings of Kutki, Atis, Jatamansi, Kuth, Archa etc. free of cost to the farmers, and cultivation was initiated. This was done under the assurance that HAPPRC would provide technology and training to farmers and pay regular visits.

The people of the village were concerned about the economic returns of cultivating medicinal plants; this uncertainty stemmed from the large fluctuations in the price of their main cash crop, which is potato, during the previous years. This compelled HAPPRC to search for the possibility of a buy-back arrangement, easing the marketing of their medicinal plant crop. Ultimately an assurance could be given to the villagers that a buy-back agreement had been reached with a company. As a result the villagers, under the leadership of Capt. Keshar Singh, agreed to start the cultivation of Kutki *(Picrorhiza kurrooa)* and Kuth *(Saussurea lappa)*.

7.3 Main characteristics of Gheshe village

Gheshe village is located at an altitude of 2,200 to 2,500 meters. The main cash crop of the village is potato, and the annual yield is very good, i.e. nearly 30 quintals per acre. However, a uncertain market price and high cost of transportation, has led the farmers to look for more profitable alternatives. The cost of transportation is the major bottleneck in any agricultural activity in Gheshe. To illustrate this, take the case of potato. The average cost of transport from Gheshe to the Dewal road is Rs 200 per mule. As a mule carries a load of about 80 kg, the cost of transporting potatoes to the road is Rs. 2.50 per kilo. As the production cost is also reported to be about Rs. 2.50, the total cost to farmers works out to be Rs. 5 per kilo. As the wholesale price of potatoes is often Rs. 5 per kilo or less, the farmers' profit is nil. Since proper storage facilities are not available, farmers cannot store their harvest to fetch a better price off-season. Although some farmers bury their potatoes under ground, this only saves enough potatoes to be consumed later in the season. The low levels of profit, and high price fluctuations were the major reason for farmers to opt for more viable agricultural options.

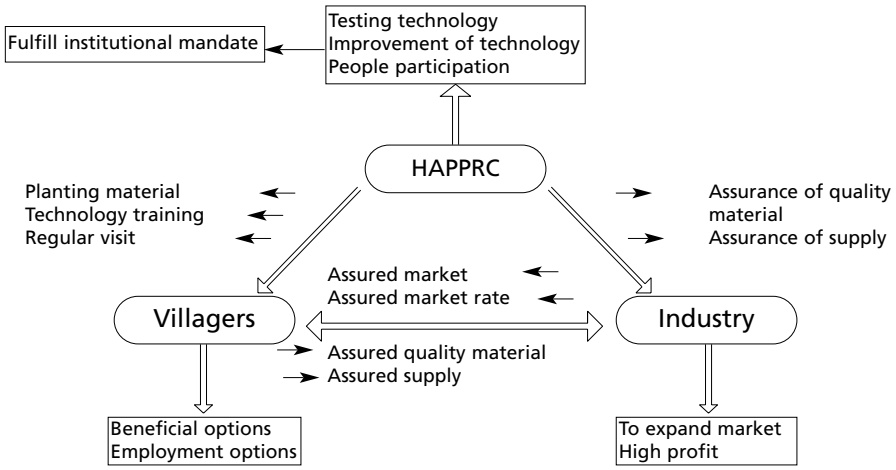
Gheshe village is surrounded by a rich and diversified wealth of medicinal plants, and its people are fully aware of the potential of this wealth. Yet the overriding issue was how to use this potential for the improvement of their livelihood, generation of extra income and self-employment. HAPPRC took this as an opportunity to test their medicinal plant technologies, make further improvements and encourage people's participation in its development programme. That is how the programme, one of the first attempts to develop large-scale cultivation of high altitude medicinal plants in India, was initiated.

7.4 The tripartite agreement

Both the farmers and HAPPRC were aware that the marketing of medicinal plants is beset with uncertainties. In order to estimate the demand for high altitude medicinal plant species, and to arrange for buy-back guarantees, a number of firms were contacted by HAPPRC. Perhaps because most of the important high altitude medicinal plants are banned species, the majority of the firms had reservations and only a few responded. One of the firms that showed interest was Dhawan International, a Delhi based firm. The firm was interested in the purchase of high altitude medicinal plant species including *Picrorhiza*

kurrooa (Kutki), *Aconitum heterophyllum* (Atis), *Nardostachys jatamansi* (Jatamansi) and *Swertia chirayita* (Chirayita). It was particularly interested in organically grown material. The proprietors of the firm visited the Centre where they were informed about the cultivation programme at Gheshe. They were told that in the first phase the villagers were willing to take up the cultivation of *P. kurrooa*, while other species could be included at a latter stage. Convinced that cultivation technology and expertise were available, and of the people's interest in the project, Dhawan International agreed to collaborate with HAPPRC through a Memorandum of Understanding (MoU), which was signed on April 22, 2002. Hereafter several meetings were organised between Dhawan International and the Gheshe villagers, the latter being represented by Capt. Keshar Singh Bisht and Capt. Harak Singh Bisht. This led to the signing of a tripartite agreement between HAPPRC, Dhawan International and the Gheshe villagers on August 9, 2002. This document laid the basis for the cultivation of the aforementioned species and the buy-back guarantee for the harvested produce (Figure 7.1).

Figure 7.1 Collaboration features for medicinal plant cultivation in Ghese cultivation



According to the agreement, the farmers are required to cultivate these crops organically. It was agreed that the company would buy the product from a minimum area of half an acre to a maximum of 50 hectares per growing season. The company will have exclusive rights to HAPPRC technology for these plants until cultivation increases to 50 hectares. HAPPRC will be free to transfer its technology to other companies when cultivation extends more than 50 hectares.

In return for the buy-back guarantee, growers are required to sell their production only to Dhawan International. The selling price will be determined with the help of a formulae, contained in the agreement. The price prevailing at the time of the agreement has been fixed as the minimum price. The selling

price will be determined by taking into account both the minimum price and the prevailing price one month before the time of delivery. It has been agreed that the difference between the minimum price and selling price will be shared equally between the industry and the farmers' society. This agreement gave lot of relief to the 32 farmers involved in the cultivation programme, as now they were sure of being able to market their produce, and at a reasonable price.

HAPPRC has assured the company that it will provide the best technological assistance to farmers to ensure a high quality product. As per agreement, in return for technical supervision and assistance to farmers, HAPPRC will charge Rs 6 per kg or 6% of the selling price (whichever is the highest). This fee will be jointly borne by the company and the farmers' society on a 50:50 basis.

Finally, the farmers' society will ensure that certain quality standards are met. These include:
- Dried root should contain at least 1% total Picrotin I and II (highest priority);
- The dried root supplied should have a maximum moisture content of 8%;
- Root size should be between 1 and 1.5 inch in length;
- No foreign matter such as soil, rodent hair, dust, stones, leaves etc. should be present.

The appearance and overall quality of the material will be tested by taking a representative sample from the harvest, in the presence of all parties. The sample will be tested and certified by HAPPRC. It is worth mentioning that at an earlier stage HAPPRC had already tested some samples for active ingredients. It was found that the quality was far better than described in the agreement.

