National Biodiversity Strategy and Action Plan

NAHIKALAN SUB-STATE SITE

Uttaranchal

Final Plan

April 2003

Vividhara

CONTENTS

Abbreviations Used:

LC – Local Community with an 's' added for communities

FD – Forest Department

SAPs – Strategies and Action Points

BCPP – Biodiversity Conservation Prioritization Project

Chapter 1

A R E A P R O F I L E
A Birds Eye View

Location & Geographical Features

Of all the Doons or Duns, intermontane depressions, Dehradun is the most spectacular. It is flanked by four immense natural features – the Himalayas in the north, the Shivaliks in the south, the Ganga in the east and the Yamuna on the west. On the first Outer Himalayan range, overlooking the Doons, nestling in a valley called Sinsyarukhala, lies Nahikalan sub state site, in the Malkot region, Raipur Block of Dehradun district, bordering the Tehri district of Garhwal. The valley's name comes from a bush called *sinsyaru* that grows where water abounds.

The outer Himlayan range stands tall with steep slopes and deep valleys. Stretching across an altitudinal range of approximately three thousand feet (from 2,500 to 5,500 ft. approx.), at times over a distance of only four to five kilometers. The gradient is often between 60 and 80 degrees. In striking contrast, the hilltops are flat or gently undulating with rolling meadows or forests.

The rock types are exceptionally varied, and a majority of these are fragile, loose, or fractured. Soil types show a matching variety. There is a wide variation in aspect, though most of the site faces south and west and this is where most of the habitation and agriculture is to be found. The moisture retentively of soils varies greatly, due to aspect and soil erosion.

The area receives heavy rainfall, especially during the monsoon months, called *chau masa* in local Garhwali. This is due to locational, topographic features and dense diverse forests. Rainfall is also markedly higher in this valley than a few kilometers lower and higher. In 1977, the Doon Valley recorded the second highest rainfall in India. This year, 2002, as most of North Western India reels under drought conditions, this valley has seen rainfall everyday, through the months of June and July. Also, there is heavy dewfall throughout the year.

Over the last ten years or so, the rainfall pattern (seasonal distribution etc.) has become highly unpredictable. Some major climatic fluctuations/variations are frequent absence of winter rain and an increased incidence of dry spells, typically between autumn and summer (creating exceedingly good conditions forest fires, as

we'll discuss later), as well as changes in the timing, intensity and spells/duration of monsoonal rainfall. Moderate summers have been steadily getting warmer and sometimes even hot. The winters are like the middle Himalayas, moving towards more moderate and less snowfall, the year 2002 bringing snowfall after a gap of more than 20 years.

The site is a critical catchment and birthplace for perennial springs and streams, together birthing the river Bhidalna that later flows into the *Jakhan* River. The natural springs of the area are the (often sole) sources of drinking water for twelve nearby and downstream villages. And more drinking and irrigation water projects are underway and proposed.

Combinations of all these factors have bestowed this area with a unique and rich biodiversity. A large range of the diversity, typical and characteristic of the Doon Valley and the Shivaliks is to be found here in addition to the biodiversity of the Outer and Lesser Himalayas.

A range of landscape and forest types, as well as ecological niches exist in this area. One of the main forest types is the banjoak forest that covers the top and upper reaches of all the hills. Most of the numerous natural springs of the area emerge just below these forests and these exercise a determining influence on the climate and ecology of the area. All the villages and hamlets are located strategically (often just) below the oak line because this is the ideal place for water availability/security, fertile, moisture retentive soil, maximum proximity to year-round diverse wild fodders etc.

The factors behind the rich and wild biodiversity (including wild floral diversity itself) have enabled the evolution of diverse indigenous crops and varieties, further characterised by its organic and rainfed nature. (A more detailed description of local biodiversity follows in a subsequent section)

Habitation, History and Socio-Economic Profile:

According to its present inhabitants, Nahikalan, the main village in the area, came into being about three hundred years ago. The first settlers came from a village further up in the Himalayas, to the north-east, in the present district of Tehri Garhwal. Till the time of Indian independence, this area was an outpost of British rule, bordering the princely state of Tehri Garhwal.

All human settlements are towards the south, and occasionally west-facing hill slopes. And so are almost all agricultural lands. Habitation is located in proximity to natural springs, which provide water for drinking and domestic use. In addition

to water availability, this location provides maximum year round proximity to wild fodders for domesticated animals and fuelwood for cooking. And where the gradient allows, agricultural terraces are carved out.

The main occupations of people are agriculture and pastoralism. They are symbiotically linked with each other and the neighbouring forests and grasslands. Pastoralism, if anything, is securer than agriculture, as agriculture depends upon the benevolence of the skies and the crop-raiding wild animals.

Agriculture is characterized by its entirely rainfed nature, organic fertilization and a wide range of indigenous crops and varieties. Numerous traditional fine and coarse cereals - millets, pulses, tubers, vegetables and spices and condiments are grown to meet food and nutritional security and incomes. For the areas habitants these are the primary sources of sustenance and income. All families possess agricultural land, the size of holdings varies, though far less than in most parts of India. The land holdings of the few dalit families are marginal. Some other families too have small holdings. The two major caste groups are farming Rajputs and dalits/harijans.

The livestock get fodder from forests and grasslands. The three main sources are forests, village common lands (mostly under individual family control) and diverse wild trees and plants on agricultural terraces. Fodder requirements during the monsoon months are met from agricultural lands and meadows alone, giving the forests a rejuvenating break.

The fertility of agriculture is entirely dependant on livestock manures and mulching materials from the forests. Land tilling is done by bullocks. Agriculture is powered by domesticated animals -- cows, bullocks, and buffaloes through manures and draught power. As almost all the fodders are wild floral plants coming mostly from the forests, the role of forests even in agriculture is critical. The microclimatic influence of forests and their impact on soil fertility and moisture (as majority of the agricultural terraces are located below the forests) is significant too.

Agriculture, animal husbandry and forests, are an interconnected system. As an elder and long-time panchayat pradhan said, agriculture in this area is unimaginable without forests. The current high levels of cultivated biodiversity are impossible without wild floral biodiversity.

Three revenue villages, Nahikalan, Nahin khurd and Kotla and the hamlets of Barkot and Semalsari with a total of 38 families (as of five years ago), reside in the area.
Other than the main occupations of farming and animal husbandry, some adults are employed in government and private jobs, primarily Government schoolteachers.

The other income source is occasional labour in government schemes. The economic condition of families where a member holds a government job is much better than others. For the families depending solely on agri-pastoralism and labour in occasional government schemes, life is hard work all round the year.

Most families own some land in villages in the plains of the Doon valley. Parts of most families and some entire families have migrated there. Some families live here and travel down 7 to 20 kilometres to farm the land in the plains. At present this is where the basic food security of the hill habitants comes from. As the staple cereal requirements of rice, most of wheat and at times corn etc. are met from these lands. Or from the government ration shops. These used to be almost entirely met from the hill village terraces earlier. We will examine how these changes came about in a later section.

During the last 20 years, about 15 families have migrated. Primarily due to lack of productive employment opportunities, agricultural losses due to wild animals and transport difficulties due to the long distance to the nearest road head.

A minimum trek of 8 km is necessary to reach the road head \ bus stop. Basic needs such as health, education, and electricity are intermittently and inadequately available. Food has to be transported on foot or horseback from the ration shops or family lands in the villages of the Doon valley. Boys and girls studying beyond the 8^{th} standard walk 16 km to school everyday. The sick have to be carried downhill 8 kms. to the nearest road head, and then another 15 by bus, to the nearest hospital. All this makes the need for a motorable road a foremost demand of the local population. A majority of the younger generation aspires to work in cities and/or migrate to the plains of the Doon valley.

Chapter 2

B I O D I V E R S I T Y P R O F I L E

The locational, altitudinal and precipitation features of the area, its diverse rock, soil and topographic features together bestow a strikingly rich floral and faunal diversity on the area. The staggering diversity also has to do with the area being a meeting point for the diversity of different ecological zones - the Doon valley, the Lesser Himalayas, and the upper ranges of the Shivaliks. Diversity is manifest at both the ecosystem and the species level.

ECOSYSTEM LEVEL

The area exhibits significant diversity at the ecosystem level. From temperate *banoak* through moist evergreen, mixed and deciduous forests to meadows, grasslands and agroecosystem.

***Ban oak* Forest:** Occurring on and near all the hill tops and the upper half of the hills, these are important rain gathering and spring charging forests, and most of the numerous perennial natural springs of the area are located below these forests. The banj forests exercise a critical determining influence on the climate and ecology of the entire area. They are mostly dense and evergreen, with associate species such as *burans* (rhododendron) and *ainyar* (*Pieris ovalifolia*), diverse species of herbs, ferns, mosses, and lichens, many of them medicinal. These forests are the main habitat for *jarhaoo* (sambar) and *bhaloo* (himalayan black bear). Frequent fires, goats, and fodder/fuelwood loppings have caused considerable thinning of the forest and loss of native ground level vegetation.
Sites: *Darhwa - Ghorha peti, Banjhyani and Kutiyan.*

Northern Dry Mixed Deciduous Forest: Found in the lower part of the area in altitude ranging between 2000-3500 feet. Till recently much of this was *semla (Bauhinia retusa)* dominant, with some pure strands of *semla*. Other main species are *raini(Mallotus phillipinensis), baherha, jhingan and kingora (Berberis asiatica*). Excessive, commercial tapping for gum, and fire, fodder and fuelwood pressures, have virtually obliterated *semla* from the area. A degraded form, the Dry Deciduous Scrub, has resulted in some of these areas. The bedrock gravel is exposed as the topsoil is completely eroded, and
xerophytic *suru (Euphorbia sp.*) is present. The last four years have seen significant regeneration of semla and other species.
One south facing site has a rich variety of huge trees and a thick and diverse understorey. The common species here are; *baherha(Terminalia bellerica), amarha*

*(*Travellers delight), *kharki, jhingan(Lannea grandis), malu(Bauhinia vahlii) and vasaka(Athatoda vasica).*
Sites: *Patniyan* (*Semla* and *Vailya), Chowki dhaar, Kaldyan ka Dhomprha* (sub-site in *Kaldyan), Bavan morh/Undhari* and *Chamogi*.

The middle hills support a confluence of tree and other flora from these two major forest types, depending upon edaphic factors (availability, fertility and moisture retentivity of soils) and aspect. The water and moisture rich gullies and west-facing slopes primarily support oak and evergreen species like gald, tun, paiyan, tilphara amongst the trees and khaksa varieties, binda, hinsar, thundiyara, kingora, nettles, bhatta amongst the bushes and varied herbs. The rocky, dry sections/ridges support chirna, madara, gonta, harshringar, kharki amongst trees, malu, servala (vines) and many shrubs and grasses.

Hill Top Meadows: Some of hill tops of the area have gently sloping, undulating meadows on them called *danda* or *sain*. As recently as ten years back, diverse grasses and herbs grew here, making it a preferred and idyllic grazing place for village cattle. Excessive grazing and fires from neighbouring lands have resulted in degradation, soil loss and the arrival and spread of exotic weeds, notably *kala bansa\lukjarhi* (KB, from now). Native diversity has been obliterated from half the area in just five years and KB threatens to overrun the entire area. Meadow sites are *Danda, Joharh Danda, Bacharvarh,Mavani ka sain* and small *danda's* above *Ghorha peti*.

Degraded, steep slopes and abandoned agri terraces also support **grasslands**. The moisture retentivity of these soils is poor, yet many species grow here, and the abundant one's are the grasses *golda, tachhila* and *thundiyari.* Tree species such as amla (*Emblica officinalis*), *chhirna, madara, gonta, saloo, raini* and *harsringaar* (*Nyctanthes arbor-tristis*) grow here, in varying concentrations. Karhi patta (Murrayya asiatica) amongst the shrubs is widespread as is semali (Vitex negundo) and the xerophyte *suru*. Sites: *Kharhiyand,* part of *Suryani* and most abandoned terraces.

Then there is the agricultural ecosystem -- a veritable **traditional agro-forestry system** full of diverse wild plants and an array of indigenous Himalayan crops and varieties (described in a following section).

SPECIES DIVERSITY

Flora

Among the main tree species found in this area are *banjoak* (*Quercus leucotrichophora*), occurring in forests by its name. These cover the top reaches of all the hills of the area, and in mixed forests; *burans (Rhododendron arboreum*), the beautiful associate of banjoak; the medicine, fodder, fuelwood important *semla* (*Bauhinia retusa*), once occurring in pure strands; the spring nurturing *tun* (*Cedrala toona*), valued for its timber as are the abundant *gald, kaula and parhanga* and the now rare *sandan*(*Ougenia oojeinensis*) ; the multi-purpose *bheemal* (*Grewia optiva*); ficus species such as *timla*(*Ficus roxburghii), pilkha and pilkhi, chhanchri and kabarha;* the medicinal *amla (Emblica officinalis), baherha (Terminalia bellirica and raini\ rohini (Mallotus phillipinensis) and paiyan, gonta, harshringar, guriyal etc.*
Some of the main bushes of the area are: *sinsyaru – the water indicator fodder,* after whom a large area is named, fodder and food *saikna or sakina (indigofera sp.,*); the wild berries and medicinal *kingorha(berberis asiatica), hinsar and kali hinsar; gandhela\karhi patta*(curry leaf), *bhararha* – fodder, medicine and fuelwood, the hardy, medicinal *semali(Vitex negundo)* and the water loving, fodder important __ *khaksa/ dom khaksa and padarha.*

Vines such as the precipice holding and enormously useful *maloo\maljhan (bauhinia vahlii*), the medicinal *gilloe(tinaspora cordifolia), gainthi, gaindalda and pahari patta* ; the savoured for its tubers *turarh;* the fragrant *surmarhi and gorgeous maalkangni;* the hardy horse fodder and medicinal *serwala* and many others.

Grasses like *golda and tachhila* -- the golden chosen fodder grasses, *musola, pildu and bhora, sallam*, the tall roof thatch and *ringaal*, the fine as reed, multi-use hill bamboo.

Herbs such as the neuro-tonic, anti-epileptic *brahmi booti*, and other medicinal herbs as *parh kesar, musli, sapaki or kutki, dandiyon ki jarhi*, *kali khatai and neelkanthi, diverse thundiyari varieties and van bhangjeer*.

A spectacular diversity of medicinal plants, with uses known to local people and local and classical *vaids*, is found in the area. We have so far identified upwards of fifty species. Some of the main one's are – *dalchini (Cinnammom sp.), amla (Embelica officinalis), baherha (Terminalia bellirica) and raini\ruhina (Mallotus philipinensis)* among the trees; *gilloe (Tinaspora cordifolia), Gloriosa superba, paharhi patta, gaindalda, serwala and gainthi* among the vines; *kingora (Berberis asiatica), hinsar\hisalu, sainkna\ sakina (Indigofera sp.)* amongst the bushes; and herbs such as *musli, sapaki/ kutki* and the ones listed in above para.

Many exotic weeds have arrived, adapted, and spread over the area in the last fifteen years. *Kala bansa* or *lukjarhi*, is today ubiquitous, having replaced native diversity at many places. *Lantana camara*, the well-known exotic has climbed upto 4,500 ft, adapted, colonised a sub site and is spreading. Thorny herbs of atleast five kinds, locally called *kurre*, some of them brought in by nomadic goats, are widespread, and are flourishing.

Fauna

An impressive faunal diversity compliments the floral diversity of the area. Many species of herbivores, such as *seerau/serow (Capricornis sumatraensis), jarhaoo (Cervus unicolor), ghurarh/goral (Nemorhaedus goral), kakarh (Muntiacus muntjak);* carnivores including *bagh (Panthera tigeris), baghera (Panthera pardus), van billi (Felis chaus), and ban bijju (Felis bengalensis), bhaloo (Selenarctos thibetanus), suar (Sus scrofa), bandars (Rhesus macaque*) and *langurs (Presbytis entellus), totriyala (Martes flavigula),saulla (Hystrix indica), khargosh (Lapus rigicollis ruficaudatus)* and a variety of rodents and reptiles are found in the area.

