



Royal Tropical Institute

**Developing a medicinal plant value chain:  
Lessons from an initiative to cultivate kutki  
(*Picrorhiza kurrooa*) in Northern India**

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## Introduction

Worldwide, medicinal plants species are depleting at a rapid pace due to large-scale, unsustainable collection from their natural habitats. The question is whether this trend can be counteracted through sustainable and economic conservation of these species. The Royal Tropical Institute (KIT), the Centre for Sustainable Development (CSD) and Ayurveda Health set up an experiment to try this out in practice for one species, in one habitat: kutki in Northern India. This paper tells the story of what happened and what we learned from it.

Conservation of medicinal plants is important for a number of reasons. Firstly, they are an important source of natural ingredients used by the manufacturers of modern pharmaceuticals.<sup>1</sup> The pharmaceutical industry is very big (US\$ 550 billion in 2008<sup>2</sup>), and its demand for medicinal plants is correspondingly large. Furthermore, a large number of plant species are yet to be screened for active compounds, indicating that the importance of medicinal plants for the pharmaceutical industry is likely to increase further.

Secondly, medicinal plants form the basis of homeopathy and traditional medicines, including Chinese, Tibetan, Ayurveda, Siddha and Unani. Medicinal plants and traditional knowledge are also crucial for traditional healers, who play a vital role in the lives of poor people in developing countries as often the main (and sometime the only) source of health care available to these people, and their animals.<sup>3</sup> Plant-based natural remedies have also become popular in many developed countries.

Thirdly, the collection and marketing of medicinal plants from forests is an important source of livelihood for a large number of poor people in developing countries who live in or nearby forest areas. For example, in Nepal alone more than three hundred thousand households are engaged in the collection of medicinal plants for the market.<sup>4</sup> The number of people engaged in collection in other developing countries is also large.

Fourthly, medicinal plants are an essential component of biological diversity. The conservation of medicinal plants, therefore, is a vital component of efforts to conserve biodiversity.<sup>5</sup>

As the demand for medicinal plants has increased, large-scale (both legal and illegal) extraction from the forests has caused serious depletion of a number of economically-important species. According to one estimate, more than 4000 species of medicinal plants are globally threatened, largely due to commercial over-harvesting to meet the demand from drug manufacturers (both traditional and modern).<sup>6</sup> The scarcity or extinction of these plants has serious implications for people's health and livelihoods.<sup>7</sup> Therefore, it is important that effective steps to conserve these plant species are taken urgently.

There are two main ways to conserve threatened species of medicinal plants: restrictions on their extraction and trade; and their sustainable cultivation on a large scale. This paper is primarily concerned with the cultivation of medicinal plants. In addition to contributing to conservation, cultivation of medicinal plants can also provide additional income to farmers in developing countries.

In order to promote the twin objectives of conservation and income generation, The Royal Tropical Institute (KIT) and the Centre for Sustainable Development (CSD) undertook an initiative to promote the cultivation of medicinal plants in the Himalayan region of India. In the following pages, this paper examines the results of this initiative (referred to as "project" in the rest of the paper) and draws lessons from it. The project was carried out in two villages of Uttarakhand, a state in the Central Himalayas in India.

The findings of the paper are of interest to a wide variety of audiences. These include: a) government agencies, donors and NGOs interested in promoting the cultivation of medicinal

<sup>1</sup> Lambert et al. (1997); Balick and Mendelsohn (1992); FAO (1997)

<sup>2</sup> Reuters, *Research and Markets: Understanding the Global Pharmaceutical Market is the Essential...*, at <http://www.reuters.com/article/pressRelease/idUS150423+16-May-2008+BW20080516>

<sup>3</sup> WHO (1999); Hamilton (2008).

<sup>4</sup> Hamilton (2008).

<sup>5</sup> SCBD (2001).

<sup>6</sup> Schippmann, Leaman, D. J. & Cunningham, A. B. (2002)

<sup>7</sup> Hamilton (2008)

plants; b) researchers and academicians interested in learning of the experience of introducing new crops in existing farming systems; c) farmers' groups and farmers' associations interested in adopting new crops.

The paper is divided into three sections. Section I describes the project to promote the cultivation of medicinal plants in Uttarakhand and its performance. Section II examines the project's performance in detail and derives lessons from it. Section III discusses the conclusions of the project.

## **Section I: Project to promote the cultivation of medicinal plants**

### **1. Medicinal plants in Uttarakhand<sup>8</sup>**

Uttarakhand is endowed with a rich variety of plant species, many of which have medicinal properties. As in other mountainous areas, these plants play an important role in the lives of people in Uttarakhand. Besides providing basic health care, the plants generate income and employment and also have implications for the preservation of biodiversity and traditional knowledge in the state.