There is a provision in the agreement that the farmers can ask for an advance from Dhawan International. However, during the entire course of cultivation at Gheshe the farmers have not taken any financial assistance from the company, relying totally on their own resources. When asked about this, farmers stressed that they preferred not to take any resources from anybody and to remain independent. Nevertheless, if the parties feel the necessity of acquiring funding for e.g. crop improvement, field operations, investments etc. they may separately or jointly approach a financial institution.

7.5 Consolidation of the scheme

As stated before, at Gheshe the average land holding of the farmers is far greater than in other villages. It was noticed that farmers generally have large pieces of barren and fringe areas near their agricultural fields, approximately 1 acre or more. HAPPRC experts suggested that these plots would be the best for cultivation of medicinal plants.

The selection of farmers was done neither by HAPPRC nor industry. The villagers decided themselves who would cultivate Kutki and how much in which area. In total 32 farmers signed the agreement, each indicating the area they

would dedicate to Kutki cultivation. In total an area of 5 hectares was designated for Kutki cultivation. The farmers registered a farmers' society *(Gheshe Kishan Samiti)* at Bhaisaj Sangh to acquire a permit for commercial cultivation of Kutki.

Out of the 32 farmers, 15 were selected for intensive training, organised by HAPPRC on the 23 and 24 September 2002. The training included visits to HAPPRC's nursery site at Pothivasa, which has been developed as a demonstration cum planting material site, and its alpine field station Tungnath. Farmers were enthused when they saw fields covered by full-bloom *Picrorhiza kurrooa* (Kutki), growing under climatic, topographic and soil conditions similar to their own.

Although many farmers were interested, a limitation of planting material meant that initially only five farmers could start cultivation. However, the next year the stock raised by these farmers was used to raise planting material for more farmers who wished to be engaged in the programme. Now the farmers are using the old stock to raise planting material for even more farmers and to cover a larger area.

In the beginning plant growth took a long time to pick up, as early establishment of the plant is very slow, even in nature (this is because of slow phenological progression). Also the initial lack of technical know-how hampered the farmers in optimising the crop's development. After proper training, the farmers were able to improve the situation (partly through manuring the fields) and the plants became well established, showing good growth during the next growing season and thus maintaining the interest of the farmers.

Farmers were not willing to take up the cultivation of medicinal plants as a substitute of their cash crops. They opted to grow medicinal plants as an additional crop on their fallow land. Preparing the land took time and slowed the establishment of the first plantation. At the same time, it seemed that farmers growing these crops were unable to pay full attention to them (reflected by the presence of weeds and low manuring rates), focusing more on their traditional crops. This will certainly decrease productivity. It is expected that this problem will automatically be reduced once the farmers get a good return from their first harvest.

Presently, nearly 4.5 hectares are under Kutki cultivation at Gheshe. Because the 32 farmers are growing it on fragmented areas, instead of on large plots, the cultivation looks patchy and fragmented. The density of the plants is a little lower than desired. Nevertheless, within the coming seasons, it is expected that the desired population will be achieved by thinning the stolons during harvesting.

The staff of HAPPRC is regularly monitoring the cultivation. The area is remote, so it has not been possible to visit the area frequently to provide direct, on-the-spot advice to the farmers. Nevertheless, the collaboration is going

smoothly, and so far no complaints have been made by any of the three parties involved. The first major harvest will be in October 2004 and only after this the level of satisfaction of the different partners can be assessed properly.

7.6 Expected benefit of the scheme to farmers, industry and HAPPRC

This collaboration is of mutual advantage to the three parties involved:
- Dhawan International will have assured access to a large quantity of high quality material;
- The farmers will have an assured market for their product, receiving a good price;
- HAPPRC will see its technology being used to the benefit of the farmers, which is the main objective of the Institute.

In order to calculate the expected economic benefits of medicinal plant cultivation for farmers, it is necessary to compare these with their traditional crops. Typically four seasonal cash crops are grown in Gheshe: potato, rajma, chaulai and palti (Ogal). According to the socio-economic survey of the village carried out by HAPPRC the production of chaulai and palti is 2 and 1 quintals per acre per annum, respectively. The selling price for chaulai is Rs 15 per kg, generating a gross income of Rs 3,000. Palti fetches Rs 20 per kg and a gross income of Rs 2,000. Considering the total cost of cultivation (Rs 1,800) including labour cost (10 days times Rs 80), manure cost (Rs 1,000) and maintenance cost, the net benefit is very low for both crops.

Table 7.1 gives a detailed analysis of the costs and benefits of producing Kutki as compared to potato and rajma. From these data it can be concluded that the cultivation of Kutki is expected to be far more profitable than potatoes and rajma. Note that with the growth of Kutki cultivation, farmers could also opt to sell planting material, which would fetch an even higher return.

7.7 Main lessons from the Gheshe experiment

The medicinal plant cultivation programme at Gheshe is the first of its kind in Uttaranchal. As the state government wishes to develop this state as a herbal state, such programmes can play a very useful role in developing the sector. Good economic returns are expected for the farmers cultivating the selected species. Once the farmers experience good returns from harvesting these medicinal plants, such a model will easily be replicated as more and more farmers will become interested in cultivating medicinal plants.

To continue the extension work for the promotion of medicinal plant cultivation, HAPPRC in collaboration with a NGO (Nature and People) have initiated cultivation of Kutki *(Picrorhiza kurrooa)* and Jatamansi *(Nardostachys jatamansi)* in the Barsu and Raithal villages of Uttarkashi district in Uttaranchal. The programme is funded by the World Wide Fund for Nature (WWF). In addition to providing training to villagers, HAPPRC has provided technical support and planting material. The Forest Department has assured

Table 7.1 Comparative cost-benefit analysis (per acre basis) of traditional cash crops (potato, ajma) and Kutki cultivation (after three years production) at Gheshe[31]

Crop	Cost of cultivation (in Rs)		Market price (Rs/kg)	Yield	Gross income (Rs)	Net profit (Rs)
1 Potato	Seed cost	1,800	5	90 qts	45,000	12,600
	Labour cost	3,600				
	Manure cost	3,000				
	Maintenance cost	1,500				
	Transport cost	22,500				
	Total cost	**32,400**				
2 Rajma	Seed cost	1,875	25	6 qts	15,000	5,325
	Labour cost	3,000				
	Manure cost	3,000				
	Maintenance cost	1,500				
	Transport cost	300				
	Total cost	**9,675**				
3 Kutki	Seed cost	2,591	250	4.42 qts	110,500	88,284
	Field preparation cost	8,000				
	Manure cost	4,500				
	Maintenance cost	5,000				
	Harvesting/packing	1,000				
	Transport cost	1,125				
	Total cost	**22,216**				

the farmers that it will provide registration, certification and other assistance. Demonstration in farmers' fields began in August 2003. Once the viability of cultivation is established efforts to establish links with companies will be made.

HAPPRC managed to distribute planting material, arrange field visits, conduct surveys, provide regular monitoring and run training programmes, using its own limited resources. These efforts are self-motivated and the institute failed to get any financial assistance or other kind of support from other institutes or government departments. Since HAPPRC is a research cum educational institute with limited resources, it is not possible to arrange or initiate similar efforts in many places. The Institute, as mentioned earlier, has technology viable for Uttaranchal farmers and is willing to transfer it, but its facilities and infrastructure need strengthening.