Of the above, serow (*Capricornis sumatraensis*), himalayan black bear (*Selenarctus thibetanus*), tiger (*Panthera tigris*), leopard (*Panteera pardus*), and leopard cat (*Felis bengalensis*) are on Schedule I of the Wildlife (Protection) Act, 1972. Barking deer (*Muntiacus muntijak*), goral (*Nemorhaedus goral*), common *langur* (*Prescybytis entelus*) and sambar (*Cervus unicolor*) are on Schedule III of the same Act.
The wide avifaunal diversity is only partly identified. Some species we and the loca people could identify are scarlet minivets (*Pericrocotus flammeus*), paradise and other flycatchers (*Muscicapa sp.*), falcons (*Falconidae sp.*), parakeets (*Psiittacula sp.),* barbets (*Megalaima sp.*), munia's *(Lonchura sp.*), partridges, eagles, tree pies *(Dendrocitta vagabunda*), magpie robins (*copsychus saularis),* sunbirds (*Nectarinidae sp.*), *hariyal*, woodpeckers (*picidae sp.), andhi chiriya*, jungle fowl, doves (*Columbidae), hillans*, mountain crows (*Corvidae),* the *kaphal pakyo cuckoo* and many other kinds of birds. The area has an exceptionally rich diversity of butterflies and moths, bees and other insects.

CULTIVATED DIVERSITY

On the agricultural terraces of the area grow a vast array of indigenous Himalayan crops and varieties, well adapted to the local agro-ecological niches. Completely rainfed and organically grown, these diverse crops are dependent on neighbouring forests and grasslands, for fertility and a suitable agro climate.

Amongst the locally grown indigenous crops are wheat, *mandua\ragi(finger millet)*, corn, various millets such as *jhingora* and *koni*(barnyard and fox tail millet), pulses such as many *rajma* (kidney bean) varieties, *bhatt*(s)--traditional soyabeans, *urad*, *tor* (pigeon pea), *kulat* and *masoor*, oilseeds like mustard(*torhiya*, *rada* and *sarson*) and *til* (sesame seed), *ramdana\chulae* (amaranthus), and vegetables and spices like ginger, turmeric, chillies, *bhangjeer* and others.

There are numerous time-tested combination crops; especially in the monsoon kharif crop and all crops are part of a rotational system. Some important combination crops are mandua, amaranthus and urad with cucumber vines on the edges or in the middle too; corn with rajma (kidney beans); turmeric is typically grown on the borders of the ginger terraces; chillies are ringed with rajma vines or intercropped with rajma plants; jaun-masoor dal and wheat-masoor dal are winter crop combinations. Crop rotation systems are elaborately worked out and strongly believed in. A typical combination is ginger followed by chillies the following year, mandua or jhingora come next followed by rajma. A local variety of mustard called torhiya is an excellent short duration crop between the monsoon and winter crops. The traditional crop rotation system is undergoing changes, as we shall discuss in the next section.

Another defining feature is a traditional agroforestry system, with numerous and diverse useful trees lining and stabilising the agri terraces. These wild and nurtured trees, and the bushes, grasses and herbs on *kalna's* (hillsides between terraces), around terraces and on large surrounding community lands make the local agroecosystem a rich, wild, diversity site too. For many families, the entire fodder needs during the monsoon months are met from private lands.

Wild relatives of many cultivated crops like ginger, turmeric, *mandua\ ragi(Eleusine sp.)*, amaranthus varieties, *sunti\lobia*(cow pea), cucurbits, ridge gourd are found in the area.

STATUS OF CULTIVATED DIVERSITY

Crop wise assessment of changes over the last twenty years, in **area under cultivation and overall production**, at the farming household level, for all the major crops and varieties was undertaken across the villages and hamlets of the area. Through interviews and group discussions covering well over 50 % of the population.

The crops affected by an enormous decline in area under cultivation are *jhingora* (50 to 75%), *jaun* (barley) and *bhatt* (traditional soyabean varieties). No seeds even of traditional Bhatt crop are to be found in the area. The jaun crop may well be on the way out. In the case of wheat, four out of five traditional varieties grown this area have completely disappeared and the fifth may well be on the verge of a similar fate, as the seed survives only with one family in a remote hamlet. The seeds of this last remaining traditional variety were lost over recent years due to repeated failure of winter rains. This is the one crop where new hybrid seeds have made a huge inroad, wiping out traditional varieties. Shorter growing season/late sowing properties appear to be the relative advantage.

For most crops, the average annual production levels per family (over 20 years) have fallen dramatically, while the cultivated area has not declined significantly. The major crop of *mandua* has seen a 50 to 65 % decline in production. Wheat crop has seen a production decline in excess of 80%. *Jaun* (barley) production has declined by 75 to 100%. Production of *ramdana* (amaranth) has declined by 80 to 95 % (across different years) while the net sown area remains same.
All the pulses and beans have seen a shocking decline in production.

* *Kulath* has declined from 40-80kg to 0-5 kg.	Above 95 %
* *Tor dal*, from 40-50kg to 1/2/5 kg.	Above 90%
* *Urad*, from 10-50 kg to 1-5 kg	90%
* *Bhatt dal* is locally extinct.	100%
* *Naurangi*	65 to 90 %

Only two crops have shown an increase in cultivated area as well as production. *Adrak* (ginger) has shown an increase of 5 to 7 times of area under cultivation. While area under *haldi* (turmeric) cultivation has increased by 4 to 5 times, in the last 7-8 years.

The above figures reveal significant decline in area under some crops like jhingora, jaun, bhatt, mandua etc. What is most alarming though is the decline in production levels. While this is true for almost all crops, the production of many crops has

fallen drastically. The situation of pulses and beans is the most alarming. This suggests that many crops are facing severe threats/constraints although farming farming families are still persisting with their cultivation. But for how long?

CHAPTER 3

MAJOR FACTORS BEHIND LOSS, THREATS AND ISSUES FACING BIODIVERSITY

This section has primary/proximate and consequent threats, underlying causes and other key local issues and factors with a bearing on biodiversity conservation. Some key site-specific features need to be borne in mind, to appreciate biodiversity values, the intensity of threats and consequences of biodiversity loss on this particular site.

- Extremely steep slopes, with an average gradient of around 60 degrees.
- The dominant rock types are fragile, loose, and fractured.
- Exceptionally heavy, especially monsoonal, rainfall.

With the coincidence of these huge factors in one context, the only way these Slopes remain stable is when they are covered with a dense and diverse floral Mantle.

WILD DIVERSITY

Proximate Causes and Primary Threats:

Forest fires have clearly been the single biggest threat to wild diversity over the last 10 to 12 years, occurring with an increased frequency, intensity, and spread. This is true not only for this area but most parts of Uttaranchal. A combination of significant factors -more and longer dry spells (frequent absence of autumn/winter rain and even spring/early summer rain turning the forests to tinder boxes), total lack of preventive and control initiatives by the forest department and local communities (for more than forty years and changing local attitudes (increase in willful and negligence/accidental fires) -make a highly inflammable mix.
On the positive side, over the last five years, there have been initiatives by the local communities to prevent and control fires. (See Ongoing Initiatives section).

Excessive Goat Grazing: A very severe, unbearable threat given the locational features mentioned above.

Migratory Goats: Large migratory goatherds comprising more than 1,000 goats, from Uttarkashi district of the U.P hills, had been spending four winter months here, since the last 30 odd years. Prior to that, they were not allowed onto the

steep fragile slopes of this site and they moved through this area, along the riverbeds onto the Sal forests of the Doons, where they grazed through the winter.

Camping for long on one spot, concentrated/excessive grazing, lopping of branches, hoof impacts led to widespread denudation of flora and set off soil, rock erosion, gully formation, destabilized slopes and landslips.

Through the 1990's many sub-sites were subjected to concentrated goat grazing by winter and forest fires by summer. Need we comment on the fate of wild biodiversity

During the making of the plan for wild diversity conservation (under BCPP) in 1997, this was the foremost issue the village women raised. Their determined opposition and initiative led to the two main villages of Nahikalan and Chotti Nahi restricting access of migratory goats to large tracts of upper and mid hill zone proximate to the village. Five years down the line this restriction has held.

Women of the area have warned that letting goats graze in these forests will negate the regenerating biodiversity in just a year.

The forest areas away from these two villages are still camped in and grazed by goats, such as bacharvarh, kutiyan, kundiyan, sinsyarukhala etc. Notably, villages of kotla, kairwan and sateli still allow migratory goats to graze in lieu of money. This coupled with the fire threat maybe a big factor behind the increased wild animal crop raiding in Nahikalan and proximate villages, with good forest habitat.

The forests in question are Reserve forests and migratory goat grazing is most likely restricted/not allowed in this area. Effective initiatives by both the forest department and local communities are needed.

How The Women Managed To Get Their Priorities Addressed

"HUM TO NAHIN DAIN DINDA!"(We won't let the forest be sold), *said the women emphatically. As the goatherders pay money to the village panchayat for forest use, it became a question of money to panchayat versus forest well being and fodder availability. With the men thinking about the money and the women about fodder and forest. Suddenly, it was women versus men and the differing gender perceptions became strikingly apparent. Though some men quietly supported the women. The herders offered to double the money and more, from the existing Rs.2500 - 3000. Even as the men got tempted, the women put their foot down. "You may get Fifty thousand rupees or a lakh, and you'll sell the forest. But we don't care about the money. We'll chase the goats away if they come. For good measure the men were warned that if the forest is sold, from the next day, it will be the men who'll go to the forest for fodder, and the women will stay at home.*

This happened in the final meeting to formulate the BCCP Plan, in 1977. They are clear and determined to this day.

Local Goats

Some herds of goats with local families have been an excessive degrading pressure on sub-sites proximate to habitation.
A combination of factors including enhanced awareness and falling prices for goats has brought population of local goats down from 125 plus to around 25.
These fragile hill slopes cannot bear goat grazing and adequate and sustainable answers to this problem are needed.

Over the last 10 odd years some **new, callous methods of fodder, fuelwood collection** and other local utilizations of biodiversity have come into vogue, especially amongst the young, ignoring the vast traditional knowledge and practice of sustainable utilisation. Excessive lopping, which included big branches and tree tops, small trees, green loppings for fuelwood etc. proved non-regenerating and degraded diversity especially in the village common land and other proximate to habitation sites. Similar utilization from private land continued to be sustainable. Underlying causes are explored in the next section.

All instances of **contractor driven medicinal plant extraction** have proved to be excessive, callous and non–regenerative. Pushing all targeted plants like *gilloe, semla, kingorha*, and *dalchini* to locally rare or endangered status. Further, as some of these plants were dominant on specific sites, this paved the way for the degradation of entire sites.

Hunting is a traditional small-scale activity at the local community level. Increased raiding and crop losses to wild animals, leading to anger and resentment, provide a fillip to hunting. The issue of crop losses to wild animals and resultant conflict is elaborated in the Threats to Cultivated Diversity Section. Occasionally, hunters from villages downstream also visit the forests.

Severe soil and rock erosion, landslips and landslides are an inevitable consequence of excessive pressures from the major threats. Local contextual features (gradient, fragile rock types and heavy rains) intensify/magnify degradational pressures and these then become threats in themselves.

Another outcome of excessive pressures on native flora has been the arrival and rapid spread of **exotic and bio-invading species** such as kala bansa (eupitorium), lantana camara and jangli pudina. Many varieties of thorny sticking weeds have creept in because of migratory goats. These colonizing species then pose a challenge to the natural regeneration of native flora.

Degradation and biodiversity loss have also **depleted the exceptional water sources** of the area. Of the 20 odd perennial springs in the area in the mid 1960s,

8 had dried up by 1997 and the remaining had considerably reduced flows. Villagers speak with concern of the hills being much drier (rapid and excessive soil moisture loss) and its manifold consequences. This consequent threat needs to be addressed directly as well.

Most sites are subject to a combination of threats. When big threats are simultaneously at work on the same site (e.g excessive migratory goat grazing by winter and a big forest fire threat by spring summer on the same patch of forest) the result is widespread degradation. The most critically degraded and altered component is ground level flora, especially species preferred by browsing animals.
Over the **last five years initiatives by LCs** have led to improvement in this scenario. Details in Ongoing Initiatives.

Whenever and wherever, there has been drastic loss of biodiversity through severe pressures, it has triggered a chain reaction of degradation (rock/soil erosion, landslides, choking springs…), leading to further biodiversity loss and degradation. This process is hastened/magnified on this site by local contextual features (steep gradients, geological fragility, and heavy rains. This necessitates a dense, diverse floral mantle for stability and very survival of the hills and water sources, making ***biodiversity conservation a local contextual imperative****, on this site.*

Underlying Causes And Concerns

Despite deep dependence and initiatives at conservation there exists a fair degree of **alienation from responsibility and ambiguity** in the LCs relationship with local natural resources. The LCs long history of continued livelihood dependence, sustainable use, as well as initiatives at conservation have never been adequately (officially) recognized and acknowledged, nor real participation ever sought.
In the last 15 odd years whenever there have been big threats to biodiversity and the environment __ mining, fires, goats… the LC got mobilized to meet them with significant success. But this happens only when the threats get big and devastating. Till then it waits for the FD, (for govt. godot?) and time is lost.
In the last 30 odd years the FD has not addressed the major threats facing the forests. Remoteness due to lack of a motor-able road is maybe an important reason. According to all local accounts, the only time the FD (forest guards); visit the area is when someone is building a house, to collect fines or bribes for timber use. And yet, there is arrogance that the FD is the sole protector of forests. All this together breeds resentment and alienation amongst the LC.
This lack of conservation, responsibility and ownership, an ambiguity about who is responsible for protection, conservation, and restoration. Who will meet the big threats to diversity. A scenario of unclear or no one's responsibility makes conservation the liability or complicated and hard to achieve.

The **rights, role and responsibility of the LC and the FD** and areas of partnership need to be clearly acknowledged and stated, so that they can play their full and timely role in conservation.
The last few years have again seen enhanced responsibility and initiatives from the local communities.
Social cultural values and attitudes of the LC have been changing too. There has been significant devaluation of traditional occupations (animal husbandry and agriculture in this case) and taking natural resources for granted. This is despite continued heavy dependence on the same for livelihood and survival.
Growing needs and aspirations, large scale outmigration (usually of part of the family) over the last two decades, some government and other jobs, the arrival of television, the nature of school education, wage labour in govt. schemes and programs like JRY, Doon Valley Watershed, Sunishchit Rojgar etc and exposure to corruption are some likely influences. The young aspire to migrate to big cities or the Doon valley.
Unmet or inadequately met basic developmental needs of education; health, livelihoods, and lack of transport have generated strong feelings of neglect and apathy amongst the LCs. The paradox of nearness and remoteness, perhaps, fuels aspirations and makes their fulfillment difficult.
Diverse and never ending work, often leading to drudgery is characteristic of the lives of human communities, most so of the women and families with no jobs (the majority) and or minimal lands. Women's lives are ceaseless work, ranging from 14 to 18 hours a day. Fodder, fuel wood and water collection needs are a significant part. This puts unsustainable pressure on proximate areas. The need for easier access to diverse fodders and fuelwood was expressed by the women.

Adequate and gainful **livelihood and employment** is a regular challenge, priority, and concern. Any plans for biodiversity conservation in this area will need to address these issues, to be effective and equitable.
The increasingly erratic **rainfall & climatic patterns** are a new cause for concern that needs to be accounted for and engaged with. This factor significantly enhances many other threats and lends a greater sense of urgency to measures to counter these threats. Notably, the increased threat of forest fires (due to longer and more frequent dry spells), conservation of water sources and soil and moisture conservation measures, etc.

Atleast, four major site-specific factors make biodiversity conservation an imperative on this site:

*** Spectacular wild and cultivated biodiversity of the area.**
*** Extreme fragility of these hills, necessitating a dense diverse floral mantle for their stability and survival.**
*** Conservation and security of critical water resources.**
*** Human livelihoods and very habitation in this area is virtually unimaginable without local biodiversity.**

AGROBIODIVERSITY –

Major Issues, Challenges And Gaps

Dramatically increased crop losses to raiding by a diversity of wild animals are the biggest threat/disincentive to farming and agrobiodiversity in these hill villages. In some villages, nearly half the agri terraces have been abandoned due to inability to protect them from raiding. Many important traditional crops, like mandua and jhingora etc., the mainstay of food and nutritional security are being cultivated less and given up in preference to cash crops, that are not/less preferred by animals. There is widespread increased hardship, anger, resentment, frustration vis-a vis wild animals (and agriculture even) and a demand for arms, giving a fillip to hunting.
Major crop raiders in order of threat factor are monkeys, wild boar, sambar, rats, kakarh, solla (porcupine), bear, etc.
There are two ironies here. A section of wild diversity is the biggest threat to cultivated diversity. Secondly, large forest tracts that local communities have a big role in protecting (which are the best in the area) are a big factor behind the wild mammalian concentrations in this area and increased crop raiding. A village wise man asks, isn't islands of good forests while others around degrade, a kind of imbalance too and difficult to sustain?