A large proportion of the medicinal plants supplied from Uttarakhand are collected from the wild. This is particularly true for plants found in high altitude areas, which are generally characterized by fragile ecosystems. As a result of intensive extraction, many species of medicinal plants are now seriously depleted.

Recognizing the threat faced by a number of species of medicinal plants, the Uttarakhand government has formulated a series of policies for their conservation. These policies have two main components: a regulation of the collection of medicinal plants from the wild, and the promotion of cultivation to meet demand and provide farmers with new income opportunities.<sup>9</sup> The main features of the policy to promote cultivation, and its impact are described in the following paragraphs.

### **2. Cultivation of medicinal plants**

The Uttarakhand government considers the cultivation of medicinal plants to be important for two main reasons: a) cultivation will provide an alternative source of supply, and thereby reduce the need to collect these plants from the wild. This will reduce pressure on threatened species and promote their conservation; b) cultivation will provide an additional source of income for the state's poor rural population, which is particularly large in Uttarakhand. According to estimates by India's Planning Commission, in 2004 about 40% of the rural population in Uttarakhand lived below the poverty line. This was much higher than the proportion of people living below the poverty line in rural India as a whole in that year, which was about 25%.<sup>10</sup> The high incidence of poverty in the state is largely due to low and in some cases declining income from agriculture, which is the main economic activity for about 80% of the working population. The low income is due to harsh climate, poor soil conditions, small average plot size and inadequate access to technology, inputs and markets.<sup>11</sup> As returns from traditional crops decline, the cultivation of medicinal plants is seen to have potential as an important source of farm income. This is because medicinal plants are believed to have a number of advantages over traditional crops, including high price, low transport cost due to higher value per unit volume and long shelf life.

The Uttarakhand government promotes the cultivation of medicinal plants with a number of enabling policies. For example: a) it popularizes the idea of the cultivation of medicinal plants among farmers through media campaigns; b) it supports research on cultivation technology of important medicinal plant species; c) it has established nurseries to propagate and supply planting material and d) it has streamlined the process of registering farmers as growers of medicinal plants.

At the time of setting up the project (2005) these policies had been in place for about five years. However, their impact was small and little cultivation of medicinal plants was being carried out by farmers.<sup>12</sup> Some of the constraints which limited cultivation included technological difficulties, complex regulations and lack of buyers prepared to pay a premium. These are discussed in detail elsewhere.<sup>13</sup>

It was clear that large scale cultivation of medicinal plants by farmers in Uttarakhand would be possible only if these constraints were removed through support and intervention by public and private institutions. KIT and CSD set up a project in 2005 with the ultimate objective of

<sup>8</sup> This section is largely based on Alam and Peppelenbos (2009).

<sup>9</sup> Government of Uttarakhand (2002).

<sup>10</sup> Government of India (2007).

<sup>11</sup> For example, half the farming households in Uttarakhand own less than 2 acres, and only five percent own more than 5 acres. See Maikhuri, Rao and Semwal (2001).

<sup>12</sup> Alam and Belt (2004).

<sup>13</sup> Alam and Peppelenbos (2009).

providing small-scale farmers a secure market, attractive prices, and technical and regulatory support to enable them to cultivate kutki (*Picrorhiza kurrooa*) and establish a sustainable supply chain to Europe.<sup>14</sup> The leading concept was to link the farmers to a concrete market demand that values sustainable cultivation practices. In the following paragraphs the paper describes the experience of the project, and the lessons derived from it.

### 3. Project description

Kutki (*Picrorhiza kurrooa*) is a high altitude perennial herb that grows between 2,500 and 4,600 meters. Its roots have many medicinal uses include the treatment of influenza, diarrhea, jaundice and cirrhosis. Kutki was selected for a number of reasons. Firstly, according to experts, it can be cultivated on poor quality land where other crops would not grow.<sup>15</sup> This would enable farmers to increase their income without unduly affecting their earnings from existing crops on good land. Secondly, there is a large demand for kutki from producers of both allopathic and traditional medicines, almost all of which is met through collection from the wild. India alone consumes around 300 MT/year (Rs. 75 million) and exports around 100 MT/year (value Rs. 25 million). Finally, kutki is listed in CITES-Appendix II and the Indian Red List of endangered species.<sup>16</sup> This restricts the trade of non-cultivated and non-traceable kutki obtained from the wild. It is therefore likely that fully traceable, officially registered, cultivated kutki would fetch a large price premium, especially in developed countries where restrictions on the trade of listed species are strictly followed. In fact, it was this factor which attracted a firm from the Netherlands to support the project and commit itself to purchasing kutki at a premium price for a minimum of five years.