[31] Kutki calculations as per Nautiyal *et al* (2001) taking the present market rate of Rs 250/kg. Kutki data are from low altitude area and from a few farmers only, who experienced very different results. The figures given here are the averages. Data for potato and rajma are on the basis of a socio-economic survey done by HAPPRC.

7.8 Conclusions

1. The success of cultivation programmes such as in Gheshe depends mainly on the awareness and interest of the villagers, supportive government policies, an assured market and profitable price levels, access to simple and appropriate technical inputs (e.g. planting material, technology), know-how and training.
2. The ex-soldiers of Gheshe were greatly concerned about the development of their area and it led them to choose the cultivation of medicinal plants to augment their income. They were the pioneers and driving force in the implementation of the programme.
3. The interest of the company, Dhawan International, was instrumental in the success of the programme.
4. In the initial stage of this programme farmers expressed doubts about the economic benefits of cultivating medicinal plants. Villagers also hesitated to adopt the cultivation of medicinal plants as a substitute for their cash crops. Such constraints will automatically be overcome once the villagers get returns from the cultivation of these crops.
5. The experience of commercial cultivation of Kutki at Gheshe is satisfactory so far. Since the harvesting is expected during 2004, only then the overall degree of success can be determined.
9. The topographic and climatic situation of Gheshe prevails in many high altitude areas in Uttaranchal and such a programme can be replicated in these areas. Governmental agencies should support such programmes and strengthen the existing institutions working in this field.

8 Summary of presentation Dabur India Ltd.: technical, legal and commercial issues in the medicinal plant trade

N.B. Brindavanam[32]

8.1 Introduction

During the last few decades, two diametrically opposing phenomena have co-existed uneasily. On the one hand there has been growing enthusiasm for "all natural" health care and other natural lifestyle products, leading to an increased demand for natural ingredients. On the other, there has been a growing awareness of and attention to ecological conservation. A balance between these two requirements could result in a "sustainable utilisation" of medicinal plants. However, while it might be relatively easy to define "sustainable utilisation" strenuous action will be needed to reconcile this conflict.

In India, the *Ayurvedic*, Siddha and Unani pharmaceutical industries have depended upon natural sources for medicinal plants – collection from the wild – so they are often regarded with suspicion when it comes to conservation and sustainable development. In particular the following issues have often been cited:
- Allegedly, the present practice of harvesting forest produce has been reckless enough to deplete natural flora in a clearly visible manner;
- Trade practices have been insensitive to the primary needs of the communities who have the rights over these natural resources.

While there is some truth in these perceptions, it is important to look at some of the main issues as seen by the industry.

8.2 Technical issues

Classical Ayurveda pharmaceutics, as propounded in ancient textbooks, describe multi-herbal formulations. The herbal constituents of these products normally exceed five, and sometimes even seventy in number. Ayurveda uses many herbs with similar therapeutic effects in one formulation. The concentration of each herb is small and decreases with the increase in the number of components. As a consequence, there is an inherent care for nature. Instead of bringing excessive pressure to bear on any particular species, this is

[32] Technical Manager (CPPD), Dabur India Limited, Kaushambi, Sahibabad – 201 010.

[33] For example, the formulation of the popular Ayurvedic health product Chyawanprash contains over 40 ingredients. Scientific studies indicate that its efficacy can be concentrated in only 6 of its ingredients. If this were to be done the prevailing demand for these plant species would take a steep rise, while the rest would remain unutilised.

evenly distributed among many species.[33] The genera of each geographical zone are utilised in small proportions. This practice plays a vital role in minimising the demand on any particular plant species, avoiding any species being brought to the verge of extinction.

Once this care is suggested in a treatise, strict use of all constituents becomes a matter of rule, without exception. The principal concept is that a product's efficacy is reduced if any prescribed ingredient is not added to the formulation. This means that if, for example, a classical formula includes an endangered species such as Kuth *(Saussurea lappa)* in small concentration, then its use is mandatory to maintain the therapeutic efficacy of that particular product. A legal ban on the collection of Kuth would mean that production of the formulation comes to a halt.

The prescribed part of the plant is also a critical factor. Often harvesting can only be destructive; for instance when underground parts or barks are required. Few attempts to replace them with renewable plant parts like leaves or flowers have been unsuccessful.[34]

8.3 Legal issues

Under the existing legal framework in India a manufacturer of herbal drugs must abide by the rules of the Drugs and Cosmetics Act. While formulating these rules, Governmental agencies have been insensitive to the effect of environmental legislation on the manufacturer. For example, when forest and wildlife legislation bans the use of a particular plant species, the licensing terms and conditions under the Drugs and Cosmetic Act mean that no modification in the licensed formulation will be accepted. As a result, the use of a banned species cannot be avoided if the product is to remain on the market. In addition, in its current form the Drugs and Cosmetics Act does not allow the substitution of prescribed plant parts. The formulation must simply conform to the basic requirements as envisaged in the ancient treatise. The manufacturer does not have the freedom to choose any alternative parts of the plant, even if there is adequate scientific and statutory justification.

Similarly, the Forest Conservation lawmakers do not take into account the fact that *Ayurvedic* medicines need minor forest produce. The laws are known to respond to emotional demands rather than basic realities. For example, one of the wildlife rules stipulates that "prior permission is required to cultivate any of the listed endangered plant species" but fails to define the authority empowered to issue such permission. The laws often complicate procedures instead of ensuring a smooth supply of medicinal plants, including endangered species, through cultivation.

[34] For instance, the barks of Ashoka *(Saraca indica)* and Arjuna *(Terminalia arjuna)* are used for uterotonic and cardioprotective activities, respectively. Research proved that substituting the bark with renewable parts (such as leaves and/or twigs) failed to generate a sufficient degree of therapeutic efficacy.

The prevailing forest management laws also fail to allocate forest wealth to the dependent communities. In addition, the new biodiversity law is unclear what "sustainable utilisation of natural resources" means in practice. It could become an impediment to accessing natural resources, even to the rightful communities.

In a nutshell, legislation fails to deal with the diverse interests at stake.

8.4 Commercial issues

Compared to other industries in the country, the *Ayurvedic* pharmaceutical industry does not have a large turnover. There are more than 9,000 *Ayurvedic* companies established in the country, but their combined annual turnover is only around Rs. 4,200 Crores (US$ 900 million).