Other hill communities that have protected their forests are increasingly facing this issue. This reality forecloses the support of LCs for wild mammalian conservation and the anger spills over to non-raiding wild fauna too. It has a potential bearing on overall community initiatives and support for forest conservation/regeneration.
We feel it is an urgent, priority responsibility of the conservation community (forest and wildlife department, wildlife experts, conservation NGOs etc.) to address and harmonise this issue for both wild and cultivated diversity to thrive.

Severe soil erosion and moisture shortages are a big challenge because of rain fed agriculture in the area. This is in an overall context of steep
Slopes, frequent heavy downpours, sloping terraces, and some wrong tilling practices.

It is only the heavy manure replenishments and geological profile of most lands that Keep agriculture going. Our crop-wise assessments reveal that productivity of most crops has been rapidly declining. This challenge and the need to address it is enhanced due to changes stated in the next para.

Increasingly Unpredictable Local Rainfall and Climatic Patterns over the last 10 to 15 years. Expressed as a phenomenon of frequent and long dry spells (from autumn to summer even), frequent absence of winter rain, heavy concentrated downpours, unseasonal rains, lack of snow/hail, late arrival early/abrupt withdrawal and excessive concentrated downpours especially in mid and late monsoons etc. Even rainfed farming communities are finding the sky difficult to read. *What and how to farm in times of changing, swinging climate*? The challenge is big for rainfed farming communities. Focused and effective action on soil and water conservation becomes all the more important and urgent.

The last few decades have seen a **sustained neglect** of the vast treasures **of indigenous Himalayan crops and varieties**. Despite their exceptional nutritional and cultivation characteristics in the given agro-ecological Himalayan contexts. Building on their strengths, helping meet the challenges is yet to happen. Promotion and support through agricultural extension and other programs has been reserved for hybrid varieties and locally alien crops and the chemical inputs required for their cultivation. Explicitly or implicitly promoting these as replacements/alternatives to traditional agro- biodiversity. Over the decades this has served to devalue traditional biodiversity and agriculture. Government policies/programs and commercial interests have been critical factors behind this.

Similar or worse has been **the fate of local knowledge and practice** linked to agriculture. A vast over centuries evolved knowledge of agriculture and local agro-ecological conditions... about nearly forty different crops (and their varieties), their cultivation needs and techniques, combinations and rotations, maintaining fertility through organic methods and moisture retention techniques through sustainable utilization of local resources. In entirely rain -fed conditions. All this knowledge is still waiting to be acknowledged and built on. Largely neglected by agricultural policy, programs, institutions, extension, and media.
There seems to be no concept of partnership with traditional farmers to meet challenges, constraints, and possibilities, so agriculture can meet diverse local needs sustainably.
Does anyone believe that there can be sustainable agriculture providing food/ nutritional security and livelihoods for mountain people, by totally ignoring existing agro biodiversity and vast traditional knowledge and practice?

Changing local social-cultural perceptions about indigenous crops and varieties, and a dwindling of associated knowledge, especially among the young is a new challenge. Various issues listed in this section are the main factors behind this.

Excessive work and drudgery: For the women of this area, everyday is full of diverse, unceasing work. The two mainstay occupations of the local communities are animal husbandry and agriculture and both are almost entirely dependant on women. The strenuous part of work and drudgery is reserved for women. Finding, cutting and carrying head loads of fodder twice a day, round the year, over kilometers and tricky paths. A head load of fodder can weigh upto 50 kgs. Volume apart. Cleaning and carrying cattle dung to terraces that can be as much as a kilometer away, twice a day.

Numerous other tasks are entirely or primarily left to women carting buckets of water, head loads of fuel wood, cooking, cleaning, and looking after the kids and the cattle… A key LC member of our team once said, "Everything is diverse here, the forests, agriculture and our never ending work". Overall, each day involves between 14 to 18 hours of work.

There's a lot of hard, repetitive and long hours of work involved in traditional biodiverse agriculture, and this is apart from all the work mentioned above. This is usually not considered and engaged with by anyone, including proponents of diversity in agriculture, like us. Lets add the following agricultural scenario to activities described above to appreciate the life of women, in hill villages, so that real and holistic answers can be sought.

Diverse crops and varieties mean more and longer seasons of work. Cultivation practices of many traditional crops, especially weeding and hoeing can be back breaking drudgery. Women have stated this to be one of the biggest drudgeries and some even stated that unless ways are found to lessen this back-breaking work, crops like mandua and jhingora will not be cultivated for long. Clearing and carrying headloads of diverse dungs to far-off terraces is another drudgery area --- women are almost never walking without some load on their heads. Over the last 10-15 years, increase in wild animal raiding of crops is demanding increased effort at crop protection, in the form of day and night vigils. Rainfall and climate have become increasingly unpredictable. These last two factors put a question mark over whether there will be a crop after all the work is done. Excessive work is a big contributory factor behind decreasing cropping area of crops that are difficult to grow and protect, leading to a shift towards less animal favoured and less labour intensive crops, often cash crops like ginger.

From any holistic and just perspective it is imperative that ways be found to lessen these unacceptable levels of work drudgery as well as effective strategies for other threats, so that work adds up to something.

There has been a sharp **increase in pest and disease problems** facing agriculture, over the last ten years. (Interactions with local people, current and past field observations). There are locally new pests and diseases, more crops under threat and increased scale of damage. Many new problems appear linked to changing rainfall patterns. Excessive mid and late monsoon rain precedes the wilting problems in kulath, tor, chhemi/ rajma, chillies etc. The insect attacks on amaranthus, kulath, rajma...also follow the same pattern.
A knowledgeable local member of our team point out instances of crops where cultivation was increased dramatically (for the market) to near monocultural levels and very soon it developed serious pest/disease problems. Ginger, rajma and chillies are three main crops to've suffered this fate. In particular years, they were almost wiped out across many villages in the area.
In pulses, cultivation on the same terraces, year after year, ignoring traditional rotational practices, is a likely factor too.
Absence and decline of winter snow and rain were also pointed out as contributory factors.

Declining productivity levels: Many individual and groups of crops like pulses and winter crops have seen dramatic decline in productivity. Overall too crop productivity has been showing a declining trend, according to detailed crop wise assessments by local communities across the area. Of the many factors the primary ones are soil erosion and rapid moisture loss due to sloping terraces and heavy rain etc., increased crop damage and losses to wild animal raiding, increasingly unpredictable local rainfall patterns, lesser quantities of organic manures, disruption and change in rotation of crops and varieties and in combinations of crops, increased outbreaks of locally new pests and diseases, lack of timely sowing and weeding of crops etc.
In Barkot, a remote hamlet nestling in and under an oak forest, the decline has been marginal and dramatically less than in all other villages and hamlets.

Low local market value and limited overall market access: Inspite of their exceptional nutritive, medicinal values, most of the important traditional crops have a low market value, especially in the markets the local people can access. The nearest raodhead is more than 8 km away, on a steeply sloping path, hindering market access by adding to time, effort, and transportation costs.
Some traditional crops have a good market value, but the market linkages are underdeveloped. Creative strategies to enhance market appreciation and value of traditional crops can play a significant role in conservation of many traditional crops.
Initiatives undertaken in the last years need further development.

A serious outcome of the above issues/threats is **clear declining trends in area under diverse traditional crops.** There is a dramatic reduction in cultivation of many traditional crops and a movement towards extensive cultivation of cash crops. This can have serious consequences, for agriculture, biodiversity, and people.

The figures for changes in cropping area and production levels for all crops and varieties over the last twenty years reveal some highly disturbing trends (Section on Status of Cultivated Diversity, in Chapter 2). With the exception of a few traditional crops and varieties the cultivation area for most crops has not declined dramatically. While as, the production levels of most crops have plummeted alarmingly. Which suggests these crops face severe threats/constraints/challenges, even as farmers still persist with their cultivation. How long can this scenario last? With such dramatically declined productivity levels, mostly in the last decade, the overall scenario for traditional crops is not good. Unless the serious threats and constraints are adequately addressed with innovative interventions and soon.

As the above changes illustrate, the **above factors/constraints together** make for significant disincentives and lead to devaluation of agriculture as a preferred livelihood and employment option, especially amongst the young. Unaddressed, these constraints/threats have over time increased to make agriculture a risky, economically unviable occupation. This has reduced the extent of attention, effort, experimentation put into agriculture. The entire agricultural system is today under threat with serious short and long-term consequences, for agriculture, biodiversity and people.

As we've stated earlier, the vast local agro-biodiversity, due to its unique values and characteristics is an ideal base for agriculture and livelihoods in the region. For its survival and sustainably meeting present and future food/nutritional security and livelihood needs for the areas peoples, effective, creative, and holistic strategies are needed.

CHAPTER 4

PAST AND ONGOING INITIATIVES

History Of Environmental Initiatives

Khoda Paharh Nikla Choona – Dongiya Bagh ki Kahani
When The Valley Rose To Resist Mining

A young hill woman, a baby in arms and a toddler in tow, stops a convoy of mining trucks. But not before a truck drags her and the kids half a kilometre uphill...

Thick Himalayan forest valley. Late December, peak winter. A cold, wild wind carries the warm, high notes of a Garhwali folk song into the forest. A makeshift hut-camp by a stream, habitated by local women, men, children, Chipko veterans and occasionally by supporters from the Doon valley and way beyond.
For 25 years, till 1986, this rich, fragile valley saw reckless, wanton limestone mining. Never sticking to the leased area, blasting all over the valley including village land, no mining plans or inspections and continuing years after the lease got over_everything that can be wrong with mining was so here. Boulders rained on homes and agri-terraces endangering humans and cattle, perennial springs and streams choked under mining landslide rubble and parallel ran timber smuggling. *The biggest impact perhaps was how a mountain of blasted, loosened rock transfigured the Bhidalna into an angry torrent of hurtling boulder and stone, swinging madly till it got lost in an ever-widening boulder wasteland. Where once forests stood or agriculture thrived.*
When reasonable requests were met with violence and arrogance, the youth of Nahikalan wrote to the Chipko movement and Kalpavriksh (then a youth environment action group from Delhi) for help.
Meetings, folk songs, slide shows, slogans, and innovative direct actions were soon in full swing, invigorating and mobilizing the valley. The mining road was closed to trucks and trees were planted on it, alongside came up a hut camp, Chipko activists dug pits to bury themselves, in the way of mining trucks, a memorial was made in the forest for hundreds of langurs who died due to indiscriminate blasting. Local women and youth were at the forefront, organized into Yuvak and Mahila Mangal Dal's.
Soon, downstream villagers, dependent on this area for their drinking and irrigation water joined up, and still further downstreamers whose lands were laid waste by the now stony Bhidalna and Jakhan rivers.

Chipko movement slogans educate even as they evoke. Some favourites I remember are: *Aaj Himalaya Jagega, pathar wala bhagega ! Paharh ki haddi tootegee, Desh ki dharti doobegee! Upar dekho jahan khadan, neeche kheti, registan! Dongiya bagh, hatt, hatt, hatt ! ('O rock eating leopard, get moving!)*
The Chipko poet, Ghanshyam Sailani, composed a Garhwali folk song on the movement.
The movement was also strengthened by support from a small but enthusiastic band of environmentally active individuals from the Doon Valley and way beyond.
Money, iron rods, revolvers, trucks … the mine owner tried all these. They responded with Gandhi inspired Chipko movement methods and their greater knowledge of the mountains to evolve ingenious 'non-violent' guerrilla tactics. As the violence and injustice grew so did people's determination. Many brave people refused to cower even in the face of threats to their lives.
Realizing or accepting the value of non-violence, even when faced with an unscrupulous adversary was a big challenge. This was met by collective and individual creativity, the space for which was likely created by the non-violent nature of the movement. Finally, local people's resolve, the creative commitment of Chipko veterans and diverse contributions from so many won the day.
In hill valley and apex court, the wanton mining was fought and in the first environmental PIL (Public Interest Litigation) before it, the Supreme Court ordered the mine closed. This became part of the famous Doon Valley Limestone Mining Case, and all mines in the Doon valley were declared closed.
Some years later, the Union Environment Ministry declared the entire Doon Valley an Eco-Sensitive Zone (under Section 3 of the Environment Protection Act), and mining is one of the prohibited activities.

DEGRADATION AND REVIVAL – THE 1990's

Quite a few years of lull in initiatives followed. Returning to the area in **1995** one found **s**ignificant new threats to local environment and livelihoods. That summer when a band of us, environment researchers and activists, started a long **Forest Yatra** from this area, we walked right into the worst forest fires in living memory. The forests were primarily the colours of ash. White for what once was trees and black for grass and leaves. The Yatra's focus, naturally, shifted to understanding the causes behind increasingly frequent and widespread fires.
The full scale and intensity of changes underway dawned only **in 1997-98**, through the process of making **an action plan for wild biodiversity conservation for this area, as part of the nation-wide Biodiversity Conservation Prioritization Project (BCPP)**.
As the entire population of the area got into collectively understanding and assessing the status and changes in their natural environment (for the first time

ever), what emerged shocked everyone! Natural regeneration was strikingly absent, important plant species were vanishing (most showed decline); exotic bio-invaders were replacing natives, drying or reduced flow in natural springs, frequent landslides, and landslips. **Degradation (often severe) was evident across sites**, only the extent varied, as unbearable threats combined to ravage biodiversity and threaten the hills.
How did such degradation occur within less than a decade of a passionate anti-mining movement? Overall, longstanding neglect of basic needs and aspirations like education, health, transport, livelihoods; changing social attitudes and declining community feeling; small government programs and a big watershed project bringing corruption alongside. Strong feelings of neglect, disillusionment, and apathy were palpable, fuelling, and fuelled by the growing movement for a separate Uttaranchal state. The deepest bonds, with environment and amongst the community began to be ignored.
Vis-à-vis forests, an alienation from responsibility (with traditional dependence, rights, conservation initiatives and role never clearly acknowledged), changing attitudes (including taking natural resources for granted) and a virtually absent forest department (perhaps caused or exacerbated by relative remoteness).

Group and community processes revealed many shared perceptions and priorities. And heightened collective spirit and brought empowerment especially of women and children. We gather that the entire community seldom met anymore and the nature and pace of ecological changes underway was the big shock. Initiatives for conservation and other priorities started well during the project.

A People's Plan for Conservation of Wild Biodiversity (BCPP Plan, from now) was formulated and prioritized, in elaborate village meetings. The local communities took on responsibility for most of the strategies.

A group of us facilitating environment and livelihood-linked initiatives gave ourselves the name, Vividhara.

The two most important elements of **the approach** during finalizing the plan and the following years of implementation were: effectively and creatively countering the biggest, most urgent threats and an awareness/sensitization/mobilization approach which enhanced conditions for local initiatives and countering of various challenges simultaneously. Other important aspects were full play to indigenous knowledge and initiative, livelihoods, choosing multi-benefit strategies and actions, cost and effort effectiveness, awareness of varied relevant local possibilities and constraints like existing knowledge, attitudes, community dynamics etc.

RECENT AND ONGOING INITIATIVES

BCPP Plan In Action And Evaluation

As a part of this BSAP, the BCPP Plan for this site, made four years back was evaluated for its effectiveness. Key threats, changes, and especially, chosen strategies were assessed. A fuller evaluation of strategies can be seen in the Strategies chapter of this plan, this section primarily describes various initiatives undertaken since 1988 and points to gaps and future directions.

From 1998 started a phase of plan in action. Almost all initiatives were voluntary community initiatives, often facilitated by Vividhara; only two programs were supported through small external funding for four months:
a) Awareness, Sensitization and Social Mobilization
b) Lessening the Human-Wildlife Conflict
The biggest current threats were countered head on.
To meet the biggest threat of frequent and devastating **forest fires**, LCs and Vividhara initiated an awareness and mobilization campaign through evocative poems, slogans, songs, and posters. Made in art sessions and workshops with interested villagers, children and Vividhara members. Soon frequented locations like schools, water springs, forest paths, village walls… hosted these art works. Village meetings and children's groups chose ways to prevent and control fires. After 40 years, in 1999, the villagers of Nahikalan set out to control fires. On one such mission, along with a large regenerating forest they also saved a village from being burnt. This created a positive atmosphere for conservation initiatives across the valley.
Willful or accidentally lit forest fires are dramatically down in this area, but they still wander in from other areas and can spread from agri-terraces and grasslands.

While finalizing the plan determined village women finally got the entire village to back their priority issue of not selling forests to **migratory goat herders,** the second biggest threat to forests. This has protected significant tracts of top and middle hill forests near the main village from excessive 0goat grazing. The women continue to hold the village steadfast on this and goats are at best allowed passage rights as earlier.
The immense pressure of village goats on proximate areas has eased too, with their numbers down to 20 from 125(from 5 herds to 1). The awareness initiative and falling goat prices playing their role.