Initially the project was established in two villages of Uttarakashi district and one village in Tehri district. However, due to farmers' lack of interest the work in Tehri district was abandoned after one year. The main reason for this was that many of these farmers earned substantial income by growing vegetables for the markets in Mussoorie and Dehradun, two large cities 40 kilometers from the village. After this the project focused only on the two villages of Uttarakashi district. A number of factors were considered while selecting the villages for implementing the project. These included: villagers' familiarity with medicinal plants in general and kutki in particular as collectors from the wild; suitable altitude and agro-climatic conditions for the cultivation of kutki as indicated by the presence of kutki in the neighbouring forest; the distance from a motor road; and interest shown by farmers. In consultation with various government agencies, two villages (Sukhi Top and Jaspur) were chosen. The villages are located at an altitude of 2700 meters, at a distance of about 200 km from the state capital Dehradun (an 11-hour drive by car along the Ganges River). While Sukhi Top is located on the main road, Jaspur is located at a distance of one kilometer from the main road. In 2005 when the project was set up, Sukhi Top had 136 inhabitants in 23 households. Jaspur had 77 inhabitants in 14 households at that time. About forty farmers who showed interest were included in the project to plant kutki.

The project consisted of two main actors: the farmers and the buyer Ayurveda Health (The Netherlands). Ayurveda Health has been importing Ayurveda herbs from Southern India for a number of years. It distributes these in Europe to chemists, pharmacies, health shops and therapists. Through the project the company intended to broaden its supply base to include high altitude medicinal plant species. Ayurveda Health was particularly interested in procuring CITES-listed medicinal plants from cultivated sources, and traded in a fully traceable supply chain. For this reason they agreed to purchase kutki from farmers on very attractive conditions. These included: a guarantee to purchase all the kutki produced during the first five years at Rs. 400/kg of dry root weight (which is about 100% premium on the domestic price of kutki). It also agreed to contribute an additional 20 percent of the value of kutki to set up a social fund for community projects in the villages. The company was willing to pay the premium because it hoped to gain important advantage as the only supplier of traceable kutki to the European market. Furthermore, as the average cost of raw material accounts for a very small proportion (only 2 percent) of the cost of its end products, the high price paid by the company for kutki was not expected to make a difference to its profits.

The project was designed and monitored by the Royal Tropical Institute (KIT, Amsterdam) and Centre for Sustainable Development (Mussoorie). They were responsible for facilitating the business partnership between farmers and Ayurveda Health and mobilizing the required inputs

<sup>14</sup> The reasons for the selection of kutki are described in the following paragraph.

<sup>15</sup> Nautiyal et. al. (2001).

<sup>16</sup> <http://www.cites.org/eng/com/PC/10/PC10-Inf2.pdf>

and services, such as planting materials, technical assistance and certification from the Herbal Research Development Institute and the Forest Department. Furthermore, they carried out research to examine the performance of the project. The performance of the project is described in the following paragraphs.

#### **4. Performance of the project**

The project was expected to provide the following benefits:

- A number of farmers in the two villages will undertake the cultivation of kutki on a large scale. They will also have a secure and profitable market for their kutki; this will encourage other farmers to grow kutki and other medicinal plant species;
- The farmers will be registered as growers of medicinal plants, which will allow them to trade in cultivated medicinal plants;
- The two village communities will benefit from the social fund;
- The villagers will be less inclined to collect kutki from the wild, leading to its conservation;
- The buyer, Ayurveda Health, will have a secure supply of high-quality cultivated kutki from a fully traceable and certified source.

In the first year of the project, the kutki cuttings planted in farmers' field have performed very poorly. This was mainly because of the poor quality of planting material; most plants were found to be infected with rot. Within two months after planting, cuttings of 25 of the farmers (58% of the total) showed signs of rot and died soon after. Only cuttings in 6 farmers' fields (14% of the total) were in good condition after this period. In order to compensate for the lost plants, farmers were provided 21,000 additional kutki cuttings in 2006. With these additional cuttings a total of more than 80,000 kutki cuttings were planted in the two villages, covering an area of 2.05 acres. Please see Table 1 and 2 in the annex. The average number of cuttings planted by farmers was about 2,000. The new cuttings were of better quality and the mortality rate was much lower than in the previous year. However, the very high rate of mortality during the first few months of the project had already led to widespread disappointment and frustration among the farmers. Although all the farmers continued to participate in the project, clearly the project did not fully recover from this initial setback.