The business practices adopted by this industry make it difficult to have syndicated data on demands for various medicinal plants. Given the legal framework under which the segment operates, it obviously uses large numbers of raw materials in small proportions.[35] According to available information, only 60 of the 436 plant species in use are demanded in high volume by the larger companies. A company such as Dabur annually procures raw material of about Rs. 5,000 million in value (about US$ 100 million). This involves over 3,000 commodities of which the major are: vegetable oils, sugar and jaggery (amounting to approximately 60% of costs); herbal components (mainly green Amla, at a value of 10 Crores); spices (10 Crores); saffron (5 Crores) and other dry, crude herbs (10 Crores). Providing an example of the input requirements of one formulation: Chyawanprash requires 47 ingredients, of which the main constituents are sugar and lipophilized Amla pulp. The estimated output of Chyawanprash from various manufacturers amounts to 31,350 MT, for which 60% of the volume is derived from sugar. Around 25% is pulp of Amla treated in a lipid medium, and close to 30% is moisture content. The rest of the composition represents small concentrations of other herbs (for example *pistacia integerrima*, *picrorrhiza kurroa*, *glycerrhiza glabra*, *withania somnifera*, *asparagus racemosus*, *adathoda vasica*, *solanum xanthocarpum*, *solanum indicum*, *curcuma zedoaria*, *martynia diandra)* and a few powered herbs. Thus, it is obvious that the industry's demand for medicinal plants is not as high as presumed in some cases.

Cultivation of the aforementioned 60 species is often suggested to industry as a possible solution for sustainable utilisation. Yet given the small demand for most medicinal plant species, the economic viability of many cultivation projects is doubtful. In general the *Ayurvedic* industry needs small volumes of a large number of species. When the demanded volume is large, for example in

[35] Note that Ayurvedic industries use close to 450 plant species. Besides medicinal plants the industry requires also minerals, metals, animal derivatives and items of marine origin as inputs. Put together, these inputs give rise to over 600 classical Ayurvedic medicines and over 2,000 proprietary formulations currently available in the market.

the case of Chirayata *(Swertia chirayta)* the landholding required to supply the material is beyond reach of individual farmers, as well as medium sized pharmaceutical companies.[36] This applies to many of the plant species used by the industry today.

Nevertheless, currently the industry is already buying 17 to 20 species solely from cultivated sources. This has been economically viable because of the multiplicity of applications (other than medicinal uses, as in the case of spices and aromatic plants) of these botanical species. Where it is economically viable, cultivation projects have succeeded. For example, Ashwagandha *(withania somnifera)* cultivation started about 20 years ago in the state of Rajasthan. Nowadays, the crop provides communities in and around the Nagaur district with meaningful returns, and the industry is highly satisfied with the consistent quality they get at a reasonable and stable price. In Nepal, Dabur has developed a successful contract-farming scheme with farmers cultivating *taxus baccata*. At the moment, Dabur is self-sufficient for this plant species. Other recent contract farming projects involve Shatavari and Chirayata in Nepal. Projects have been initiated to grow Pippali in Andhra Pradesh through an inter-cropping mechanism. Projects for the cultivation of Kutki, Revandchni and Guggulu are in their infancy. Again, such initiatives would not be practical for all of the 60 most procured species.

8.5 Conclusions and recommendations

An essential prerequisite for any successful initiative promoting a sustainable medicinal plant sector is to accept the existing technical, legal and commercial realities. Below, some measures are suggested which could ensure a sustainable usage of Uttaranchal's medicinal and aromatic plants:

- Inventorisation. There is an urgent need to quantify the existing stocks in the wild, especially for the 60 most demanded species; specific focus should be put on the 20 which are indigenous to Uttaranchal. This is necessary to assess the demand-supply gaps for each species.

- Consolidation of Joint Forest Management programmes. The Joint Forest Management and forest extension programmes need to include minor forest products such as medicinal plants. Planting material could be distributed to Joint Forest Management groups, to be planted in forest areas.

- Inclusion of a business dimension in Joint Forest Management schemes. In their current format Joint Forest Management schemes do not focus

[36] The estimated national demand for Chirayata *(Swertia chirayta)* is about 150 MT per annum dry plant; this translates into 800 MT of fresh crop. An average *Ayurvedic* company would require 2 to 3 MT per annum while many of the others buy it, yet in kilograms. While the plant attracts a remunerative price today, the prospects for its commercial cultivation are greatly nullified by the altitudes at which the plant is grown and for economic considerations.

sufficiently on business activities; e.g. the promotion of entrepreneurial skills and assistance to building effective commercial farmer organisations (as potential partners in buy-back arrangements) is required.

- Optimal use of cultivated and wild sources. The cultivation of medicinal plants can be considered as an option in intercropping systems. Where cultivation is thought to be not viable, Joint Forest Management schemes could include the planting of medicinal plant species in forest areas.

- Periodical reviews of forest policies. The present stock taking of timber and fuel wood species should be extended to inventories of medicinal and aromatic plants.

9 Summary of presentation Weleda Ltd. Germany: international dimensions of the medicinal plant sector: Weleda's perspective

Bas Schneiders[37]

9.1 Introduction

In 1921 WELEDA Ltd. was founded in Switzerland by Rudolf Steiner, philosopher, and Ita Wegmann, physician. Based on an anthroposophic philosophy of humanity and nature, the company produces homeopathic and anthroposophic medicines and natural body care products. Weleda's head and central procurement offices are located in Southern Germany. Weleda has branches all over Europe, as well as in Canada, USA, Latin America (Peru, Brazil, Chile, Argentina), Africa (South Africa) and Asia (Japan, New Zealand, Taiwan). The German branch currently employs 640 people. Its turnover was 90 million Euro in 2002 (up from 60 million in 1997)[38], of which around 40% is medicine, and 60% health care products (in 1997 this proportion was 50-50). Weleda's main products lines are:

- medicines;
- "over-the-counter" products, including bath products, elixers;
- dietetics;
- body care products and natural cosmetics (including baby and child care, skin care, body oils, body lotions, hair care, leg and foot care, deodorants, shaving creams, tooth care).

Below some essential quality criteria and sourcing policies are discussed which could be of relevance for Uttaranchal producers, processors and potential exporters.

9.2 Quality criteria

The leading concept of Weleda is that living processes within our organism are closely related to processes in nature; forces of the body, soul, and spirit in each of us interact intensively – with each other, and with the environment. Based on this insight Weleda has developed care products with natural active ingredients, including essential oils, absolutes, resinoids, plant extracts etc. Weleda uses about 650 different raw materials. Around 60 of these raw materials constitute 80% of the total volume (60% of total value); herbs represent only a very small portion. The ingredients:

- are grown in a biodynamic and organic way;
- do not contain artificial fragrances, colours, or preservatives;

[37] International Sourcing, Weleda Ltd., Germany.

[38] Weleda's worldwide turnover is around 200 million Euro.

- are not based on mineral oils;
- do not include any Genetically Modified (GMO) elements.

All Weleda's products are produced following stringent requirements such as:
- strict pharmaceutical standards;[39]
- no testing on animals;
- traceability of origin of all the used ingredients;
- ingredients derived from sustainable sources.

It must be stressed that at Weleda, production is not simply a mechanical procedure. We process and combine raw materials according to holistic criteria, to maintain the original life force of the plants.

Weleda's business approach is characterised by working in a transparent and sustainable way, with all its partners involved, integrating elements related to ecology, social criteria (e.g. fair trade principles) and economics. These guidelines provide the fundamental principals for its sourcing policy, which is discussed in the following section.