Callous non-regenerative methods of fodder/fuel wood collection that were coming into vogue have been substantially controlled through an awareness, sensitization approach based on traditional knowledge.

The **main village spring** lived under perpetual fear of landslides having been buried under twice within a decade. After discussions the Doon Valley Watershed Project agreed to support the work of making check dams and contour walls in this area and repair of a drinking water tank for cattle. Reviving an old tradition the area above the natural spring was declared out of bounds for goats and loppers. Later cuttings and saplings were planted by community shramdaan. Dramatic natural regeneration and enhanced water in the spring are there for all to see.

Since 1998, many **experience cum work camps** have been held for college students from Delhi. These mutually enriching experiences have often been the high point for awareness and community work (shramdaan). Exposure to Himalayan biodiversity and the ecosystem and nature experiences through forest and agriculture treks, acquaintance with the key challenges, first hand experience of life and culture in hill villages, interactions with villagers, voluntary work on chosen priority tasks alongwith villagers, sessions with children at the activity center, cultural evenings and feedback sessions are the main activities in these camps.

Many environment enthusiasts from different lands have also had rich experiential stays and sharings. These last two activities have been our **chosen version of eco-tourism**. Based on the experience and learnings of these years the local communities are enthusiastic and there is considerable scope of expansion.

In 1988, **a library cum activity center, with nature and environment as focus areas,** was started in the *panchayat ghar* of Nahikalan. With its few hundred books and art materials this is a favourite space with the village children and some grown-ups. Story telling, thematic posters, singing are other occasional activities. The teachers of the local schools and parents vouch for the positive learning and other effects this has had on the children. Several environmental workshops and sessions have been held in the local schools and the enthusiastic students and teachers are keen on Vividhara members continuing these activities.

Cultivated Diversity Initiatives

As stated earlier, the biggest threat before agriculture and agro-biodiversity is spiraling wild animal raiding of crops. The first half of a two-pronged strategy involves enhancing water and food availability in the forest habitat. To meet animal's needs and regenerate the ecosystem, half a dozen **joharhs/pokhars (ponds/pools) were revived/made anew on hilltops and as many natural springs**

were revived. Implementing actions for reducing threats of forest fires, goats, etc. helped improve the wild food situation. The second part is **making crop raiding more difficult** for the animals. Over the last few years several innovative methods have been identified and tried out, resulting in some reduction in crop losses. This complex challenge requires further engagement.

To counter economic and social devaluation of traditional organic agriculture an **organic food marketing initiative was initiated in 1992**, between the farmers of Nahikalan and consumers in Delhi. This first organic food marketing experiment in Delhi revealed an enthusiastic niche market.
Few years later it revived in a new form. Vividhara and the areas farmers, in partnership with the Beej Bachao Andolan(Save the Seeds Movement -- a pioneering farmers movement in the Garhwal Hills to save dwindling Himalayan crops and varieties) have **from 1995 to the present, held an annual exhibition on Himalayan cultivated and (and some wild) biodiversity and sale of organic foods and natural products, at the popular Dilli Haat in Delhi**. As a part of Dastkar's Nature Bazaar, the best regarded annual crafts mela in Delhi. These exhibitions seek to create awareness and further support for dwindling indigenous crops/foods and organic cultivation through enhanced market and societal value, leading to furthering of sustainable rural livelihoods. Through live displays, sales, folk songs, informal interactions, theatre, photographs and posters these entirely non-funded exhibitions have over these eight years, **outreached to a few lakh urban citizens** of varied social backgrounds and ages. Small scale direct selling and retailing through a few outlets is on through the year.

On the hill end, numerous farming families spread over six villages are getting higher returns for their surplus crops. Providing a **fillip to several devalued and neglected indigenous Himalayan crops** with exceptional nutrional/medicinal attributes and suitability to local agro-climate. Millets like *mandua(ragi*), jhingora(barnyard millet), kulath dal (nature and ayurveds remedy for kidney stones), the nutritious drought-proofing amaranthus, medicinal himalayan turmeric and ginger are some such. Locally developed natural products include pickles, chooran/mouth freshner, jams from (locally abundant) amla, a candy from medicinal ginger, a traditional cough medicine, a natural insect repellant/air purifier from a wild marigold relative etc. Cultivation of some locally suitable crops is going up and hundreds of amla trees have been planted.

The potential for expanding scale is immense and needed to further benefits to more organic farmers and making healthful organic foods available more widely at non-exorbitant prices.

Some other activities initiated on a small scale in the last few years:

* Identification and integration of suitable fruit trees and medicinal plants in the agro- ecosystem.
* Encouraging/facilitating homesteads and vegetables, for nutritional security and conservation.
* Facilitating improvement in organic manures, including from neglected/wasted biomass.
* Enabling the installation and functioning of a pan-chakki (water mill) for making grinding various grains and spices and husking of crops. To lessen burden of lugging sacks of grain and flour for kilometers over steep slopes.

Brief Evaluation Of Species, Sub-Site And Overall Changes

Due to the above initiatives significant overall and species and micro-site level changes/improvements were observed in the ecological and biodiversity status of the area. The most striking and heartening change is the natural regeneration of native floral diversity across all the sites, including on the most degraded. On some sub-sites the regeneration in just 4 to 5 years is dramatic. Local women specifically mentioned the return/regeneration of small trees of prioritized species on several micro-sites.
Most of the highly threatened and prioritized species have shown a revival. See Annexure-1 for Prioritized Flora List. Of the ten highest priority tree species (BCPP Plan, 1988), seven (Banjoak, Bauhinia semla, Cedrala toona, etc. have shown) have shown considerable to dramatic revival. Amongst the prioritized bushes too, most like bhararha, khaksa, kingora, hinsar, gandhela, itholna etc. have shown a perceptible regeneration. In the case of most prioritized Vines and Climbers the changes were less difficult to detect, as no significant trends of improvement or decline were observed. Perhaps indicating continued pressures and a need for closer observation and attention.

The three major grass fodder species, Golda, tachhila and musola have shown improvement in status, significantly due to some private and community grass patches being closed for regeneration after some plantation under the Doon Valley Watershed Project. No further decline was detected in any species and some herb species like the various thundiyari varieties, admarkha/apamarg, van bhangjeer etc. showed considerable regeneration.

On many micro-sites native floral species could be seen competing valiantly and even successfully with bio-invading species like kala bansa etc. This has been possible on sites where there is a significant lessening in cattle and human pressures on native flora. Overall, most sites colonized or dominated by kala bansa are showing a

revival of native diversity, for the same reasons. Overall, from a linear progression the threat of kala bansa colonization and domination is substantially less than was the case five years back. The chosen, prioritised BCPP approach appears to be working. Other strategies like manual uprooting are also practiced on agri-terraces and even on community lands by some enthusiastic locals and by the bachha (children's) brigade, on the hill top meadow, their favourite micro-site for grazing animals and playing.

Lantana camara, the other major exotic bio-invader, continues to be a significant future threat as it has aclimatised and is spreading from its one colonized site. Community cutting back of kala bansa was undertaken in 1998 and it suppressed the plant for a few years and gave opportunity to existing native diversity to revive, but the temporary respite is over. Community initiative to cut or uproot it on sight appears to be the only effective approach at present.

Landslide and landslip occurrence has shown a phenomenal decline. There have been no new landslide sites. Other than one old, geologically unstable micro-site (Patniyan ka dhompra) no landslides have taken place in these years. Most of the other dozen or so recently active sites have been moving rapidly or slowly towards stabilization. Landslip occurrence too is dramatically reduced.

Rock and gulley erosion is remarkably down in the sites proximate to habitation, primarily due to gulley plugging in most gulleys and reduction in biotic pressures. But most of the check dams and gulley plugs have filled up with stones and many gulleys are in need of further watershed measures. Soil erosion levels indicate a decline, as native diversity regenerates. Soil moisture levels too are showing some improvement across many areas.

Many natural springs are showing increased water flow throughout the year or longer seasonal flow. Local women feel the joharhs and pokhars on hilltops have significantly helped in this and more joharhs need to be made for which they suggested appropriate sites. Some revived springs need further watershed works in their immediate catchments.

Most of these changes are nascent and fragile, merely indicating a discernible change in trends towards the better. Local contextual factors like steep slopes, heavy rainfall, predominantly south/south west facing slopes are ever present.

As the village women warned, excessive goat grazing and/or rampaging forest fires could wipe out the benefits in a year. The good efforts must sustain and more needs to be done.

Through this period and process many strategies and actions have been tried out, with significant positive impacts and an identification of most promising approaches and relevant local factors. Including during formulation of this BSAP.

Chapter 5

STRATEGIES AND ACTION POINTS

For Conservation of Wild and Cultivated Biodiversity

Overall, the draft Strategies and Action Points chapter has the following sections/format for most Strategies and Action Points __

- Strategy name and number.
- Priority rating (for Strategies and for most Action Points, separately).
- Brief background/introduction to Strategy or Action Point (including local contextual factors, threats or factors behind loss of diversity), for important strategies and wherever needed. This is to enable readers to better assess the strategy in the light of local factors.
- Occasionally, a small statement of objectives of strategy when these are not obvious. Justification and gap analysis are additional sections for some of the most important strategies and when needed.
- BCPP Evaluation for Strategies and Actions (whenever a similar strategy/AP was formulated under the BCPP Peoples Plan for Conservation and was implemented/experimented with in the last four years. So that lessons are incorporated and not missed.
- Action points and sub-actions are marked distinctly with numbers for main and sub-action points and are usually elaborately detailed.
- The basic format described here is also followed for Action points separately when needed, but mostly at the strategy level when common to all action points.
- Elaborateness of details depends on the priority status of the strategy/action point, need for details and time possibilities. Given this we've attempted to work out strategies and actions as much as possible.
- Responsibility for implementation.

The Strategies and Action Points are organized and numbered in the following format— W - stands for Wild Biodiversity Strategy, C - for Cultivated Diversity Strategy with relevant numbers and Action Points are stated as .1, .2 and Sub-Action Points have a further decimal mark.
e.g W1.1 is Wild Diversity Strategy 1, Action Point 1 and
C1.1 .4 is Cultivated Diversity Strategy 1, Action Point 1, Sub-Action 4.

Section One

WILD BIODIVERSITY CONSERVATION STRATEGIES

Evaluating Learning and Planning Anew

As stated earlier, a Plan for Wild Biodiversity Conservation was made for this area four years back as part of the Biodiversity Conservation Prioritization Project of WWF-I . As part of this BSAP exercise, the BCPP Plan has been evaluated for its effectiveness and appropriateness in meeting its objectives.

Evaluations of Strategies and Action Points implemented/tried out over the last 4 to 5 years are presented as a separate section towards the beginning of many individual strategies/action points. The overall evaluations and site/species specific evaluations are in section, Recent and Ongoing Initiatives and BCPP Evaluation, in the last Chapter.

This evaluation and understanding of the experience and effectiveness of a recent plan was an important component of formulating strategies for this BSAP. It enabled us to focus, detail and prioritise strategies and action points beyond what may otherwise have been possible. Helping us to build upon or change, formulate new and importantly to detail the most successful and highest priority strategies/action points. The latter may particularly be examined for wider relevance and adoption.

An interesting feature to bear in mind while going through the evaluation of the BCPP plan is that in the four years since its formulation there have been only 4 months of financial support, for two programs, viz. environment education, awareness and social mobilization and lessening crop raiding and the people wildlife conflict. All other initiatives have been voluntary, by the local communities and Vividhara.

Strategy W1

FOREST FIRES
Prevention and Control

Priority: V. High

Background:

Forest fires have been single biggest threat to the forests of Uttaranchal over the last 10 to 15 years. And very much threat no. 1 for the wild biodiversity, ecology of this area, with enormous consequences for the human communities as well.

Forest fires have been occurring with an increased frequency and wider spread over the last more than a decade. Frequent, long and severe dry spells have made this threat bigger and more difficult to handle.

In this area, for about forty years from the 1960s to late 1990s there were no efforts or initiatives to control forest fires once lit, neither by the local communities nor by the forest department. For long there have been no efforts at prevention either. As most of the forests fall under the category of reserve forests, the local communities, suffering an alienation from responsibility, felt it was the forest department's job. And the FD simply never arrives when the fires are raging. Remoteness due to lack of a motorable road, likely contributes to the neglect. According to the local people, not even the fire guards which the FD appoints, ever reach the area in the event of fires.

Due to its importance, this is an elaborate and detailed evaluation and strategy.

BCPP Evaluation: Fires - More or Less?

Our experience in this area and elsewhere says, that local communities can take the initiative if they are adequately motivated. *Check this:* ***" hum bujhayenge !"*** *We will go and put it out.!!!, they villagers had said while finalizing BCPP strategies. But no one has put out a forest fire here, not for forty years, we had reminded them. " I will", "yes", " we will", they had replied. This was four years back..* ***And they did !!!***

In the spring-summer of 1999, the villagers of Nahikalan set out to control forest fires. On one such mission they not only managed to substantially save a large regenerating forest but also save a village from being burnt. This created a positive atmosphere across the valley. Subsequently, there have been other efforts at controlling fires from spreading thereby saving forests.

There has been a substantial reduction in the incidence and spread of forest fires, over the last five years . Far fewer fires are being lit, almost no fires are being lit in the forests by people from this area. There have been some instances of people of this area taking the initiative to control fires that have spread into this area from outside. Some fires lit on private grasslands and agri-terraces spread to neighbouring community and private plantation lands. These were mostly successfully controlled by the local communities(our observations, local accounts, micro-site evaluations).

In short, the nascent anti-fire shift in local consciousness that surfaced during discussions to formulate the BCPP Plan became actively evident in the following years and needs to be built upon.

Observed Impacts and Changes

The drop in occurrence and spread of forest fires is making a significant/big difference to the forests. Regeneration is visible in many areas. Native species of herbs, shrubs, small trees can be seen regenerating, across many areas. The reduced fire and goat pressures are seen as the critical factors behind this by the local communities. Our field visits during this period bear this out as well. Many more small saplings of important local trees like the oak and Bauhinia semla can be seen, than five years back. Then, semla was identified as the fastest declining tree (80% decline over 20 years) with no regeneration and hence extremely threatened in this area. Regeneration of many other important and locally useful native flora plants was observed. Lack of natural regeneration was a worrying finding of the BCPP study. On most sites, the only species showing good to dramatic growth were exotic and other colonizing species. Recent field visits revealed a declining trend in the populations and density of these species. These species have been observed to spread most after fires and due to excessive grazing by goats.

Overall, soil moisture levels and vegetative cover have enhanced, due to the combined effect of actions based on the BCPP strategies --- notably for fires, goats, sustainable fodder-firewood collection, reviving *joharhs* and springs, reducing human and cattle pressures on plantation and vulnerable areas etc (BCPP Evaluation, 2001).

The rains too have played a role, in lesser incidence of fires, resulting in fewer long dry spells. Some winter rain (lots last year) and spring/early summer rain.

Which actions worked most – learning from experience…

The awareness, sensitization and mobilization program made a huge difference and lead to local perceptional/ attitudinal change about fires. Social climate has changed to forest fires being seen as a destructive and negative activity.

This is evident amongst all sections of the local population, especially of the main village.

The children particularly are exceptionally sensitized.

Successful Methods:

Wall Writings of couplets, slogans, poems – evocative, communicative, and direct – in Hindi and Garhwali, to sensitise, make people think and act responsibly.

Together making Songs, Slogans, Poems… some very creative poetry emerged out of this process.

Posters: An artist friend made some exceptionally communicative and inspiring posters. These directly and indirectly inspired local youth and children to other ideas and initiatives.

Stories, and art with children: Lots of anti-forest fire and nature sensitizing art emerged from this.

Village and group meetings to discuss, share perceptions about the problem and determine contextually effective actions. During the formulation of BCPP plan and after.

Motivating and Mobilizing people to come out and control fires.

Gaps –

There is need for a big creative awareness campaign, covering the entire area, all the villages and hamlets and forest areas. The small scale one has been very successful with excellent outcome on the ground.

A fuller, more active and creative initiative and role of the Forest Department, including a partnership with local communities. Elaborated in the action points.

Some Specific Gaps :

1. People still light fires on their own grasslands and agri-terraces, including in the worst (most dangerous) summer season. These fires tend to spread and often spiral out of control. A few years back, one such fire went and burnt a new plantation of mainly young fruit trees and lots of grass. Adequate precautions are not taken, and in the hot, dry summer conditions, preventing fires from spreading is very difficult.

2. Though the incidence of forest fires has dropped, some fires still get lit. Many of these are by people traversing the large forest area to other villages uphill. These are most likely accidental or mischievous. These need to be prevented.