The situation improved during the following years but the number of farmers with good kutki fields remained small. For example, during 2008 only six farmers in Jaspur and four in Sukhi had good kutki fields, while another 10 farmers had satisfactory crops. Although they were keen to expand the size of their cultivation by planting new cuttings from their fields, the growth of the plants was very slow and it was not possible to take cuttings from them. The rest of the farmers- most of whom had suffered high mortality, were not sure whether they would continue with kutki plantation. Also in the second year, the main reason for the high mortality was the poor quality of planting material.

The situation did not change significantly during 2009 as nine farmers in the two villages had good kutki crops, while the crops of another 7 were satisfactory. None of the farmers were able to expand their cultivation for the reason mentioned above.

Even the farmers with good kutki fields have very small area under kutki; each has covered about a 100 square meters area with it, with an average of about 1500 plants. As this is too small a size to give a sellable crop, the motivation to look after the fields is small. Only one farmer has sold 3 kilograms of kutki (value Rs. 750.00) from his field this year to a local trader. Although the farmers with good fields are determined to continue with kutki, it is unlikely that they will be able to expand their kutki plantations to a commercial level. This is mainly because the growth of the plants is very slow, which prevents farmers from taking new cuttings needed to expand.

As the project farmers could not obtain a crop as expected, it was felt necessary to identify another group of farmers in Uttarakhand who were cultivating kutki and could supply it to Ayurveda Health. Fortunately, around this time the project had been approached by an Uttarakhand based NGO called Ankur, which is working with a group of farmers. One of its activities includes the promotion of medicinal plant cultivation, especially kutki. Ankur is based in a remote village called *Ramni* of Ghat block, at an altitude of 8500 feet. According to Ankur, it had about 2 million kutki plants in 2007 on an area of about 5 hectares. In addition to this, about 100 farmers working with Ankur were reported to be successfully cultivating kutki on their

planted fields. The average number of kutki plants planted by Ghat farmers was 4000 plants. 74% of them were satisfied with kutki cultivation.<sup>17</sup>

In 2007 Ankur was concerned about the marketing of its kutki production and was looking for a buyer who could pay a premium for cultivated kutki. Until then they had been selling kutki planting material to the Uttarakhand government's horticulture department. This provided them with higher income than they would have received from selling kukti roots in the local market. As their cultivation expanded, they were interested in finding new markets, but with income comparable to what they received from the horticulture department for the planting material. It was, therefore, interested in participating in the KIT-CSD-Ayurveda Health project and supply kutki to Ayurveda Health at prices agreed with the Jaspur-Sukhi farmers.

The situation was discussed with Ayurveda Health and it was agreed that working with Ankur will contribute to the project by providing experience to set up a sustainable supply chain of kutki from India to Europe. This opportunity was used in 2008 when 300 kilogram of dry kutki was supplied by Ankur to Ayurveda Health. The transaction provided the project with valuable experience in building a medicinal plant supply chain, and the ability to solve problems faced in setting up the chain. To our knowledge, this is the first time that a traceable cultivated medicinal plant specie has been supplied to a European company from India. However, the arrangement was not repeated in 2009 as Ayurveda Health is interested in purchasing kutki from the farmers in Sukhi and Jaspur villages who are working with the project.

The project came to an end in December 2009. The performance of the project has been less than satisfactory. It was able to achieve some of its objectives, including: a) A large number of farmers became interested in cultivating kutki and other medicinal plants, more than 40 of whom planted kutki in their fields; b) Almost all (42 out of 43) farmers were registered with the government of Uttarakhand as growers of kutki; c) A number of research publications based on the experience of the project were produced. These contributed to interest in the conservation of medicinal plants. However, the project failed to achieve its most important objective of enabling farmers to grow kutki on a large enough scale to export it to Ayurveda Health. The reasons for the poor performance of the project are described in the following paragraphs.