9.3 Sourcing policy

The leading principle in Weleda's procurement of its ingredients – natural raw materials – is that it must be linked to long-term sustainable resources. This is done through:
- own production gardens (Weleda owns approximately 40 ha biodynamic gardens in different locations, mainly in Europe);
- contract growing (long-term contract farming arrangements, mainly in Europe);
- special projects (for instance involving rose production in Turkey, rathania in Peru[40]);
- trade (procurement through the open market).

Most of the fresh plant material (around 180 species) is supplied by own gardens cum cultivation plots. Dried herbs (around 100 species) are supplied through contract arrangements. In volume and value, fatty oils and essentials oils are the most important ingredients.[41]

In order to meet customer expectations and translate its business philosophy into practice, the company is looking to:

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[39] Including Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP) and Food and Drug Agency (FDA) standards.

[40] These are five year projects involving plantations and small-scale farmers. Some activities are sponsored by outside agencies such as the German Agency for Development Cooperation, GTZ. Rathania (used in toothpaste) is an endangered species, often collected illegally from the wild. The project combines sustainable collection activities with cultivation efforts.

[41] Here lies the potential for Uttaranchal; the production of aromatic plants and the processing and subsequent export of essential oils.

- find long-term partnerships in sourcing;
- dramatically increase the share of biodynamic and organic material;
- develop and implement a fair trade policy;
- fully endorse international wildlife and plant material regulations (i.e. CITES);[42]
- implement a system of efficient, centralized buying.

It is noted that European regulations have recently become especially strict in relation to the quality of medicines, including the components they are made from. Obtaining the required permit is a very costly affair, which often only the larger players in the market can afford. It has to be stressed that exporters must inform themselves properly of the latest European regulations when planning to set-up an export business.[43]

Weleda's acquisition of medicinal and aromatic plants and oils is direct from the producer or processor in the country of origin. It aims to acquire all its raw material supply directly from the source. Traceability is required, providing answers to "what comes from where?" and "is it produced in the right manner?" Only 100% pure and natural material is purchased. Currently, identification of purely organic sources of lavender, rosemary, peppermint, jasmine, geranium, and rose is ongoing.

Weleda invites all Indian producers and processors to cooperate with the company by setting up organic and biodynamic projects that will generate high quality, reasonably priced ingredients. Weleda can guarantee it will buy the produce, and can offer professional support for specific technical areas. The ultimate aim is to develop long term partnerships.

[42] Weleda is co-operating with organisations such as the World Wildlife Fund (WWF) and TRAFFIC.

[43] Producers and processors should never depend solely on exports. In order to spread the risks, national markets should be explored as well.

10 Conclusions

10.1 Introduction

The presentation of the papers was followed by a discussion of predominant issues related to the development of the medicinal plant chain in Uttaranchal. The session focussed on the difficulties and opportunities facing the medicinal plant chain and what could be done to enhance its sustainable development. The most heavily debated topics were: policy measures and their enforcement, appropriate research and technology development, effective market and communication linkages among chain actors, sustainable conservation practices, and the feasibility of cultivation. A short summary of the discussion is given below.

10.2 Discussion

a. A new medicinal plant policy for Uttaranchal:
   - The main objectives of Uttaranchal's policy are to promote both the conservation and cultivation of medicinal plants. In the past, the implementation of the policy has not been very effective, and the excessive and illegal collection of medicinal plants and other valuable species has continued. This has partly been because a large number of agencies were given the responsibility to implement the policy, with no clear definition of roles. Now, new policies are being prepared. Some participants raised doubts about the effectiveness of any new policy that continues to rely on agencies, such as the Forest Department, that have not performed well in the past.
   - Government agencies are not suited to perform marketing activities, and therefore, the decision to make the Forest Development Corporation responsible for marketing medicinal plants may not help the sector. This should be left to the private sector. Government agencies should create the enabling environment in which the sector can prosper, focusing for instance on proper legislation and its enforcement, providing relevant infrastructure, market information and technology support to collectors and cultivators.
   - While government policies and plans look good on paper they are not fully implemented. This point was raised particularly strongly by farmers and NGO representatives. Doubts were raised about the capacity of some agencies to perform the tasks given to them.

- Currently, most of the governmental expenditure on health care involves allopathic medicine. It was suggested that a substantial proportion of the governmental health budget should be spent on supporting traditional systems of medicine. This would value the place these systems play in existing health care practices.
- The cost of cultivation of medicinal plants is often higher than the cost of collection. This puts the cultivators at a disadvantage. The farmers engage in an expensive, long-term investment and bear considerable risks. Some of the participants felt that in order to compete with the collectors, farmers need monetary support from the government, at least in the initial stages of cultivation. However, others, including government officials, stressed that government intervention could distort the market and generally do more harm than good. In the past many government schemes to promote new crops, such as horticulture, failed because the governmental agencies did not understand the commercial and market conditions while farmers were primarily interested in availing themselves of subsidies and other financial incentives from the government.

b. Conservation and local communities:
   - It would be difficult, if not totally impossible, to conserve medicinal plants without the involvement of local people. Any intervention should take into account that conservation is closely linked to the livelihood options available to local communities. In order to be effective, any conservation strategy must involve these communities, and provide income generation opportunities to them. As users of local medicinal plant material, local communities are a valuable source of knowledge on any issue related to these plants. This should not be ignored.
   - The medicinal plant policy needs to appreciate fully the importance of the traditional knowledge and practices followed by local communities. They should also recognise that the community's control of its forest resources (such as Van Panchayats areas) plays a vital role in the conservation of medicinal plants and associated traditional knowledge. In-situ conservation, where local communities maintain biodiversity of certain species in their fields or forests, should be intensively encouraged by NGOs, policy makers, researchers etc.

c. Technology development and diffusion:
   - The selection of species to be cultivated should be driven by commercial potential and not by environmental threat alone.
   - Cultivation technology for a number of commercially important species is yet to be developed. Efforts to develop these technologies need to be accelerated.
   - While a number of research institutes are working on medicinal plants in Uttaranchal, their contribution to technology development has been limited. A great deal of work is duplicated, which diminishes the efficiency of research efforts. There is a need for greater coordination of technology development and diffusion efforts.

- So far, little information is available on which species can be planted successfully under different, specific ecological conditions. At the same time, few cultivation practices have been identified that have been proved to work in practice in farmers' fields.
- The lack of suitable, quality planting material is a major problem for those farmers ready to take up the cultivation of medicinal plants.

d. The potential of aromatic plants:
   - Currently adequate attention is not given to the cultivation, processing and trade of aromatic plants. According to industry representatives, the demand for these plants is substantially greater than the demand for medicinal plants. Also, the trade in aromatic plants is not constrained by national or international legal restrictions and complex standards. Moreover, information is widely available on suitable cultivation practices, and facilities to process essential oils are common. As these plants have the potential to provide significant income and employment opportunities, this chain should be given equal importance with medicinal plants.