3. Forest fires often travel into this large forest area from surrounding areas. The awareness campaign needs to outreach all the neighboring villages and entry points to the forests.

There is a great need to build upon the positive actions, effects and the momentum of the last few years.

Knowledgeable local women warn that these benefits can be wiped out in a single year by forest fires and goats. So, with fires there is no place for complacency, especially when important, long neglected work has recently started to happen.

For here, but also for rest of Uttaranchal and elsewhere:
Only a considered and concerted joint effort of the Forest Department and the local communities, with help from people's organizations and NGOs can turn the situation around. A comprehensive, high priority, effective and viable action program, looking into all aspects of the issue needs to be formulated and implemented on a priority basis.

> This plan must include, at its core, a creative, effective and participatory awareness strategy, for all of Uttaranchal. And an overall plan that can/will work on the ground. This biggest threat is thankfully relatively non-controversial, where no diverse and difficult interests have to be balanced.

The focus, emphasis needs to be on prevention, on not lighting and letting fires start.

And then on how and who all will control.

❖ **Action Points –**

❖ **Awareness, Sensitisation and Training**

Priority: V. High

This is a critical need both for the staff of the Forest Department and the local communities. *All important aspects particularly the following key dimensions need to be addressed in any awareness/training and action program.*

- The main actors and causes behind fires
- the immediate, short and long term effects and consequences
- various methods and approaches to prevention
- key actors in prevention and their roles

How to control fires once they're lit :

- key actors in controlling fires -- forest and fire departments and the local communities – coordination, communication and sharing of roles between them.
- when you see a fire, what to do and who to inform.
- selection of and training in, the best and appropriate techniques and methods to control forest fires for both forest department staff and local communities.

Responsibility: Forest Department
Time Frame: Short term

- **W1.1 A Big Awareness and Sensitisation Campaign** -

Priority: V. High

To awaken people and communities to the consequences of forest fires and their responsibilities. To be undertaken preceding the fire season and comprising a package of various **chosen contextually appropriate, creative methods**, including

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The best way appears to be **wall writings where possible or sign boards** with strong moving communicative messages in Hindi and the local Garhwali dialect.
Highest priority locations for awareness messages: All the entry points into the forest areas (this is the most important location). Plus some messages in all villages and other strategic locations like water tank/spring, resting points, schools, panchayat ghar, prominent walls etc…

The law of the land regarding forest fires and especially provisions for fire lighters needs to be publicised. Through wall writings, on boards, in pamphlets and on posters.
FD is the most suitable agency to undertake this. We can collaborate with them over content and design. The law can be publicized by itself as well as with other awareness material and forms, in this section. Vividhara can certainly undertake to disseminate/put up in this and surrounding areas. As well as in some other community conserved areas like in Hemwalghati and in the Bhilangana block of Tehri Garhwal.
***A* pamphlet / hand bill** needs to be written and designed -- sharing essential consequences of fires, the law of the land and exhorting people not to burn their and their children's future. Not to commit the ultimately unnecessary sins. That helps no one. This pamphlet is then reached out to all the homes in the area asking people to please read it out to all family members and to please display it on a wall at home.
Some posters too. For schools, panchayat ghar, children's activity center, shops and other activity places. Vividhara can undertake responsibility for this area, but for larger areas or all of Uttaranchal, other agencies like the forest department will need to be involved.
Street play by local actors, performed in the broad area, is another promising possibility.
Slide shows -- some visual material for this already exists with Vividhara.
Village and Hamlet Meetings Just before the fire season starts, highlighting the destructiveness of fires and the chosen strategies, so the consciousness prevails through the summer.
Spots on Doordarshan and Akaashvani (A.I.R) broadcasting messages highlighting the destructive consequences of fires and how they must not be lit, aired just before and during the fire season. Village folk are avid listeners and viewers of AIR and DD programming and take such broadcasts earnestly and seriously. This possibility can be explored for other regions as well, especially for years when the fire threat is very high.

What will determine the effectiveness of these methods (wall and board written slogans, poems etc., pamphlets, posters …) will be the **clarity of issues and their creative, communicative and evocative qualities**. Without these, there may not be much point in the exercise.
Responsibility: Vividhara
Time Frame: Short term to medium term

- **W1.2 Making Fire lines and Transporting Fertility**

Priority: High

An easy and effective way to make fire lines in a hill context is to clear all big and small forest paths of flammable materials. The following is a multi-benefit action point for this area:
Turning forests paths and mule roads into more effective fire lines, by clearing them of the dry, fallen, inflammable leaves and carrying the leaves to underfertilised far -from - village agricultural terraces for fertilization, before the summer fire season. The mostly *banjoak* leaves that heap the forest paths from winter onwards are a great fertilizer and the local people liked the idea of twin benefits, of increased and easier fertilization and fire control from a single activity. Other flammable materials also need to be cleared and these are primarily dry exotic and other weeds. Some village people did this last year, with observable positive impacts on the agricultural crop.
For this to be done comprehensively across the area, removing all inflammable material including weeds, the local communities can be offered some financial support, as part of the overall fire prevention plan.

Responsibility: Vividhara, Local Communities

W1.3 Preventing Fires from Agri- terraces and Grasslands

Priority: High

From spreading to the forest. These fires, lit on agri-terraces and grasslands need to be the responsibility of lighters to control and watch over till the fire is out.

Fires on agri-terraces and grasslands must not be lit once weather gets hot and dry(summer or even a hot, dry spring). In other seasons, full preventive measures should be taken and the fire must be watched over and put out by lighters before leaving the area. This needs to be squarely the responsibility of lighters. Overall, the fire lighting way of doing things, like getting rid of thorny bushes and the belief that fires promote grass growth, burning crop and fodder residues and animal dungs(primarily in waste dumps) etc. needs to be engaged with and suitably altered. Huge quantity of valuable biomass, currently burned and wasted can be utilized for enhancing soil fertility by incorporating into local organic manure making.

Responsibility: Local Communities, Vividhara(fertilizer from crop residues and animal dungs).

CONTROLLING FIRES

Action Points: headings are in bold, below.
Priority: V. high

❖ W1.4 For Forest Department and Local Communities in Partnership

➢ Let us state, once again, that the only way to bring about and sustain real minimizing and control of forest fires is through a big involvement of both the **Forest Department and the local communities. In a complementary partnership** to save the forests. The big difference made by the efforts of some concerned officials (foresters) of the Doon Valley Watershed Development Project, in the last big fire year (1999) bear out the value of partnership with the local communities.
There is an important role and responsibility of the FD in prevention and control of forest fires. According to all local accounts, this is a role it has not adequately played in this area for the last forty years.
➢ Local people need to be **trained in ways and methods to control fires**.
Is the forest department line staff adequately trained to control the spread of forest fires? See first action point for this strategy.
The Forest departments **Fire Guards** (FDs Fire Patrol ?), must be appointed from nearby villages, for the sake of effectiveness. Those living far from/outside the area (10-15 kms) have simply never ever reached when there's a fire.
Who and how to inform in case of fire __ who/where do the local communities or citizens inform in case of forest fires. Telephone numbers, ideally a Forest (Fires) Help Line could be set up, during the fire prone months. These numbers need to be widely publicized.
➢ The FD needs to **publicise the law of the land** regarding forest and wild fires, especially regarding the role of different agencies, sections of society and penalties for fire lighters.
The law also must be **enforced**, including relating to fines and confinement, on fire lighters. The local communities of this area are ready to support the enforcement of the law on fire lighters, as this follows an awareness campaign and as forest fires in this area are patently destructive.
Responsibility: Primarily Forest Department, Local Communities

❖ W1.5 Encouraging Communities that Prevent and Control Fires :

Priority: High

There need to be suitable incentives (even in the form of rewards or awards) for communities that take the initiative to prevent and/or control forest fires, or have their own effective community systems to meet this forest fire threat. One way to do this can be the institution of an award, given every year to three or five most

outstanding communities. It will not only express appreciation and encouragement to responsible communities, but will create an encouraging climate for others to follow suit. This can be announced for 5 or 10 years to begin with. The financial implications will not amount to much given the benefits. And if it comes from the FD, it will be a tiny fraction of the FD's budget for fire prevention and control. Let us think of the value of forests that would've been saved. There can also be a clause requiring the award money to be spent on some priority local environmental works, chosen by the community itself.

The amount should not be too small, not less than Rs. 5 --10,000 per village that is awarded. It would be crucial to ensure that only the most deserving villages are selected. Or the purpose will be defeated. A committee with representation from people's organizations and NGOs can be set up to help in identification and selection.

Responsibility: Forest Department

Strategy W2

BAN THE GOAT RUSH
OR BANISH BIODIVERSITY

Priority: V. High

Background:

There are big location factors that make goat grazing in this area a very serious issue.

- The first factor is extremely steep slopes, with an average gradient of around 60 degrees.
- Secondly, the dominant rock types are fragile, loose and fractured.
- Thirdly, the area sees very heavy, especially monsoonal, rainfall.

The coincidence of these huge factors in one context, makes it virtually impossible For these slopes to sustain goat grazing. The only way these slopes remain stable is When they are covered with a dense floral mantle and that is something concentrated goat grazing just doesn't allow.

Numerous serious consequences of goat grazing on the native biodiversity and the ecosystem are evident in this area. Soil and gulley erosion, slope destabilization, that can trigger landslips and landslides especially on degraded and vulnerable slopes; wide spread of bio-invading species in the wake of excessive goat grazing pressures including various hardy colonizing weeds(*kurre*) that have been introduced into this area by goats; the severe impacts on native wild biodiversity

most alarming in the case of ground level browsable wild flora and young tree saplings; the new, rampant and disastrous practice of lopping big branches of oak, gonta and other important trees for goats to graze on etc…(LC knowledge and our observations)._

What goats do, in a nutshell, as a wise village woman put it, " *Rerha karda, bata nahi rakhda, ghas chaupat, kurrhe sab jagah …, jangal na deva bakri walon ko .* " (they make rocks roll, break paths, the grass is gone, there are weeds all over …don't give the forests to the goats !)

Goat grazing is the second biggest threat and factor behind biodiversity loss, in this area. (unanimous view of villagers and our assessment of threats).

There are two kinds of goat herds, migratory and local.

MIGRATORY GOAT HERDS
Priority: V. High

Migratory goat herds comprising 600 to 1000 goats, from Uttarkashi district of the U.P hills, had been spending three to four winter months here, since the last 30 odd years. Till then, they moved through this area, along the river beds onto the Sal forests of the Doons, where they grazed through the winter. They were not, then, allowed onto the steep and fragile slopes of this hill BSAP site.

Addressing the issue of excessive grazing by migratory goat herds, has long been the biggest priority of the women of the area. In 1997, they had managed to dramatically insist on the village community adopting a proactive challenging strategy, as part of the final BCPP plan for this area. The essence of this was to not allow the goat herders grazing and camping rights in the forests, in lieu of money, as had been the practice for some three decades. (See Annexure ---, how the women managed to get their priorities addressed).

- **BCPP Strategy Evaluation and Action Points -**

W2.1 Overall, this strategy has worked very well, held steadfast in the face of challenges. This is for the hill top and middle slope forests linked to Nahinkalan and Nahin khurd.

At times the goats and their keepers have been allowed passage and/or a few weeks of stay at the end of the season. Other than this the villagers, led by the women, have been firm.

Regeneration of native flora has been observed in many areas, and has been pointed out by local communities especially by the women. Important native trees as well as bushes and herbs.

A significant continuing constraint has been that nearby villages like Kotla, Kairwan and Sateli (up north) still give out the forests they have traditional fodder fuelwood rights over, in lieu of money. And from there goats stray and are sneaked into the areas that have been restricted by villagers.
W2.1.1 The other aspect is that every year the issue has to be engaged with. The goat herders land up and work various strategies on the village people. Including favours and incentives to individuals and communities. So far these have been withstood. *Its like an annual corruption test the men of the area have to go through. With their women being very effective chief vigilance commissioners.* Interesting, but this needs to be built upon and ensured.

Money from the goat herders was the principal **source of funds for the village panchayat**. Vividhara has been generating some alternative funds for the panchayat through its programs like awareness cum work camps for students etc. More sustainable community generated sources of funds need to be worked out.

W2.1.2 In **Kotla village**, over these intervening years, the perception and mood of many people have moved towards not selling the forest. With facilitation and encouragement, the village is likely to take a conservationist decision. Other neighboring villages too need to be similarly engaged with to find sustainable answers. These villages are outside the current BSAP site.

W2.2 The **Forest Department needs to ensure that no nomadic goats are allowed onto these steep, fragile hills** that are catchments to numerous critical natural water springs that meet the drinking water needs of a dozen villages, on top of all their other ecosystem roles. The forests in question fall under the category of *Reserve Forests*. And need protection from this grave threat.

According to the local people goats were not allowed onto these slopes till the early 1960s. There may be existing rules in place that need enforcement. Given the various locational and other factors and the evident disastrous consequences, both listed at the beginning of strategy, there clearly needs to be a **strictly enforced ban on goat grazing on these fragile slopes**.

W2.2.1 Whereas this area (traditionally closed to goat grazing) cannot tolerate goats,there need to be **fair options and alternatives for the goat herders** and goats. Interms of alternative grazing lands for the winter months. Suitable and sustainablelocations and systems need to be found for them. One way would be to

spread thetime duration out over different areas. There may need to be restrictions on the sizeof theherds etc. Our information is that they used to traditionally graze in the Thano Sal Forests.
The village women are still firm and emphatic in their stand and this bodes well for the area. One of them even warned that goats and forest fires could wipe out all the regeneration and improvements in a single year. On these vulnerable high biodiversity hills the choice is banning the goat rush or banishing biodiversity.

Responsibility: Village Communities, Forest department, Vividhara
Time frame: Short term to Long term

VILLAGE GOAT HERDS
Priority: V. High

Village goat herds are a big degrading pressure, round the year, on the steep hill slopes around the village. Loss of vegetation cover, hoof destabilization of steep and vulnerable slopes, leading to landslips and slides, serious threat to critical natural springs (primary source of drinking water), paths etc. For lands around the village, under a combination of threats due to proximity, this is the biggest unsustainable pressure/threat.

This threat needs to be met fully, if biodiversity, future ecological and water security and the livelihoods of local populations are not to be destroyed for the sake of some short term benefits to a few local people.
BCPP Strategy Evaluation and

- **Action Points -**

Priority: V. High
W2.3.1 Reviving an old tradition, the community declared **areas above natural water springs out of bounds for goats.** This has been enforced by the community with vigour and seriousness for the main water source of the village. This area has regenerated and the water sources are securer.

W2.3.2 This action must continue even stronger and be stretched to cover areas above other natural springs. Secondly, degraded Common lands afforested under the Doon Valley Watershed Project and currently regenerating similarly need to be strictly out of bounds for goats. Thirdly, goats must be kept away from other degraded and vulnerable areas especially steep gullies and landslide areas.

Addressing the issue of local goats has been very tough, as the community hasn't been very willing to put its foot down, or seriously rein in, the local goats and their keepers. Despite evidence of present and future disastrous impact.

Through a process of regular interactions there is today an enhanced awareness of the disastrous impact of goats on the overall ecosystem. The non-viability of goats with the local geographical context is also beginning to sink in.

This enhanced awareness and a sharp fall in the market value of goats, has resulted in three out of four goat keeping families, selling all their goats. From more than 100 locally kept goats, the number has come down to 20-25, from four herds to one.

W2.3 This opens up a tremendous and immediate opportunity to **enhance awareness, mobilization and take present and future decisions regarding goat keeping**. What big disincentives can be put in place (restriction of access to areas, rotational grazing and a goat tax) or can goats be altogether banned by the local communities ?

If an activity is so patently disastrous for an area, its people, presently and even more in future, and the benefits (of money) are only for very few, for a short while at that. If costs and negative impacts very hugely outweigh benefits, can the community not restrict/ ban such an activity… this is a test for how alive, aware and functional -- a community is or not. If the community has strong reservations about intervening then these need to be understood. At any rate, it is important to have a full and focused discussion in village meetings on this issue, so the issues involved are clearly and widely understood. Clearly, at the least, some strong disincentives to goat keeping and strategies to minimize and repair the damage they cause need to be put in place.

These ideas have emerged from the village communities and enjoy the support of the vast majority of local residents.

W2.4 The Government, the FD/Soil and Water Conservation Department/Jal Nigam needs to move fast to either impose **a total ban on goat keeping and grazing on these steep, vulnerable hills or impose a stiff Goat Tax**, per goat paid yearly, working as a disincentive. While the government moves on this or takes a while figuring this out, the local communities need to move to either ban or impose taxes on goat grazing. Money from any Goat Tax needs to be used for local ecological restoration and regeneration.