## **Section II: Performance of the project and lessons from it**

### **1. Reasons for poor performance of kutki in Jaspur and Sukhi**

An important objective of the project is to understand the factors which influence the success/failure of efforts to promote the cultivation of medicinal plants, and to draw lessons from the experience. The main reasons for the poor performance of kutki were:

**Poor quality of planting material.** In spite of the Uttarakhand government's claim that good quality kutki planting material is available from its nurseries, the reality is very different. The project procured kutki cuttings from two sources: a government research institute, reputed to have expertise in the propagation and cultivation of kutki; and the state forest department, which has a number of nurseries set up especially to propagate planting material of important species of medicinal plants. The planting material supplied by both these sources was of poor quality and led to high mortality during the first year. The cuttings supplied by the research institutes were of particularly poor quality and almost all of them died within two months of planting. This is particularly unsettling when looking at the initiative by Ankur which proves that producing good quality planting material is a solvable problem. We complained to both the agencies about this. The Department of Forest partially compensated the project by providing 21,000 cuttings free of cost to the farmers whose plants had died during the first year. Please see Table 3 in the annex.

As a result of very high rate of mortality many farmers were very disappointed and lost interest in the project. In fact, as mentioned earlier, the project did not fully recover the setback suffered during the first year due to this reason.

**Cultivation on small plots of very poor quality.** As this was the first time the farmers were growing a medicinal plant species, they were not sure whether kutki can be grown in farmers' fields. For this reason they were not prepared to plant kutki on large area or on good land,

<sup>17</sup> CSD-KIT survey of kutki farmers in Ghat.



which was being used for cultivating other crops. The average size of the kutki plantation was less than 150 square meters. The plots were too small and farmers had little interest in looking after them. Although the recommendation by experts suggests that kutki is best grown on poor soil, the farmers' experience indicates that this is not so; kutki plants performed especially bad on poor soil. We can conclude that there was insufficient agronomic support in the project to actively follow-up and tackle these problems experienced by the growers.

**Lack of irrigation facilities.** The literature suggests that kutki can be grown on poor soil and its cultivation does not require irrigation. Based on this information, we did not discourage farmers from planting kutki on dryland. However, farmers found that irrigation is necessary for the survival and growth of the kutki plants. In the absence of irrigation facilities, the growth of plants was very slow. The project provided 21 farmers irrigation pipes worth about Rs. 23700 at 50% of the cost during the second year. But, faced with high plant mortality and slow growth, many farmers had already lost interest in maintaining their kutki plots. This shows that the initial performance of a project is crucial for the overall success of a project.

**Farmers' expectations of financial benefits not met.** As a number of government subsidy schemes are operational in Uttarakhand, there is a tendency among farmers to expect financial support from external agencies, including donor agencies and Non Governmental Organizations (NGOs). It seems that some of the farmers joined the project and planted kutki with the expectation of receiving direct financial benefits from the project. For example, some farmers hoped that the project will pay cash incentive to farmers for planting kutki. When they realized that this was not going to happen, they lost interest and did not look after the kutki fields.

**Emergence of an alternative cash crop.** At the time of project's inception the farmers were interested in kutki as a possible cash crop. However, within two years, many of them began to receive large income; the yearly average household income of farmers in Jaspur and Sukhi villages was more than Rs. 16000 during in 2006 from apple orchards, which they had planted about 5 years ago. This changed farmers' attitude towards kutki and other medicinal plants, many of whom felt that apple orchards had better potential as source of income. This led to general decline in interest in kutki. The decline in interest was particularly evident in Sukhi village, where the household income from apple was especially large; it was more than Rs. 19000 per year. Compared to this the income from apple in Jaspur was Rs. 5500 per year.

We have also analyzed the factors contributing to the successful cultivation of kutki in Ghat area by farmers working with Ankur and have attempted to identify additional reasons for the lack of success in Jaspur and Sukhi villages. This has been done with the help of data collected through household surveys in the two areas. The samples for the survey included 37 households in Jaspur and Sukhi and 87 households in Ghat area. The following reasons were found to be important.

**Experience with agriculture.** The villagers' experience with agriculture is very different in the two areas. While villagers in Ghat are traditionally agriculturalists, the inhabitants of Jaspur and Sukhi have taken to farming only recently. A majority of villagers in Sukhi and Jaspur were agro-pastoralists until the late 1960s. The men looked after livestock, which was the main source of income, while women farmed to supplement their household incomes. During the summer men would pasture their goats and sheep on the meadows and in the forests, and in wintertime they would migrate to grazing areas in the foothills. A significant number of families were also engaged in trade with Tibet, selling grain, clothes and metal goods in return for salt and wool. The situation began to change during the 1960s. Trade with Tibet ceased after the 1962 Indo-China War. Moreover the Forest Department, concerned about rapid deforestation in mountain areas, began to impose serious restrictions on the grazing of livestock. This forced the villagers to look for new sources of income beyond animal husbandry. Since then agriculture and horticulture have been adopted by most inhabitants of these villages. Although their experience with farming techniques is still limited, they have been very successful in growing apple. This is mainly because they have received good quality plants and technical support from farmers in the neighbouring state of Himachal Pradesh, which has a very long history of successfully growing apple orchards.