e. Market information:
   - Close to no market research has been done to assess the demand for medicinal plants. As a consequence, reliable information on the commercial viability of various species is not available. The projections produced by governmental agencies are often overoptimistic. The farmers take decisions to cultivate species on the basis of this information and suffer losses. Information is relatively difficult to obtain because of the illegal character of a large part of the trade.
   - Demand projections need to be realistic, for instance taking into account the fact that cheaper substitutes and new technologies are being developed continuously. In recent years new techniques have been developed which enable companies to extract active ingredients from more sources and more efficiently. They require smaller quantities of biomass in order to extract the same amount of active ingredient.
   - The potential of national versus international markets was also discussed. While the latter offer higher prices, exporters are required to meet strict quality standards and complicated import procedures, which require large investment. The development of exports needs accurate, up-to-date information on how to access global markets.

f. Income and employment generation:
   - It is important to increase the incomes received by primary collectors and cultivators. It was strongly felt that cultivated and sustainably collected material should receive a premium. It was also stressed that collectors and cultivators are totally different groups of people. The former are often landless families and for them cultivation does not provide a meaningful livelihood alternative to collection.
   - Plant material could be processed locally, creating value addition and employment. It is, however, important that industry is involved in the

setting up and operation of these facilities. It was stressed that processing needs to be in line with the demands of the end market, be it global, national or local.

g. Linkages among the chain actors:
   - As linkages between the various actors associated with the medicinal plant chain are weak, there is little flow of information between them. It was suggested that regular interaction should be organised to build these linkages. The newly created Uttaranchal Medicinal Plant Board and the Herbal Research Development Institute could take a lead in this.

10.3 Follow-up action

Based on the discussions, a number of follow-up actions were suggested by the participants. Among others, these included:
- Steps to strengthen linkages between various actors in the chain should be taken urgently.
- Reliable information on policy, technology, market opportunities and prices should be made available to the chain actors, especially to collectors and farmers. For instance, farmers require reliable, up-to-date information on prices, where to sell their produce, how to get a permit and which technology to use for which plant in which area.
- Efforts to develop practical cultivation technologies for selected species should be accelerated. Quality improvement of the final product is among the highest priorities.
- Research efforts should be better coordinated. In order to diffuse technology more effectively, farmers should participate in the research, for instance through researcher-supported, farmer-managed demonstration plots.
- The shortage of good quality planting material for promising species is a bottleneck in the expansion of cultivation activities. The private sector and NGOs should be encouraged to set up nurseries to propagate high quality planting material and market it to farmers.
- The private sector should be encouraged to set up processing facilities in areas where medicinal plants are collected or cultivated. This is necessary to create additional income and employment opportunities for the local people.
- Uttaranchal should take steps to promote the organic cultivation of medicinal plants. The state should build a name as being a supplier of high quality and unique medicinal plant material.

The consultation was the first interactive event where stakeholders in the medicinal plant chain in Uttaranchal could meet, get to know each other, discuss salient features in an open manner, brainstorm and plan joint action to make the sector prosper. Successful, coordinated market chains that create benefits for its actors are however not build overnight. This is a complex matter involving a number of issues, including the inevitable conflict of interests among chain actors, the time required to search for common interests concerning and linking all chain actors, the lack of information, lack of resources, the changing environment in which the chain operates (be it national or international policies,

technology or markets) and the time required to experiment with what works and what does not. More consultation is needed to identify those "win-win" situations that supersede individual interests. Preferably this should be facilitated by a knowledgeable, relatively neutral party with ample experience in guiding such consultations towards meaningful, genuinely supported consensus and action. The potential is very large since many enthusiastic people, including farmers, researchers, policy makers, medical practitioners, traders, and consumers are anxious to see the removal of the major impediments affecting the chain, strongly believing that Uttaranchal can benefit significantly from "the healthy enterprise".

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Appendix 1 List of participants

Government officials

1. Dr. R.S. Tolia, Chief Secretary, Government of Uttaranchal, Dehradun
2. Ms. Dr. Vibha Puri Das, Principal Secretary, Government of Uttaranchal, Dehradun
3. Prof. A.N. Purohit, Bhartia Chair for the Conservation of Medicinal Plants, Dehradun

Researchers

4. Dr. J.S. Rawat, Director, Herbal Research and Development Institute (HRDI), Gopeshwar
5. Dr. M.C. Nautiyal, Scientist, High Altitude Plant Physiology Research Centre (HAPPRC), Srinagar
6. Dr. B.P. Nautiyal, Scientist, HAPPRC, Srinagar
7. Dr. C.P. Kala, Researcher, G.B. Pant Institute of Himalayan Environment and Development, Kosi
8. Dr. Anil Dimri, Indira Ghandi National Open University Maidangrhi, New Delhi
9. Mr. Subash Metha, Advisor, Food and Agriculture Organisation (FAO) India, Bangalore

NGO representatives

10. Ms. Sonali Bisht, Institute of Himalayan Environmental Research and Education (INHERE), Almora
11. Mr. Emmanual Theophilus, Project Director Himalaya Region, Foundation for Ecological Security (FES), Munsyari
12. Dr. G.G. Gangadharan, Joint Director, Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore
13. Dr. Madhav Karki, Regional Programme Coordinator, International Development Research Centre (IDRC), New Delhi

Industry

14. Mr. Bas Schneiders, International Sourcing, Weleda Ltd., Germany
15. Mr. Vikas Dhawan, Dhawan International, New Delhi
16. Mr. N. Brindavanam, Technical Manager Ayurveda, Dabur Ltd., New Delhi
17. Mr. Hemant Kumar, Arcadia Tea Estate, Dehradun
18. Mr. Ranjit Lall, Independent Consultant in Organic Produce, Dehradun

Farmers

19. Ms. Malika Virdi, Munsyari
20. Mr. Birender Singh Rawat, Nandapryag
21. Mr Captain Keshar Singh Bisht, Gheshe
22. Mr. Captian Harak Singh Bisht, Gheshe
23. Mr. Sudarshan Singh Kathait, Ramni

Organisers

24. Dr. Ghayur Alam, Centre for Sustainable Development (CSD), Dehradun
25. Ms Pallavi Shukla, CSD, Dehradun
26. Ms. Petra van de Kop, Royal Tropical Institute (KIT), Amsterdam
27. Ms. Cathelijne van Melle, KIT, Amsterdam
28. Mr. John Belt, KIT, Amsterdam

Appendix 2 Workshop programme

30-31 October 2003, Hotel Ajanta International, Dehradun, India

OCTOBER 30, 2003

09:00-10:00 Registration

10:00-10:30 Inaugural session

Welcome address

Keynote address: Dr. R.S. Tolia, Chief Secretary, Government of Uttaranchal

10:40-10:45 Tea break

10:45-11:45[44] Session I Chair: Ms. Vibha Puri Das
Medicinal plants sector in Uttaranchal: findings of a recent study
Ghayur Alam and John Belt

11.45-12:45 Session II Chair: Ms. Vibha Puri Das
Overview of state policies, plans and interventions to the promote medicinal plant sector in Uttaranchal
A.N. Purohit

12:45-14:30 Lunch

14:30-15:30 Session III Chair: Dr. G.S. Rawat
Policy and Institutional Reforms in the Medicinal Plant Sector in Uttaranchal: Lessons from an IDRC Study
Madhav Karki

15:30-15:45 Tea break

15:45-16:45 Session IV Chair: Dr. G.S. Rawat
Wild plants as resource: new opportunities or last resort? Some dimensions of the collection, cultivation and trade of medicinal plants in the Gori Basin
Malika Virdi

[44] Note that each session contains 20 minutes presentation and 40 minutes discussion.