Responsibility: Forest Department, Village Communities, Vividhara (facilitation and awareness).
Time frame: Immediate to short term. Or as long as it takes.

Strategy W3

AWARENESS, SENSITISATION AND MOBILISATION

Priority: V. High

Introduction and Background

A most critical pivotal strategy that can determine the success or failure of individual strategies and of the overall plan for wild biodiversity conservation.

It is an important component of all the strategies for wild biodiversity conservation. For roughly half the strategies, including many of the highest priority ones it is the most crucial component.

The crux of this strategy is that a creative and well focused awareness, sensitization and mobilization program can ensure and spread far and wide substantial understanding and engagement of the local communities with biodiversity and environmental conservation issues. A strong local base is thus prepared and it can only have positive effects. If there is any program or initiative (governmental, NGO or any other) for conservation, or impinging on it, constructive engagement and monitoring by the local communities is virtually certain. Without any substantial external support or initiatives also it is most likely that there will be some local individual and/or collective initiatives to address biodiversity concerns. It's a positive impact and outcome situation, any which way.

BCPP Evaluation

The focus of the awareness strategy and approach since the BCPP plan was the chosen strategies, especially the important ones such as those for fires, goats, fodder fuelwood, bio-invaders, ECO-SOS etc. For all of them the awareness strategy has worked very well and the positive impacts are there to be seen across the different sites
of the area. Details of the efficacy of awareness component for different strategies can be seen in the specific strategies.

A brief evaluation of the enhancing awareness strategy/approach for some key strategies:

An awareness campaign was the *sole approach for preventing fires*. This has had dramatic results. Heightened concern led to villagers taking the initiative to even fight forest fires. This is the first such instance in more than forty years.

The awareness/sensitization approach to *sustainable collection of fodder and fuelwood* has led to a perceptible decline in instances of callous, non-regenerative methods of collection, like lopping small trees, big branches and tops of trees.

Goats and cattle are being kept out of areas above natural springs and some exceptionally vulnerable (ECO--SOS) areas. Instances of grazing in plantation areas also registered a decline.

On the most threatened sites and overall, there is a discernible lessening of human pressure on native diversity, and some pressure is being put on *the bio-invaders*. The *regeneration of native floral diversity* and the retreat of bio-invaders is evident on many sites. The tide has turned.

Four years on, our assessment is that the plan for wild biodiversity conservation has been largely successful. Overall, the dramatic decline of floral diversity has been halted. There is substantial regeneration across all sites, though the extent may vary. All key threats have been substantially controlled.

There were only four months of external funding for two programs. Namely, for lessening the people wildlife conflict and for awareness/sensitization and mobilization. Other than that there have been voluntary initiatives and engagement by local communities and Vividhara members.

How was this change achieved?

One of the biggest reasons behind the positive outcomes of the BCPP strategies and overall approach appears to be the focus on awareness, sensitization and social mobilization.

Critical to this is involvement of and partnership with local communities; sensitivity and appreciation of their hardships and priorities, wide spreading and building upon and plugging gaps in the LCs knowledge and understanding of the local natural and other contexts.

There were three distinct phases and intensities in the awareness work. Firstly, during the formulation of the BCPP plan, the participatory approach and full involvement of all sections of the local communities, the sharing back of findings and full endorsement of the plan by local communities. There was a markedly higher awareness and concern by the end of the plan, and some local initiatives had started even as the plan was being written. Secondly, the four months of external financial support, in which awareness was one of the two programs. Many creative approaches were followed and all sections of population were targeted. Thirdly,

Vividhara members have continued their low-key awareness and mobilization work, without financial support. With at least two substantial programs every year. One or more exposure and voluntary work camps for university students from Delhi. This has often become a high point of awareness, enthusiasm and mobilization for the local people and the visitors. The other is the annual exhibition in Delhi, focusing on cultivated Himalayan biodiversity.

In this way, many separate activities were not undertaken and yet there are big improvements. A lot /most of what could be done without funding and external support has been happening. All the indicators point to enhanced awareness, including some change in attitudes and behavior regarding many key threats and issues. This unfortunately doesn't yet cover all the people in the area. Or outreach to surrounding areas.

That is how and why we feel enhancing awareness, sensitization and mobilization has been and can be critical. None of this implies that other strategies are not needed, awareness enhancement often works best alongside other actions to directly and holistically address key threats and other local priorities.

As Bhopal Singh, one of the coordinators of this BSAP exercise says, "without awareness and involvement of local people, all efforts and resources can come to nought. And with this alone a lot can happen". Our belief has been reinforced, and proved. And so we set full store by this strategy. Enhanced awareness and sensitization also enables people to understand and meet future threats on their own. This is the most effective, cheapest, holistic, replicable and hence beautiful way to biodiversity conservation.

- **Action Points -**

W3.1 Highest Priority Issues and Themes for Action :
Priority: V. High

- **W3.1.1 For Specific Strategies –**

Forest Fires : the most important action point is a big awareness campaign. Details are in Strategy for Preventing and Controlling Forest Fires, both evaluation of last strategy and proposed action points for awareness.

Sustainable and Regenerative Utilization of Fodder, Fuel wood and other local community needs: assessing sustainability, regeneration, carrying capacity.
The Three Sustainable Use Principles and other action approaches and points.
Details in strategy for sustainable utilization for fodder and fuelwood.

Goats: Details in strategy, banning the goat rush, see above.

Other strategies for which awareness component is important. *ECO-SOS ASAP, Controlling the Bio-Invaders, People-Wildlife Harmony etc.* Details under respective Strategies.

- **W3.1.2 Local Contextual Imperatives for Biodiversity Conservation**

High biodiversity values
Extreme Fragility
Exceptional endowment of perennial water sources
Irreplaceable for human livelihoods and habitation

W3.1.3 Important issues to generate and widespread awareness on.
An elaboration:
In this site of exceptional concentration of wild and cultivated diversity - some key themes for enhancing local awareness and understanding of biodiversity:
The role, significance and values of wild biodiversity, in the local and larger contexts. Linkages to key issues of relevance to local communities like livestock, agriculture, Water availability and security etc. Identification and values of wild flora and fauna. The interconnectedness of different species and ecosystem components. Including Between the locally valued and not valued components of biodiversity. Bridging the big gaps in local knowledge, value and interest about components like wild mammals and other wild fauna (like avifauna, insects and microorganisms).

Key geographical features of the area and their individual and combined implications ---
Steep slopes, loose and fractured rock types and heavy rainfall, implying extreme fragility of hill sides. A dense floral mantle is the only way to keep the slopes stable, the hills in place --- a local contextual imperative for biodiversity conservation. All the more, how to ensure protection and conservation of slopes, hills and biodiversity.

Livelihoods and human habitation: the mainstay livelihoods of the human communities are pastoralism and rainfed agriculture, unimaginable without wild diversity. Additionally, as water sources and these very fragile hill slopes are dependant on biodiversity, human habitation would not be possible here if biodiversity were to deplete significantly.

- **W3.2 Chosen Action Methods -**

All of these have been tried and found to be particularly and beautifully suitable.

- Environment Education in Schools
- Literature/books, stories, discussions, painting and drawing, games and activities etc. __ for the Library and Activity Center.
- Slide shows for communities, schools, activity center.
- Songs, poems, music, slogans
- Wall writings, posters
- Visiting other communities and initiatives etc.
- Trainings
- Theatre
- Melas and Exhibitions

Target groups: children, women, youth, dalits in particular. The entire community.

W3.3 In addition to focusing on this area, the awareness programs need to *outreach to **neighboring areas***. Desirable in itself, but also critical from the point of view of some of the strategies like for forest fires, goats, bio-invaders which often spread into this area From outside. This can make a difference and have a bearing on the effectiveness and sustainability of the overall plan. A promising approach would be to focus some of these awareness initiatives on the schools of the broad area. Specific priority strategies like for fires and goats would require more village and hamlet level engagement.

Responsibility: Vividhara

Some new awareness messages/slogans from the women of the area

Jangal nahin to pani bhi nahin, Jaise bachhe paal rahe,
Nava dala na kata ! jangal palo vaise hi !

From the forest fire awareness campaign:

Rakh ka dher, ya dhara pyari pyari,
Kya chahiye, marzi tumhari.

An a final one, tongue in cheek, for obstinate, compulsive fire lighters, who hate to be preached to:

Aag lagava, paap kamava Jail java, chakki peesa !

Strategy W4

WATER MATTERS

❖ **Action Points –**

❖ **W4.1 Reviving Hill top and other Ponds and Lakes - the *Joharh* idea**
Priority: V. High

BCPP Evaluation and Action Details

The flat and gently sloping hill tops of the area have some big and small j*oharhs* (lakes and ponds) on them. Erosion and silt flows from nearby areas had made them shallower and smaller than before. Four of these have been revived and three new ones made. These have had major positive impacts, like easier and longer availability of drinking water for wild animals and cattle, prevention of erosion, landslips and slides (especially of slopes above the main village water spring, sustained moisture availability for adjacent and downstream areas leading to regeneration etc.

- W4.1.1 There is need for **improvement and strengthening of the old and newly revived Joharhs** (improvement plans have been made after evaluation). Some major elements are: increasing the size and depth (esp. of *bachharwad, ghorha peti and the big danda* j*oharhs*) where suitable, clearing and appropriate leveling of the inlets and outlets, strengthening of embankments, removing bio-invaders from the surroundings and inlets, optimizing base levels to minimize pressure on embankment etc.

The *joharhs* would need some maintenance works, more in the first one or two years and less later. A monitoring and maintenance mechanism needs to be finalized.

- W4.1.2 **Making new Joharhs __** appropriate sites for some new joharhs have been identified, in field visits and discussions with local communities.

For full benefits, it is important to make as many *joharhs and pokhars* as possible. To meet the objectives of minimizing village visits and raiding of crops by a diversity of wild animals, enough of the sites of *joharhs* should be well into the forests, away from the villages. Certainly, they should not be sited, primarily or entirely near the villages.

Why revitalize and make new joharhs ?

Drinking water - for wild animals, cattle,... Water sources have dwindled dramatically and drinking water is what brings wild animals to water sources near

the village and thereon to raid the crops of the villagers. The ponds and watering holes would make water available in their habitats.

- *Recharging of natural springs* - as many of the *joharhs* will be on or near the tops of hills.
- Enhanced *soil moisture.*
- An optimum method of *watershed treatment*, wherever possible
- A major role in *gulley erosion control, stabilization of slopes and prevention of landslips and landslides.*

Many local people spoke of how the hills have gone drier, the hill slopes and soil have far less moisture than they used to, with enormous consequences for biodiversity, regeneration and productivity. The joharhs could play a major role by *enhancing the moisture availability and regeneration capacities of the ecosystem.* This would also help in *prevention of wild fires*.

All the Bubbling Natural Springs !

❖ **W4.2 De-choking, Reviving and Enhancing the Flow and Perennial Nature of Natural Springs**

Priority: V. High

BCPP Evaluation and Details of Actions-

Over the last few years, the local communities have de-choked about half a dozen springs that were buried under landslide and landslip rubble. Some protection structures like check dams/retaining walls and little pools have been made at these sites.

- W4.2.1 Protection and conservation measures need to be undertaken in the gullies (immediate catchments) of dechoked springs ___effective and innovative watershed works like brushwood dams, gully plugs, check dams, contour bunds etc. according to context requirements and possibilities.
- W4.2.2 Further, all choked / dried / reduced flow and seasonal springs need to be revived and/or enhanced. The first and big primary step in this direction would be to gully plug and check dam all gullies in the area with context and flow appropriate structures. A joint survey and mapping of all springs and gullies and catchments would be the ideal beginning. This team could comprise of knowledgeable and experienced local individuals, Vividhara members, Forest department officials, soil and water conservation and/or watershed departments and experts. On-site planning of types and design of structures, location/siting and other important details can be undertaken, with contextual needs and appropriateness in full view.

W4.2.3 The catchments of natural springs (especially the gullies above and surrounding slopes) need a high degree of protection from grazing (especially by

goats), lopping and other pressures. There is need to revive an old tradition of the area (usually not followed any more), of the zone immediately above water sources being out of bounds for grazing cattle. Forest fire prevention and control is a priority action, for the entire catchment.

For all this to work, the local community must be a critical player in undertaking watershed works, as this will enhance involvement and responsibility, as well as provide employment. Further, for long term sustainability, there needs to be a system of incentives and compensation for opportunity costs to the local communities. This can be linked to responsibility for maintenance of works and protection of catchments.

Inputs from a hydrologist to understand and determine the overall catchment areas for natural springs will be valuable.

W4.2.4 Plants known to hold water in their root zone, such as *tun* and *banj* (oak), need to be accorded highest protection and planted where needed in the catchments of these springs. Other selected species are: *paiyan, tilphara, sinsyaru, kingora, binda* etc.

Many villagers and Vividhara members have considerable experience in undertaking innovative watershed works.

As many springs and /or their catchments fall in forest areas, the FD can play a leading role in this endeavor or be an important partner. Technical expertise/advice and finance could be two key inputs.

Responsibility: Village communities, Forest department, Vividhara.
Time frame: Immediate/ Short term

❖ **W4.3 Ensuring wild animal and ecosystem needs while tapping water for human needs from natural springs in forest areas**

Priority : High

The impact on wild animals and the ecosystem needs to be taken into account while planning and implementing drinking water and irrigation schemes, from natural springs and streams in forest areas. Currently the entire source is tapped leaving no drinking water even for wild animals. A fixed proportion of the overall water available in a spring must not be tapped or a maximum percentage of springs that can be tapped in a given area needs to be determined and fixed. So that at least some water continues to be available for the well being of the ecosystem and its constituents.

The next two Action Points are practical and holistic mechanisms for the high priority need to conserve the catchments of springs. They substantially overlap in the issue they seek to address. One or both can be implemented complimentarily or the more viable one can be chosen.

- **W4.4 Ways to protect and conserve the catchment of springs/streams tapped for human needs**

Priority: High

While many of the springs and streams in this area are being tapped for human needs, no attention or concern is given to protection and conservation of the catchment on which these springs depend. These have seen widespread degradation over the last 10-15 years and no one is even looking that way. The hill villages and proximate forest areas, the BSAP area, are exceptionally water rich providing drinking and irrigation water to a dozen villages.

Details : A certain fixed portion of the cost of all such water schemes needs to be set aside for protection and conservation of the catchment. Prior to the undertaking of work on the water pipelines, catchment treatment and conservation work should be undertaken. Where sources are already tapped, this work should be undertaken on an urgent and priority basis. Villagers from proximate communities must be important players in this endeavor. The responsibility for design, monitoring and the quality of the work can be of the forest department. Further, each year, for each water source tapped a certain fixed amount of money should be paid in royalty by the Jal Nigam to the forest department or directly to the proximate village, for maintenance of the health of the catchment of natural springs. This money can be generated by setting aside a certain fixed percentage of the money charged from end users.

The best way to ensure that the catchment is in fact conserved and the water sources are secure, is for this money along with the responsibility to be entrusted to the local communities, whose job it will be to undertake such conservation and protection measures. This will also enhance their stake in the conservation of water sources and their catchments. Currently communities proximate to and dependent on a particular forest area have no stake in the conservation of water sources therein if these are tapped for providing water to other villages. They can often be primary actors, connivers or passive onlookers to the degradation of the catchments of the said sources. Water availability is plagued by huge seasonal fluctuations, the sources can be smothered by small and big landslips, usually a regular flow of stones, silt… The forest department and the Jal Nigam can monitor/evaluate the status of the sources and the catchments from time to time. Many highly desirable objectives can thus be met.

Responsibility : Jal Nigam, Forest Department, Local Communities.

❖ **W4.5 A WATER RESERVE – A way to conserve an exceptional water source and biodiversity rich zone**

Background and Objectives:

This is a proposed holistic mechanism, for conserving critical water sources and biodiversity. This is an area of heavy rainfall, blessed with numerous perennial natural springs and streams. It also a site of exceptional wild and cultivated biodiversity. These blessings of exceptional biodiversity and water source richness are very deeply and even symbiotically related to each other. A thick mantle of diverse wild floral diversity is a crucial factor in the stability of extremely steep and geologically fragile and vulnerable slopes that are prone to severe erosion and landslides and landslips. Protection and sustainability of critical water sources makes biodiversity conservation a local contextual imperative.