The situation in Ghat area, on the other hand is very different as farming is traditionally the most important occupation. The role of trade and horticulture in these villages is minimal. Being more experienced and skilled in farming, these farmers have been more successful in domesticating kutki in their fields.

**Size of landholding.** In both areas, farming is carried out on small terraced fields, most of which are scattered over large distances. In both areas, there are no irrigation facilities, and rain-fed farming is practiced by all farmers. There are, however, important differences in terms of the size of landholding; on average, households in Sukhi and Jaspur villages hold more land than in Ghat. For example, 30 percent of the households in Sukhi and Jaspur own more than 2.5 acres (Table 1). Compared to this, only 15% of the farmers in Ghat have more than 2.5 acre. Again, while only 14 % farmers in Jaspur and Sukhi own less than 1 acre land, in Ghat the proportion of such farmers is 47%. The average landholding in Sukhi and Jaspur is almost twice (2.3 acre) the average landholding in Ghat area (1.3 acre). Please see Table 4 in the Annex.

Although they have comparatively large landholdings, a large proportion of the land of in Jaspur and Sukhi is far from the villages. Also, and probably for this reason, much of it is neglected and of poor quality. Many farmers have planted kutki on this neglected land. In villages in Ghat the land is more intensely cultivated and is of better quality. This has also contributed to the success of kutki in these villages.

**Importance of cash crops.** Cash crops play an important role in Jaspur and Sukhi: 88% of the land in these villages is planted with these crops. The situation is different in Ghat where a majority of land is planted with staple food crops. These farmers are interested in adopting cash crops to supplement their income.

Apple is the most important cash crop in Sukhi and Jaspur. Taken together, 87 percent of all households in these villages have apple orchards, covering 36 percent of the cultivated land. Apples' role is particularly important in Sukhi Top where all the households have these orchards.

The emergence of apple completely changed the local farming scenery. And it is a comparatively new phenomenon: most of the orchards were planted after mid 1990s. Furthermore, about 40% of the apple trees were planted in after 2000 and will start giving fruit next year. This suggests that the income from apple is likely to increase in the near future. The farmers in these villages are focused on increasing their income from apple by planting new orchards and increasing productivity of existing orchards. At the same time their interest in kutki has declined. This clearly points to the need to pay attention to existing farming systems and their implications for the success of new crops. Our project did not do this adequately. In Ghat area the situation is very different. The income from potato, which is the only significant cash crop, is small. Farmers are looking for cash crops which can augment their income substantially. It is for this reason also that they have greater motivation to look after their kutki cultivation.

**The importance of farming for household income.** Although they are traditionally agriculturist, the income from farming accounts for only a small proportion of the total income of farmers in Ghat villages; according to our survey data it accounts for only 10% of the household income. Wages earned through working as laborers is the most important source of income; it accounts for more than 60% of the household income. In Sukhi and Jaspur, on the other hand, agriculture and horticulture are the most important source of income; they accounts for almost 70 % of total income in these villages.

As their dependence on agriculture and horticulture for household income is lower Ghat farmers can use a considerable part of their good land to plant experimental crops such as kutki. The loss of income from the land used for kutki would have little affect on their income, much of which comes from wage labour. This is an important reason for the comparatively larger plots on which kutki has been planted by these farmers. According to our survey data, the Ghat farmers have planted kutki on an average area of about 0.1 acre. The average number of kutki plants being cultivated is 4000 per farmers. Compared to this, the farmers in Jaspur and Sukhi have planted an average of 1500 plants on about 150 meters.

Farmers in Jaspur and Sukhi, on the other hand, are much more dependent on income from agriculture and horticulture. They can not afford to devote large plots of land to experimental crop of large gestation period as this will affect their income substantially. It is for this reason that the farmers in these villages have planted an average of 1500 plants on less than 150 meters.

## **2. Lessons from the project**

An important objective of the paper is to examine the lessons derived from the project which can be useful for setting up effective initiatives to cultivate medicinal plants in India and other developing countries. These lessons are discussed in the following paragraphs.