16:45-17:45 Session V Chair: Dr. G.S. Rawat
Medicinal plants trade in India: a macro view with a focus on medicinal plants of Uttaranchal
G.G. Gangadharan

19:30-22:00 Cocktail and dinner
Location: Hotel Ajanta Continental

OCTOBER 31, 2003

9:30-10:30 Session VI Chair: Mr. Ranjit Lall
Technical, legal and commercial issues in the MAP trading from a domestic buyer's perspective
N.B. Brindavanam

10:30-11:30 Session VII Chair: Mr. Ranjit Lall
International industry: the perspective from Weleda – Germany
Bas Schneiders

11:30-11:45 Tea break

11:45-12:45 Session VIII Chair: Dr. Madhav Karki
Research and technological implications for sustainable development of medicinal and aromatic plants in Uttaranchal
J.S. Rawat and Manisha Upadhyay

12:45-13:45 Session IX Chair: Ms. Malika Virdi
Collaboration between farmers, research institutions and industry: experiences of *Picrorhiza kurrooa* cultivation at Gheshe village in Chamoli district, Uttaranchal
M.C. Nautiyal and B.P. Nautiyal

Industry's perspective of the Ghese experiment
Comments by Vikas Dhawan

Farmers' perspective of the Gheshe experiment
Comments by Captain Kesar Singh Bisht

13:45-14:30 Lunch

14:30-18:00 Plenary discussion Chair: Dr. R.S. Tolia
Moderator: A.N. Purohit

18:00 Vote of thanks and closure

Appendix 3 Proposed policy for Uttaranchal: policy draft under consideration[45]

Policy statement

The objective Uttaranchal Medicinal and Aromatic Plant Policy would thus be: "To maximise the benefits of protection and production of medicinal and aromatic plants, which so far form the part of wild flora, from the region by forging an alliance between conservation, cultivation and commercialisation and ensuring effective ban on illicit trade of these plants from Uttaranchal."

Goals of UMAP policy

To obtain long-lasting benefits from national and international trade by becoming the value-added supplier of medicinal and aromatic plant and plant products with authenticated material of known characteristics, taxonomic sophistication and high assurance of regular supply.

Strategy to implement the policy

The goals of UMAP are to be achieved by following actions:

1. A separate board for medicinal and aromatic plants has been formed.

2. Actions for addressing the obstructive regulatory mechanisms, which has impact on the supply of raw material are:
   i. Populations of scarce plants would be identified, and genetic material preserved appropriately using resource protection, and the establishment of gene banks conserving the diversity in genetic material from various localities. These will be designated as MAP Conservation Areas. No harvest will be allowed from MAP Conservation Areas. These will serve as gene banks. From out side the Conservation Areas, harvest from the wild will be undertaken only by Forest Development Corporation to insure sustainable harvest.
   ii. To allow the farmers to grow high value species, which otherwise come under restricted category, and to prevent the possibility of illicit collection of these from the forests, a system similar to the one in use to monitor the production of opium in the country would be adopted. Under this system, growers will be registered by an authority, which controls

[45] Policy Draft under Consideration: taken from Prof. Purohit's paper, see Chapter 3.

the supply of seed/planting stock. Registered growers would be given requisite seed for the area proposed to be cultivated and the expected output would be worked out on the basis of norms. If the farmer fails to hand over the expected output, an investigation would be carried out to determine if there has been any diversion of the produce to the illegal market. Such a certification of produce would be assigned to the Board or any authority nominated for the purpose, which will designate a group of experts to do the job. The experts group would include a plant taxonomist, an agro-technologist, a forest official and revenue official from the area where the certification has to be done. For other species, farmers will be free to grow and market them. However, at the time of marketing, they will have to produce a certificate from the Board or its nominated authority that the produce is cultivated one.

iii. A Central Marketing Organisation would be set-up for the plants, which come under restricted category, to ensure trouble-free and adequate supply of such plants required by consumers. Other species, if cultivated, would be sold in the open market by the growers.

3. Actions for promoting the cultivation of medicinal plants would include:
   i. Information dissemination regarding values and opportunities;
   ii. Demonstration of management and harvesting techniques in different habitats;
   iii. Provision of ongoing technical expertise to farmers in management, harvesting and marketing of plants through an extensive extension programme;
   iv. Provision of source materials, including seeds and cuttings, for enrichment planting;
   v. The development of economic models for estimating returns on wild plant farming;
   vi. The traders' demand for bark products would be coordinated with logging operations in forests by forest department;

   These activities will be undertaken by an Institute/organisation identified by the Board or its nominated authority.

4. Actions to reduce the problem of land for cultivation and conservation of location specific gene-pool:
   i. If difficulty is experienced in locating appropriate land in a compact area, community lands, including unutilised government land and land available with the village community, viz., Gaon Sabha or *Van Panchayat* land, would be used to start the cultivation programme. However, wherever the choice is available, farmers' fields would be preferred over community or government land for commercial cultivation.
   ii. Forest lands, other than *Panchayat* Forests, will be earmarked as MAP conservation areas or multiplication areas for location specific species and inclusion of the same in all working plans of all forest divisions in the State.

5. Actions for the optimal use of existing expertise in plant cultivation, processing and marketing are:
   i. Establish a directory of individuals with appropriate expertise and services.
   ii. Develop a networking system between potential suppliers and the market players. A funding system would be established to facilitate the transfer of expertise to poorly resourced market players.
   iii. Identify and access appropriate international expertise and case studies with potential for contributing to the situation in this State.
   iv. Build on the expertise of institutions that have already developed extensive knowledge in production, cultivation, processing and marketing.

   These net-working activities will be the responsibility of any institute/ organisation identified by the Board or its nominated authority.

6. Actions to ensure sufficient initial planting material:
   Nurseries would be expeditiously established to make available the starting plant material by the forest department and put for multiplication in their nurseries. The State owned non-productive horticultural farms would be used for this purpose. If nurseries are established in a progressive farmer's field, adequate compensation would be paid for use of his land.

7. Collection, processing and selling:
   The concept of monopoly marketing, through Forest Development Corporation for species collected from wild, would be introduced. Herbal *Mandies* with suitable storing facilities will be established in the foothills of Uttaranchal, where farmers can sell their produce.

8. Actions for promoting the quantity and quality of plants supplied to markets are:
   i. Products, packaging and retail outlets and dispensing establishments would be improved to meet consumer demand and promote consumer welfare. *All the produce from the State will have a State Trade Mark.*
   ii. All products will carry the information such as time of harvesting, place of collection/cultivation, method of drying/processing, quantity and price.
   iii. A range of different standard products with a range of prices would be marketed and response monitored to identify the levels of demand, and potential opportunities for expansion.

9. Actions for promoting business skills within the medicinal plant market are:
   i. Basic literacy courses would be provided for gatherers and street traders.
   ii. Courses in business skills would be developed for a range of enterprises.
   iii. Courses on beneficiation at various stages in the marketing process would be developed and provided to market players, especially at gatherer and trader levels.