This exceptionally water source rich area has more than a dozen perennial natural springs and some streams. Over the last 20 odd years, some half a dozen perennial springs have turned seasonal, and some others have dried up. (Consensual local community evaluation)

The majority of the water sources are located in two exceptional zones. The first and more important, pan and ghatta khala and its catchment ghorha peti and darhwa, are where most of the perennial natural springs are located. These are also the primary source of the bhidalna rau. Other than drinking water for wild mammals and cattle, these springs are tapped as critical sources of drinking water for nearly a dozen villages as well as irrigation water pipelines and channels. There is a steady stream of proposals and plans to tap the remaining sources.

Despite and enormous and obvious critically high value, the entire area is under diverse pressures. The area above and around the springs as well as the overall catchment, comprising of vast oak forests. Frequent and wide ranging fires in the catchments, excessive migratory goat grazing, and consequent to these two, the spread of bio-invading species, some of which like kala bansa (eupitorium) are water guzzling species, contractor driven medicinal plant collection etc. No effort at protection and conservation of the critical catchments has been made so far, by any of the concerned agencies, like the Forest department (the area is a Reserve Forest), or the Jal Nigam, that merrily keeps tapping all the natural springs.

The second major zone of natural springs is where the villages of Nahinkalan, Nahin- khurd and Kotla are located. Other than meeting the drinking and other water needs of these villages, and hamlets of Semalsari, Dhewal khet and Harijan basti, springs within this area are the source of drinking water pipelines for some downstream villages.

Action Details - From the viewpoint of present and future water security for more than a dozen villages, as well as its other diverse values, conservation of these water sources with its linked biodiversity and ecosystem is a high priority.

We propose that the most important natural springs zone, comprising the Pan and Ghatta khala with their catchments (Ghorha peti, Darhwa etc.) be declared a Water Reserve.
This will meet the objectives of biodiversity conservation as well as present and future water security of the habitants of more than a dozen near and far villages.

In such a reserve, protection and conservation of natural springs, streams, their catchments and ecosystem will be the primary objective. Activities to enhance and further the primary objectives may be undertaken where needed. All activities inimical and contrary to the said primary objective will need to be banned. All threats and pressures to the sources and their catchments, like forest fires, goat grazing etc. will be steadfastly prevented and controlled.

Some specific components of a Water Reserve :
A high level of protection to the area.
Closing of immediate catchment to interference by cattle and humans.
Accurately determining the catchment of springs. And undertaking appropriate and comprehensive catchment treatment measures.
Notification/declaration of the area as a water reserve.
Support/ incentives to proximate villages to conserve the area. Also as opportunity costs. As we state in the next para, the LCs can be financially supported to undertake responsibility of conservation, this would also take care of opportunity costs.

To our minds, this is a good way to meet various objectives and make them compatible. To make the process simple and effective (cost and enforcement wise), the management of the water reserve could primarily be the responsibility of the local communities, with checks and balances. Vividhara is willing to facilitate, especially at the community level. Or it can be managed by a government department with partnership and opportunity costs to the local communities.

In the second water source zone, around the village of Nahinkalan etc. the critical catchments need to be accurately and scientifically determined. And then ways to enable and ensure adequate protection and conservation need to be selected and implemented. As this zone is in and around the village lands, the villagers

participation and support and harmonizing with their current use and needs of lands will be critical.
Again, they can be entrusted the responsibility of maintaining the flow and ensuring the overall security of these springs. And supported/compensated for the same.

Strategy W5

SUSTAINABLE AND REGENERATIVE GRAZING, FODDER-FUELWOOD COLLECTION AND OTHER LOCAL UTILISATION OF NATURAL RESOURCES

Background: Areas proximate and with altitudinal similarities to villages are degraded and under threat from excessive fodder and fuel wood collection.
Significant incidence of non-sustainable callous methods of fodder-fuelwood extraction, especially by the youth, were observed.
The most important fodder and fuel wood providing wild flora have dramatically declined over the last 25 years. Ground level browsable flora was found to be the most severely declined category of flora, four years back (BCPP Plan).

BCPP Evaluation and Gap Analysis

There is some improvement in all of the above practices, categories and scenarios.
Over the last four years, a discernible improvement in the level of care adopted while extracting fodder and fuelwood etc. has been observed directly and is borne out by enhanced levels of natural regeneration, including in areas proximate to the village. The most degraded sites have shown significant regeneration, as have some of the most threatened and fodder-fuelwood ideal species like Bauhinia semla and banj oak.

A sustained attempt was made to revive the tradition of areas above water springs being out of bounds for grazing goats and cattle. This has been very largely successful for the main water source of the village. Although attempted restrictions on lopping in this area have not been as successful, overall, the area has regenerated and the slopes of the immediate catchment of the spring are stabler.

There is some improvement and the considerable work remains to be done. There is a need for selection and implementation of locally viable innovative strategies. There are gaps existing in spreading the awareness and sensitization message and approach to all families and individuals.

There is a felt need for reducing the time and hardship involved in collection of fodder and fuelwood. This involves many hours a day of work, round the year, for the women. This is a priority action need expressed by them. Proximity and quality plus diversity of fodders and fuelwood would be the primary concerns.

How to protect specific areas, such as proximate and those with altitudinal similarity, or high biodiversity or ecosystem values, from excessive pressures and degradation. The former are mostly village common lands and occasionally other forest lands too. Contextually viable management strategies need to be selected, for enabling sustainability and regeneration.

Action Points -

- **W5.1 Awareness, Sensitisation and Training**
- **W5.1.1 Sustainable Use Principles:**

Priority: V. High

Based on traditional practices and local knowledge of harvesting tree fodders with regeneration and sustainability in focus, simple and important principles of what not to do when out gathering fodder were identified and simply phrased, in the local Garhwali dialect. These can go a long way in protection and regeneration of diverse wild trees and the ecosystem.

The Three Simple Principles are:

***Choti Na Kata* (Don't cut the tree tops)**

Its a strong traditional belief that the top/tip of the tree must not be cut, as this harms and may even kill the tree. Also, seeds form only on uncut branches and a shortage of seeds is one of the reasons for the lack of regeneration of trees.

***Mota Phanga Na Kata* (Don't cut big branches of trees)**

This too damages and harms the tree and can even kill them.

***Chhote, Bachhe Perh Na Kata* (Don't cut small trees)** There are very few new, young trees in the forest.

These principles need to be shared widely and creatively with all the habitants of the area.

Responsibility: Vividhara, Local Communities.

- W5.1.2 **Treating Forests Like One's Own**

In addition to the land under private ownership, there are substantial community lands currently under private control and utilization of natural resources for fodder/ fuel wood grazing etc. Despite intensive use, the condition of these lands,

the trees and grasses thereon is pretty good, way better than the open lands under community control. The same care and methods need to be adopted for utilizing fodder fuelwood etc. from community and forest lands.

***** W5.1.3 **No lone forest wanderings for non tree climbers:** Grass and fuelwood gathererswho cannot climb trees tend to cut big branches and small baby trees. They must be encouraged to go to the forests only with tree climbers.

- **W5.2** Training in simple methods of **assessing/evaluating impacts and levels of sustainable regenerative use.** Sharing findings with the entire community for appropriate actions.

W5.3 Other Methods/Paradigms of Sustainable Use:

❖ Experiments with **Rotational Use/Closing of Areas for Regenerative Rest** is a promising holistic approach to meet the twin objectives of biodiversity conservation and local needs. It will also enhance productivity and overall health of ecosystems. Such plans need to be designed and experimented with by the local communities taking all considerations into account. They only work with a clarity of purpose and involvement of the community and with management/monitoring mechanisms. This could be within and over seasons, or closing of areas over longer periods like 1 year or more. Sub-sites under a lot of human and cattle pressures or otherwise important such as catchments are the highest priority areas for this.
Priority: V. High
Responsibility: Local Communities, Vividhara

❖ **Extremely fragile and high value areas** such as those prone to landslides and landslips, as well as critical important areas, like above water springs, need to be closed to grazing animals, fodder and fuelwood collection.
Responsibility: Village communities, Vividhara

❖ **W5.4 Reducing hardship for women through easier availability of fodder and fuel wood :**

Priority: V. High

Enhancing agroforestry amongst agri-terraces, abandoned terraces, ghas pakhas (grass slopes/patches, usually under family control) and common lands.
Details in strategy by the same name under cultivated diversity conservation strategies section.

Rejuvenating Productivity and Value of Village Common Lands. Common lands under community control or under private utilisational control need regeneration and development as highly productive and diverse fodder, fuelwood lands.

Utilization and other practices on these lands need to be assessed for their suitability to these primary objectives. A list of most important/highly preferred species needs to be drawn up. These species then need to be encouraged and nurtured, in the process of natural regeneration. High value and/or declining species can be selected and grown, through direct seeding or after raising as saplings.
This action point, especially the last part, can be integrated with strategy for enhancing Agroforestry, see above and in detail in section 2, cultivated biodiversity strategies, under the Enhancement Strategies heading.

- **Identification and propagation/protection of rare/threatened/ endangered species.** Tree and shrub species that have declined dramatically have been identified. See Annexure - 1, Prioritised Species Table. These need to be accorded protection and taken up for propagation and planting where needed.

Responsibility: Village Community, Vividhara (awareness and training).

- **W5.5 Bio Gas and Nirdhum Chulhas (smokeless stoves)**

Priority: V. High

Bio-Gas

The large numbers of cows, buffaloes, bullocks, horses and goats and much wasted dung, makes this **area particularly suitable for the setting up of bio-gas plants**. It has the double benefit of easing pressures on the forest and the effort in collecting fuelwood. In the interviews, brainstormings and strategising sessions this idea was repeatedly mooted by locals, Conservation and other benefits and viability were assessed. It was finally chosen as **a highly preferred strategy**.

Locals feel (and it is borne out by the two functioning family biogas plants) that with the coming of bio-gas, fuelwood use will be reduced, to between half and one fourth of current levels, which could be mostly met from private and village lands and by dry wood alone. Eliminating the need for green tree loppings. Other positives include villagers carrying prepared manure to far off terraces instead of the current numerous heavy head loads of wet cowdung, that understandably don't reach the further off terraces.
Two bio-gas plants have been set up and are running successfully for the last 2-3 years. Most of the families are even keener on bio-gas as a result. Design and other contextual considerations need to be kept in mind, while finalizing details.
Relevant governmental agencies need to help in this priority action for a highly suitable context.

Nirdhum Chulhas (Smokeless Stoves) __The current *chulhas* are extremely energy inefficient and miniscule openings result in the small kitchens being filled with heavy smoke. Greater energy efficiency of Nirdhum Chulhas would bring down fuel wood consumption and smoke levels. This strategy can be implemented in combination with bio-gas or on its own.
Responsibility (both for Biogas and *Nirdhum chulhas*: Relevant government agencies, Vividhara (Facilitation, and coordination if needed)
Time frame: Short term

- **W5.6 Popularizing and Propagating Bamboo as a Multi Benefit Wood Substitute**

There are few bamboo clumps in the area and **more need to be planted**. Of locally useful and suitable varieties. Sites for such plantations were identified . With its exceptional sustainable use possibilities and ability to check erosion and stabilize slopes, bamboo needs to be encouraged as **a wood substitute** for a wide variety of uses such as roofing for cattle sheds and homes, gates and doors for *angans* and homes, for fences around homes and terraces, etc. In time it may also open a bigger window to the world of bamboo crafts.
Responsibility: Vividhara

Strategy W6

HARMONISING THE PEOPLE –WILDLIFE RELATIONSHIP

Background:
A substantial solution to the problem of crop raiding by wild animals, is a strong local priority and the resultant reduction in the people - wildlife conflict is the necessary beginning to any faunal conservation initiatives. Frustration and anger with the crop raiders spills over to other wild mammals too and gives the small scale traditional activity of hunting wild animals a fillip and justification. Increased crop raiding has also created an ironical situation of substantial conflict between wild and cultivated biodiversity conservation. Today, a diversity of wild mammals is one of the biggest threats to cultivated biodiversity.

Water sources in the forests have reduced due to drying up and tapping of forest springs for drinking water pipelines. This brings the wild animals to the sources near the village and thereon to the villager's crops. There has also been rapid degradation in the habitat of the animals, including a severe decline in flora. These factors together appear to be important reasons for the increased crop losses.

❖ **Action Points:** The pros and cons of numerous ideas were assessed – effectiveness, financial costs and viability. Two sub-strategies, for intervention at two different levels, were finalized.

W6.1 The first part is ensuring adequate water and food availability for the wild animals in their habitat.

W6.2 On the agricultural end, there's a combination of ways (action points) to make crop raiding more difficult.

For details of this important strategy see the full strategy, in section 2, Cultivated Diversity Conservation Strategies.

Strategy W7

THE REGENERATION WAY TO REFORESTATION

Protect and Regenerate ! Why Plant ?

Priority: High

❖ **W7.1 Action Point -**

A suggestion from many knowledgeable local persons, especially for the forest and other relevant government departments was that **the best way of reforestation was to close patches of forest completely for a substantial number of years. No plantations are needed. This is the considered and experiential view of numerous knowledgeable people and communities from the Garhwal hills.**

Details: The best approach to reforestation, reclamation of degraded wastelands and indeed restoration and conservation of biodiversity, in this area and elsewhere in the outer and middle Uttaranchal Himalayas, has proven to be eliminating human and goat, cattle interference and pressures, as well as preventing other threats like fires, etc. Primarily the focus needs to be on countering the threats and interferences, and this is what needs to be invested in, rather than on expensive plantation programs with abysmal survival rates, and often ecologically and locally inappropriate species. This will cost far less. The main expenditure is on protection and here too the effort should be to motivate local communities to undertake responsibility and social fencing should be an integral component.
From the biodiversity viewpoint, a naturally regenerated area, protected from human interference, will have a biodiversity profile that is many times richer than any plantation area.

On hill tops and slopes, this approach will also be more beneficial for the flow and perenniality of highly valuable natural springs. See details in strategy, Water Matters.

There are numerous living examples of this approach, all over the Garhwal Himalayas. This traditional wisdom of hill communities is the basic approach of many very successful community initiatives at conservation and regeneration of natural resources.

Some carefully chosen, indigenous keystone species, fruit and other hardy, appropriate species may be planted by seed sowing or planting. This is only as an additional and complementary input. One common addition in community initiatives is the walnut, through direct sowing of seeds. Some control of exotics or other biodinvaders may be needed.

Strategy 8

ECO - SOS - ASAP

For landslide, landslip and other areas of exceptional geological fragility

Background: Areas that are extremely vulnerable and threatened due to landslips and landslides were identified and named ECO SOS ASAP sites. Instances of dramatic vegetation loss in a topographical and geological context of extremely steep slopes, weak and loose rocks across most of the area, make this a very serious threat. Unaddressed, the situation snowballs, even on to sites downhill. Natural springs are smothered and enormous soil and rock erosion takes place. Consequences for the biodiversity and ecology of the area are apparent. It is also a serious safety threat for people, cattle and agriculture.

Biodiversity Conservation -- A Local Contextual Imperative

Apart from all its other values, biodiversity conservation and regeneration has a special role in this area, given the topographical and geological profile of these hills. The numerous landslides and slips, severe gulley and rock erosion, and smothered natural springs that have followed natural vegetation loss and degradation of any local site suggest that a dense biodiverse native floral mantle is a local contextual imperative. Shorn of this the hills themselves are threatened, what to say of the human habitants.

This is why some sites were identified as ECO SOS sites and eco and biodiversity restoration on them seen as priorities.

BCPP Evaluation:
The incidence of landslides and landslips has gone down dramatically in the last 3-4 years. There were very few new occurrences, despite very heavy rainfall in these years. Most of the old sites of landslides and slips have started moving towards gradual stabilization.

Recent improvements have been due to lessening of big threats like fires, goats, and sharp reduction in cattle grazing and fodder-fuelwood collection pressures.
No restorative measures have been attempted so far.

- **Actions Points –**

W8.1 In all landslip/slide and other vulnerable areas **all cattle and human pressures need to be eliminated**. Especially, they need to be **strictly out of bounds for goat and cattle grazing**. They should be also protected from lopping for fodder and fuelwood.

W8.2 Restorative measures:
* Watershed treatment measures beginning from hill top downwards.
* Planting of slope stabilization species like gonta, malu (bauhinia vahlii), semali (Vitex negundo), etc.
* Contextually appropriate protection works, where needed and possible --- contour bunds, check dams, gulley plugs, brushwoods etc.

During the BCPP Project, ECO SOS areas were identified and eco-restorative were strategies discussed. Some of the priority sites that need stabilization attention: Patniyan ka dabbar, slopes below semalsari, slopes alongside berhjarha, above the Pairi spring source and water tank, above the aam grove park, kaldyan ka pani ka khala etc.

For sites or parts thereof falling under reserve forests, the forest department needs to take the initiative, including funding of restoration works.