Let us first re-iterate the important reasons for the failure of farmers in Sukhi and Jaspur to cultivate kutki on a large scale. The three most important reasons are: poor quality of planting material supplied to farmers, leading to very high mortality of plants; small uneconomic size of plantations on poor and neglected land, causing lack of interest and motivation among farmers; and emergence of apple as a profitable cash crop, leading to a shift of interest from kutki. The success of farmers in Ghat also appears to be related to these factors. The farmers there were provided with healthy planting material by Ankur, their size of plantation is bigger and kutki is seen by farmers as a potentially important cash crop. Potato, which is the only significant cash crop in the area, is seen as less profitable than kutki.

Introducing kutki in the villages would have required an "innovation approach" with active involvement of all the key actors, including the farmers, researchers, extension workers, local businessmen, people from government and non-governmental institutions. Thereby, the likelihood of raising problems at an early stage and starting concrete experiments exploring solutions, with the key people taking an active role in it, could have been improved.

The lessons from these observations are clear. Firstly, the government agencies responsible for providing farmers with planting material and technical support need to improve their performance. While these agencies claim to be capable of propagating and supplying planting material to farmers, the quality of material supplied by them is some time not very good. Furthermore, although they promote the cultivation of medicinal plants, research institutes do not have experience of large scale cultivation of these plants on farmers' fields. Their expertise is often limited to small scale cultivation on pilot sized plots. The research institutes also lack resources and mandate to carry out extension activities. Their resources (and activities) are largely limited to holding seminars and occasional training of farmers. They are not engaged in intensive extension work which is necessary for successfully introducing new crops which have not been domesticated yet.

The situation is furthered worsened by the fact that the extension capabilities of government's agricultural and horticultural departments in India are now considerably weaker than in the past. Also, the cultivation of medicinal plants is not their priority. They are more interested in introducing improved varieties and techniques of fruits and vegetables. Forest department also does not have adequate extension resources.

Clearly, this must change. The government agencies need to augment their capability to produce good quality planting material and strengthen their capability to develop and transfer technology for large scale cultivation of important species of medicinal plants.

Secondly, our project distributed its resources on a large number of farmers who planted on very small plots. These small plots provided farmers with little motivation to look after the plants properly. The efforts to promote the cultivation of medicinal plants should focus on a smaller number of farmers who are prepared and able to cultivate on large, commercially viable plots on good land. The size of cultivation should be large enough to provide farmers with enough incentive and motivation to look after the fields. This point is particularly relevant for mountain areas, where there is a shortage of good farmland.

Thirdly, the project did not fully understand the farming systems dynamics prevalent in the villages, and this contributed to wrong choice of villages. The cultivation of medicinal plants has a greater chance of success when their income potential is more than the income from other cash crops. Therefore, while selecting an area and a group of farmers, it is important that income from various cash crops is examined in detail. Moreover, as our experience in Jaspur and Sukhi shows, it is necessary to take a long term view of the situation. Not only the current income from cash crops should be considered but expected income from cash crops in the pipeline during the next few years should also be taken into account. Also one could defend to focus more on working with the relatively larger farming households in the community.

To conclude this section, we would like to stress that community cultivation of medicinal plants is more difficult than usually suggested in the literature. This is particularly true of the literature

produced by scientists working on medicinal plants, and state government departments engaged in the promotion of medicinal plant cultivation, such as forest department. They exaggerate the potential economic benefits of cultivation while underplaying the difficulties which farmers are likely to face. As a result of this, farmers and non governmental organizations take up cultivation of medicinal plants without fully appreciating the difficulties involved.

It is also important to keep in mind that cultivation of medicinal plants has to compete with other crops. The technical difficulties associated with domestication of many high altitude medicinal plants makes them often less favourable than other crops such as fruits orchards (for example, apple orchards in our case study). The cultivation technique of the latter is easily available and they represent considerably lower risk for farmers. Farmers are interested in increasing income but they will prefer to adopt crops which are already established and involve only the usual risks associated with farming. It is also interesting to note that long gestation period associated with medicinal plants is perhaps not an important constraint as farmers are quite prepared to plant fruit orchards, many of which take up to 10 years before full harvest can be received. They are not deterred by the long gestation period as the potential risk is much lower ("it is a proven technology") and benefits are much greater than medicinal plants.

### **Section III: Conclusions**

This paper describes the results of a project whose objective was to promote the cultivation of an important medicinal plant (kutki) in the Indian Himalayan state of Uttarakhand. The project was set up jointly by KIT and CSD and involved about 40 farmers in two villages and a company from The Netherlands (Ayurveda Health), who was interested in buying cultivated kutki at a premium. It was hoped that the project would lead to the establishment of a sustainable supply chain of traceable and cultivated kutki (and other medicinal plants later) from India to Europe. This would contribute to the conservation of kutki in the wild and would also provide additional income opportunities for the farmers. The project was set up in 2005 and was concluded in December 2009.