   All these activities will be co-ordinated by the Herbal Research & Development Institute.

10. Action for research on the medicinal plant:
    i. There would be a reorientation of research investment, with a shift to research which identifies effective methods of sustaining market supply and improving the quality of products currently consumed. One of the major components of R&D Programme would be on the development of herbal products. This would be undertaken in *Ayurvedic* Colleges and other institutions with MAP charters. For this, these Institutions would be equipped with modern facilities so that they can develop the products and go for patenting them. At present, the entrepreneurs of the herbal industry are either highly experienced persons or second generation who took this industry from their fathers. In most of the cases the herbal remedies are the outcome of the own efforts of Vaidyas, who do not have any degree. This human resource would be used for training the next generation and documenting the remedies developed.
    ii. A State-wide networking of all R&D Institutions in MAP, including Agriculture Universities, would also be established with HRDI playing the nodal role. This networking besides exchanging up-to-date progress of R&D activities would also be made responsible for working out agenda for these institutions.
    iii. To achieve the targets of conservation, cultivation and commercialisation, a short, medium and long-term strategy would be followed. It will consist of (1) *Short-term (5 years* – Multiplication – seed, clonal or organ culture; Cultivation of selected species; Germ plasm collection and establishment of experimental plots; Variant selection and identification of elites) (2) *Mid-term (5-10 years* –- Organ, cell and tissue culture, and variant selection; Development of agro technology; Farming of plants of pharmaceutical importance; Initiation of micro enterprises; Understanding genetic system) and (3) *Long-term (10-20 years* – Molecular marker mapping and genetic fingerprinting; Secondary natural product farming).

11. Companion policies:
    It is apparent that a policy for MAP will also need support from a few other policies, which could be termed as Companion Policies, such as:
    i. Mainstreaming Ayurved System of education by making it a mandatory curriculum with the Allopathic System of Medical Education.
    ii. Policy prescribing *Ayurvedic* medicine compulsory up to 30% in rural dispensaries and PHCs and 20% in urban dispensaries and hospitals and preference for *Ayurvedic* treatment and medication over Allopathic prescriptions.
    iii. Policies promoting certificate and diploma courses in *Ayurvedic* System for Para-workers.
    iv. Policy promoting investments in *Ayurvedic* products production Centres.
    v. Policy to register Vaidyas and local healers.

Appendix 4 Profiles of research organisations engaged in medicinal and aromatic plants activities in Uttaranchal[46]

	Institute	Contact person	Activity*
1	Forest Research Institute (FRI) P.O. New Forest Dehradun – 248006	Director Ph: 0135-2757021, 2752925 Fax: 0135-2756865	a, b, f
2	Botanical Survey of India (BSI) Northern Circle 192, Kaulagarh Road, Dehradun – 248195	Mr. K.K. Singh, Joint Director Ph: 0135-2755478, 2753433 Fax: 0135-2757951	a, b, d
3	Herbal Research & Development Institute (HRDI) Gopeshwar-246 401, Chamoli	Dr. J.S. Rawat, Director Ph: 1372-252572	a, b, d, f, g
4	Wildlife Institute of India (WII) Post Box No. 18 Chandrabani, Dehradun – 248001	Dr. G.S. Rawat, Prof. & Head Department of Habitat Ecology Ph: 0135-2640111-115	a, b
5	G.B. Pant Institute of Himalayan Environment and Development (GBIHED) Kosi, Almora – 263 643	Dr. Uppendra Dhar, Director Ph: 05362-241041 Fax: 05962-231507	a, b, d, f
6	G.B. Pant Institute of Himalayan Environment and Development (GBIHED) Garhwal Unit, Srinagar	Dr. R.K. Maikhuri, Scientist In-Charge Ph: 01368-252603 Fax: 01368-251159	a, b, d, f
7	G.B. Pant University of Agriculture and Technology Pantnagar	Dr. Kewala Nand, Associate Director Ph: 05944-233473, 233608	b, f, g
8	G.B. Pant University of Agriculture and Technology Ranichauri-249 199, Tehri Garhwal	Dr. P.S. Bist Ph: 01376-252138, 252119 Fax: 01376-252128, 252150	b, f, g
9	Kumaun University Nainital	Dr. Y.P.S. Pangtey, Botany Department, Dr. C.S. Mathela, Chemistry Department Ph: 05942-235068, 235563	b, c, d, g
10	Hemwati Nandan Bahuguna (HNB) Garhwal University Srinagar, Garhwal	Dr. R.D. Gaur, Botany Department Ph: 01368-252175	b, c, d, g

[46] Information provided by Dr. Rawat, see chapter 6.

11	Horticulture Experiment and Training Centre Chaubattia, Ranikhet	Mr. Vinod Kumar, Director Ph: 05966-222792	f, g
12	High Altitude Plant Physiology Research Centre (HAPPRC) Srinagar, Garhwal	Dr. M.C. Nautiyal, Scientist Ph: 01368-252070, 252172	a, b, d, f
13	Central Institute of Medicinal and Aromatic Plants (CIMAP) Regional Centre, Nagla, U.S. Nagar	Dr. P. Ram, Scientist In-Charge	a, b, c, d, f, g
14	Central Institute of Medicinal and Aromatic Plants Regional Centre, Purara, Baijnath, Bageshwar	Dr. Reddy, Scientist In-Charge	a, b, c, d, f, g
15	National Bureau of Plant Genetic Resources (NBPGR) Bhowali	Dr. K.S. Negi, Senior Scientist Ph: 05942-249027 Fax: 05942-220027	a, b, g
16	Herbs Development Scheme, Co-operative Department Ranikhet	Dr. S.S. Mishra Ph: 05966-220347	a, b, d, f, g
17	Central Council for Research in Ayurveda & Sidha (CCRAS) Tarikhet, Ranikhet	Ph: 05966-264227	a, b, c, d, f
18	Gurukul Kangri State *Ayurvedic* College Haridwar	Principal	b, e, g
19	Defence Agro Technology Research Laboratory (DARL) Pithoragarh	Dr. Bhuvnesh Kumar, Scientist Ph: 05964-225564, 224664 Fax: 05964-225564	a, b, f, g
20	Aushdheeya Vanaspati Van Sanstha "Aranya Vikas Bhawan" 73-Nehru Road, Dehradun-248 001	Sh. R.P. Kala Ph: 0135-2657610, 2713813 Fax: 0135-2655488	a, f
21	Rishikul Rajkiya *Ayurvedic* Mahavidhlaya Haridwar	Principal	b, c, e
22	Forest Research Wing Forest Department Government of Uttaranchal Haldwani	Conservator Research and Training	a, f

* Note: The following activities are distinguished:

(a) Conservation research (threat assessment, distribution, species recovery)
(b) Botanical research (e.g. Inventory, herbarium development, raw drug repository)
(c) Medical research (pharmacology, pharmacognosy, clinical research)
(d) Medicinal plants database
(e) Herbal product development
(f) Agro-technology development, propagation and cultivation
(g) Any other type of research on medicinal plants.