The project has achieved some of its goals. For example, it was successful in motivating more than forty farmers to plant kutki in their fields. It has also facilitated the registration of these farmers as cultivators of medicinal plants with the state government. However, the project has failed to achieve its primary goal as large scale cultivation of kutki has not been accomplished. While a handful of farmers plan to continue with kutki cultivation, most farmers have either abandoned their plantations or are likely to do so in near future. Furthermore, although the project was able to establish a supply chain to Europe with kutki grown by an NGO (Ankur), this has also been abandoned as the Dutch company is interested in buying kutki only from the farmers who are associated with the project.

This paper analyzes the reasons for the poor performance of the project, and derives a number of lessons from them. The project failed to meet its main objectives for the following main reasons: a) poor quality of planting material supplied to farmers, leading to very high mortality of plants; b) inclusion of a large number of farmers in the project who planted kutki on small uneconomic size plots on neglected land. These farmers had little interest and motivation to look after these plots; and c) emergence of apple as a profitable cash crop, leading to a shift of interest from kutki. These findings have important lessons for efforts to promote the cultivation medicinal plants. For example, the government agencies responsible for the promotion of medicinal plant cultivation should ensure that good quality planting material is available to farmers. Similarly, research institutes working on medicinal plants need to make greater effort to develop and propagate large scale cultivation technologies. Currently these institute lack resources and mandate to carry out large scale transfer of technology to farmers.

The projects aimed at promoting medicinal plants should encourage farmers to plant on large area. It is only when the size of the cultivation is large that the farmers will have sufficient stakes in the effort, thereby increasing the chances of its success. The project should focus on a smaller number of enterprising farmers who are prepared to take risk by planting large area with new crops. If they are successful, other farmers will follow. Finally, the projects should take into account the fact that cultivated medicinal plants will compete with other cash crops. The cultivation of medicinal plants has a greater chance of success when their income potential is more than the income from other cash crops. Therefore, while selecting an area and a group of farmers, it is important that income from various cash crops is examined in detail. Moreover, it is necessary to take a long term view of the situation. Not only the current income from cash

crops should be considered but expected income from cash crops in the pipeline during the next few years should also be taken into account.

To conclude the paper, we would like to stress that cultivation of medicinal plants is more difficult than usually suggested in the scientific literature and governmental promotional material. While these agencies exaggerate the potential economic benefits of cultivation, they underplay the difficulties involved in the cultivation of plants which have not been domesticated. It is important that agencies and NGOs involved with the cultivation of medicinal plants fully take these difficulties into account, and take steps to remove these. This will go a long way in foreseeing and removing many of constraints faced by the project described in this paper.

The project also has some lessons for the development of value chains in general. These include: a thorough assessment of the technical and economical feasibility of the chain to be developed; understanding of the prevalent farming system which will have an impact on the performance of the chain; ability to undertake long term involvement to ensure the success of the chain.

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## Annex

**Table 1**

Number of farmers, cuttings planted and area covered

Village	No. of Farmers	No. cuttings	Area (acre)
Sukhi	28	53,000	1.30
Jaspur	15	30,000	0.75
Total	43	83,000	2.05

**Table 2**

Status of cuttings two months after planting

Village	Status of plants in farmers fields (number of farmers)			
	Very Good	OK	Bad	Total
Sukhi	3 (10.71)	6 (21.43)	19 (67.86)	28 (100.00)
Jaspur	3 (20.00)	6 (40.00)	6 (40.00)	15 (100.00)
Total	6 (13.95)	12 (27.91)	25 (58.14)	43 (100.00)

**Table 3**

Status of cuttings two months after planting (according to source)

Source of planting material	Status of plants in farmers fields (number of farmers)			
	Very Good	OK	Bad	Total
HAPPRC*	0	0	18 (100%)	18 (100%)
Songad Forest Nursery	6 (24%)	12 (48%)	7 (28%)	25 (100%)
Total	6 (14%)	12 (28%)	25 (58%)	43 (100%)

\* High Altitude Plant Physiology Research Centre. An Uttarakhand based research centre which specializes in research on cultivation technology of medicinal plants, including kutki. All the cuttings purchased from HAPPRC died within 2 months of planting.

**Table 4**

Size of landholding (% of households)

Village	Up to 1 acre	1.1 to 2.5 acre	More than 2.5 acre
Jaspur and Sukhi	14	56	30
Ghat	47	40	13

Source: village surveys in Sukhi, Jaspur and Ghat