Responsibility: Forest department, Soil and Water Conservation department, Vividhara, Local Communities

Strategy W9

HONEY BEE, INDIAN HIMALAYAN

Priority : High

Objectives:
Conservation of endangered Himalayan Honey Bee.
Enhanced crop productivity.
Honey - for nutrition and income.
Greater local knowledge and stake in conservation of wild flowering plants.

- **Actions Points –**

See Strategy and action points, same name, in section on Cultivated Diversity Conservation Strategies.

Strategy W10

FROM ALIENATION TO INITIATIVE AND PARTNERSHIP

- **Removing the Feeling of Alienation amongst Local Communities and a Partnership for Effective Conservation between the Forest Department and the Communities**

Background and Gap Analysis
The local agri-pastoral communities have a deep and varied primary dependence on the local natural resources for their survival and livelihood needs. This historical utilization and dependence continues much the same in essence, to this day.
The critical livestock are primarily dependant on a diversity of wild fodder plants from the forest. Agriculture is entirely dependant on animals for manures as well as for draught power. As the locals say agriculture is unimaginable without the forest. And then there are various other needs fulfilled by the local biodiversity, like : Cooking fuel is almost entirely firewood: wood for implements, house building and repairs, furniture; wild foods; medicines, fibres etc.

And yet, the popular perception among the local communities is that the forests belong to the FD. And are the FDs responsibility to protect and conserve. This has been most in evidence when the forests are threatened notably by forest fires. The primary responsibility for protection and conservation and the initiative is seen to lie with the FD. The alienation comes from a lack of control, decision making powers, formal and recognized participation and involvement in management,

protection etc., adequate acknowledgement of their interrelationship and huge potential role etc. This expresses as a lack of responsibility, care, ownership, belonging in local communities interaction, utilization, perceptions and attitudes towards the forests and the ecosystem. It creates conditions for unsustainable, callous and non-regenerative extraction of resources for local needs as well as earlier instances of lack of concern and even participation in wanton, destructive exploitation of medicinal plants (by contractors), excessive destructive grazing by migratory goats, by giving money to local communities etc.
Essentially sustainability and medium and long term consequences are sacrificed and rampant biodiversity loss and ecosystem degradation are the outcome. This was part of the scenario, in this area too, four years back. As we said at the outset, this is in a situation where the dependence in this context is absolute and irreplaceable. And yet the responsibility can be missing. A strange unconcern and alienation.

And it makes the imperative of conservation, so much tougher to achieve across wide and varied areas. Here and there, exceptional communities and NGOs try to work various creative ways around and through this. As we too have been trying. This scenario makes substantial achievement of the needs of conservation so much (and it seems avoidably) tougher to achieve Always an uphill task !. For a widespread and substantial positive change, this alienation needs to be addressed at the Governmental policy and program levels too, as we suggest below.

Action Points -
W10.1 The most effective and surest way to relieve the alienation of LCs and to enable them to play their role, is to clearly recognize and state the rights, role and stake of the local communities in the sustainable utilization of natural resources . Their traditional livelihoods and survival needs of deep and varied dependence on the local biodiversity and ecosystem, importantly include needs of fodder, fuelwood, food, mulching materials, medicines, timber for house repair and construction and for agricultural and other implements etc. See Local knowledge and use of biodiversity, Annexure 3. Then there is the traditional and recent role in conservation/protection through community initiatives (see Chapter 4, Past and Ongoing Initiatives). That there is so much floral and faunal biodiversity in proximity to human habitation itself speaks for the sustainable use and conservation principles. Overall, this long term relationship and stake in conservation needs to be acknowledged clearly in governmental policy and programs. This will enhance the LCs stake and role in the long term survival and well being of biodiversity and the ecosystem.

W10.2 At the same time, it is important to arrive at *clear responsibilities and obligations of local communities in conservation* of the same resources. Let us

restate here, that all initiatives for conservation in this area in the last nearly two decades have originated solely from the local communities. Yet, there is an air of ambiguity and no ones fully felt and practiced responsibility when it comes to conservation. We've discussed this dynamic in detail in the Underlying Causes and Threats section (Chapter 3). Notably, the LC appears to wait for the FD before it finally swings into action and precious time is lost. Specifically, sustainable utilization needs to be the primary responsibility of the local communities. Then the have a big role and responsibility to protect forests from fires, keep cattle and other pressure away from immediate catchments of springs, landslide/landslip areas etc. Please see specific priority strategies for details.

W10.3 In fact *the* ***relative and complimentary roles of the FD and the LCs*** in the protection and conservation of the areas wild biodiversity need to be worked out in view of relative strengths and contextual factors and the outcome should be widely known and strictly followed. It is in the complimentarity of these roles, a partnership for conservation that the greatest hope and real possibility of conservation of wild biodiversity lies. Holistic conservation needs to be seen and felt as the overarching, supreme purpose, with equity and partnership as principles, the way reveals itself without ego's and turf wars. We have detailed out specific and complimentary roles in many strategies, notably action points of highest priority strategies for control forest fires (Strategy W1) and goat grazing (Strategy W2), as well as Strategy, Water Matters (W4). See specific SAPs for details.

Participation of people and communities, needs to move way beyond being a theoretical concept, for reports, seminars and projects, to **a full/substantial involvement**. A dynamic genuine partnership for conservation and sustainability.

W10.1.1 A specific demand from members of the local communities was that they should have clear exercisable **rights to timber from dried forest trees** for construction and repair of houses. The fear of having to pay fines or bribes is resulting in nearby green trees being felled, defeating the very aims of conservation. The existing system of kukath trees and PD needs to be examined from this angle. A specific number of dry timber trees that can be availed per village / year for local use, needs to be fixed. And this should be easily available. The full village gram sabha can decide on need and use within the community.

Responsibility: Forest department, Ministry and Deptt. of Environment and Forests.

- **W10.4 Incentives for Local Communities to Conserve**

For communities that have taken exceptional initiative/special efforts for conservation and regeneration of forests, water sources … maintaining a high biodiversity profile, protection of endangered and threatened species of flora and fauna there need to be processes and systems of acknowledgement, encouragement, incentives, support, celebration. Including as rewards, awards and financial support. In addition to acknowledgement and fostering a favourable climate, this will enable these special communities to undertake further priority conservation works that needed some external support/know-how. How to utilize the support can be decided in a full village meeting with participation of all sections, especially women, dalits and elderly.

Preventing and Controlling Fires – See details in strategy for preventing and controlling fires. Implementation of this most important strategy will send out positive messages about the FD's seriousness and help build a constructive and conservationist partnership/relationship between the FD and local communities.

W10.5 Mandatory approval/concurrence of most relevant and representative local community bodies (like gram sabha) of most proximate and other affected villages, for any new projects and schemes, esp. any proposal for non-forest uses. There is an MOEF circular stating this.

Strategy W11

HALTING AND TURNING BACK THE BIO—INVADERS

There are three main species/categories of bio-invaders in this area :
Laltain / bhoot phool (Lantana camara)
Kala bansa (Eupitorium sp.)
Varieties of Kurre – bhotiya, mengna and laes (a local category of plants introduced by migratory goats)

KALA BANSA AND KURRE
Priority: V. High

- **Action Points -**
- **W11.1 From dramatic loss of biodiversity to restoration/return of the native and creatively pushing back the invaders:**

W11.1.1 Keeping away fires, goats and other excessive pressures
Our observations and experiments over the last few years have conclusively revealed that the spread of *kala bansa* and different *kurre* varieties is clearly

linked to excessive degrading pressures on the native diversity and ecosystem. The link with wild fires and excessive goat grazing is most phenomenal, they spread like an epidemic post fires and goat grazing, It's a near complete take over from native floral diversity, leaving it no place to return to -- homeless on its own land. Further, *kala bansa* has no human, cattle pressures, nor do any insect or pests bother it. Its deep as well as adventitious roots and fire resistance make it an extremely hardy, adaptable and aggressive colonizer.

Hence, **prevention and control of forest fires and goat grazing are the two most important action points to control bio-invaders**. Details in Strategies for Preventing and Controlling Fires and Minimizing the Goat Rush. **This breakthrough approach works as a prevention as well as control and reclamation strategy !**

The biggest learning (most important result of experiments) of the last four years about exotic and other colonizing weeds, is that if fires and goats can be controlled and pressures on native diversity lifted altogether or reduced, the native diversity regenerates and spreads once again. And the colonizers start to retreat. This was observed in experiments across many sites over the last 5 years.

So this is chosen priority action point and approach. It is also the most time and resource efficient and most holistic way. For native diversity returns along with control and retreat of the colonizers.

As Gandhiji used to say, colonizers have a chance only when the native society is not in good shape, when there are too many pressures, threats and degradation (unbearable pressure and injustice...) of the native diversity/ecology/society. In these conditions colonizers get an opportunity, even a free run. It's the same with society, culture and politics, diversity/pluralism and militancy/fundamentalism. If one's own house is in harmony and diversity is protected and celebrated. Native diversity, life and well being will thrive and flourish. In the ecosystem and the country. And certainly not when there is severe erosion, destabilized slopes and willfully lit fires. *Ecology Lesson No. 1*

- **W11.1.2 Bringing utilisational and other pressures to bear on kala bansa:**

Wherever and whenever it can be ensured that native diversity will get full opportunity to return and reestablish, by not being subjected to unbearable pressures --- there Kala bansa and different *kurres*' can be **manually uprooted**.

Careful manual uprooting and cutting of kala bansa provides water retentive mulch and manure. It can in the same way also be turned into manure for agriculture,

growing trees or regenerating the location where its growing. Kala bansa, in fact, can thus be made to turn from an invader into a eco-restorative agent.

Medicine – the leaf and tender stem sap of kala bansa is an excellent local medicine for cuts and wounds.

W11.2 CONTROLLING LANTANA CAMARA (LALTAIN, BHUT PHOOL)
Priority: V. High

Evaluation and Action Points- Controlling the spread of Lantana camara is a priority action. Its totalitarian colonizing nature, decimates native diversity wherever it spreads and it is very difficult to control and eradicate once it has colonized an area.
Four years back there was only one small sub-site (Gonta dalda) that it had colonized. Manual cutting of bushes was undertaken by the community in a shramdaan. This enabled native diversity particularly existing trees and bushes like oak and others to regenerate and spread. But four years down the line it has spread again. Additionally, stray plants can be seen at various other sunny and steep slope locations.

W11.2.1 It needs to be cut, uprooted if possible, wherever it is found. On fodder/fuelwood collection trips etc. The local community needs to be made aware, motivated and mobilized for this task.
On its main colonized sub-site, a community action to cut and dig out /uproot needs to be undertaken as a experiment. Otherwise the spreading seeds from this nursery will be difficult to control.

Responsibility: Village communities and Vividhara. For all the Action Points, for both kala bansa and lantana.
Time Frame: Immediate Onwards.

Strategy W12

MEDICINAL PLANTS

Jarhi Bootiyan ya Thekedaron ki bootiyan?

- **BCPP Evaluation and Action Points -**

Excessive/comprehensive exploitation of some valuable medicinal plants, through the contractor system, has almost wiped out the targeted species from the area. The main plants that are in a locally threatened state, due to the above reasons are

dalchini, semla, kingora (Berberis asiatica) and *gilloe*. To allow regeneration, no extraction of these plants should be allowed.

❖ **W12.1 There should be no medicinal plant extraction through the contractor system**, as this is driven by pure commerce, with no thought for sustainability. The above paragraph states the consequences of this policy. And it is so across the Western Himalayas. Regeneration and sustainability have to be primary concerns in the collection of medicinal plants.

Responsibility: Forest Department and concerned government departments/agencies.

W12.2 When possible sustainably, medicinal plant collection should be undertaken only by a local village cooperative or samiti, with a stake in long term conservation. Training in sustainable, regenerative collection needs to precede such a program. Only plants that are abundant in the area and can be sustainably utilized should be chosen. Entirely or primarily, plants whose fruits, berries or leaves can be utilised need to be chosen. Measures to ensure and enhance regeneration need to be simultaneously adopted for all chosen plants, commensurate with utilisation levels. Depending on collection and demand levels, propagation and cultivation needs to be adopted where possible. Regenerative use will be the guiding principle. The population of no collected chosen species should decline.

Responsibility: Vividhara

There has been no medicinal plant extraction in the last four years. All the four major targeted plants have seen considerable regeneration, in these years. Villagers have also taken initiative and a lot of care to minimize use of these plants. A few hundred semla plants have been raised in a nursery and planted in various locations over the last four years.

W12.3 Cultivation of medicinal plants and simple processing is a high potential option in this area. As a great diversity of medicinal plants occur in the area, **a garden of medicinal plants, focusing on threatened, rare and high value plants can be grown.** There is a great possibility of growing plants from areas with altitudinal and climatic similarities like other parts of outer Himalayan range and elsewhere in the Lesser Himalayas, the upper reaches of the Shivaliks, and the Dehradun Valley. Some villagers have experience in nursery techniques and an appropriate site exists. Further, as **local people are enthusiastic about growing economically viable medicinal plants in their fields,** experiments in the nursery garden can be the base for identifying plants and cultivation techniques. Non-favoured by wild animals medicinal plants are ideal for cultivation on the numerous

abandoned (due to animals) agriculture terraces. For details see Strategies on additions to agroecosystem and harmonizing people-wildlife conflict, in Section Two, Cultivated Biodiversity Conservation Strategies.
Responsibility: Vividhara

W12.4 Gilloe Latkao Abhiyan: Gilloe/Giloy is an important medicinal plant that is naturally occurring in this area. It is an amazing immune system regular/booster and is in the forefront of research to find a cure for AIDS. It can be propagated by simply placing cut green twigs on trees and bushes in the monsoon season. It is a hardy vine which spreads widely and can be grown on degraded and rocky lands. It is a good source of winter fodder for cattle. A few years down the line after sufficient regeneration it can be harvested sustainably for medicinal uses. Private lands and village common lands, other than degraded forest lands are the chosen locations for this experiment.
Responsibility: Village Communities and Vividhara.

Local Needs / Livelihood - Conservation Link Ups

'Eco Hum Dev' (Ecological Human Development): A strong local felt need is a big shortage of income and employment opportunities. Addressing these needs through creative, sustainable old and new uses of indigenous biodiversity can also serve to simultaneously enhance the local community's value and stake in conservation of both wild and cultivated biodiversity. Due to a variety of factors, the employment opportunities in local rainfed agriculture are currently limited.
Integrating conservation imperatives with those of local livelihoods and needs has been an endeavor throughout this plan (as strategies and actions above illustrate), this section focuses directly on this critical linkage.

Strategy W13

ADDING VALUE TO INDIGENOUS BIODIVERSITY

- **Action Point –**

Simply processed and marketable natural products can be made from many naturally occurring and cultivated plants of the area. Over the last many years the local people have been experimenting with and making simply processed natural marketable products from local diversity.

Sustainable and regenerative use is first and foundation principle. For wild diversity, only fruits or other parts and plants that can be sustainably, regeneratively used are to be selected. Care to utilise only a small proportion of the total available plants needs to be taken. The overall populations of utilised species of plants must be maintained and even enhanced. Cultivation and propagation needs to be gone into wherever needed and/or the scale is substantial. E.g. the amla experience and approach.

Naturally occurring **amla has tremendous possibilities**. On a small scale local people have experimented with, and have been making and marketing some natural *amla* products such as a mouth freshener-cum-chooran, *achar,* jam *etc*. There are various other options such as a natural *amla* candy.

The fruits of **amarha** and **lassoora** , available in plenty, make well known and delicious pickles. **Leaves of *gandhela* (curry leaf)**, occurring in natural abundance here, are a high source of easily assimilable iron and a digestive and can be marketed as dry leaves and a powder.

The **indigenous himalayan varieties of turmeric and ginger** grown here are exceptionally rich in medicinal values and flavour. Marketing of processed ground haldi, over the last years, locally and in Delhi, has revealed an enthusiastic and large market. Highly productive, hardy, well adapted and happy here, it grows without any hindrance from pests, diseases and most importantly the wild animals. *Just the crop to grow more, worrylessly !* Ginger has long been grown extensively, for the market. Marketing dry ginger (*sonth), ginger powder, pickle* could add value to its cultivation.

W13.1 To our mind, a small scale unit in this area is the best way to realize the possibilities stated above. Hygienic conditions and quality control are of the essence in any food processing venture. Our experience shows that this is difficult if not impossible to ensure at the household level. And best and easiest undertaken in a space distinctly meant for this purpose.

For more details on this promising action point, see strategy/action points in cultivated diversity section.

W13.2 Bhimal indi-medi hairwash/shampoo

Bhimal (*Grewia optiva*) is a multi-use, locally abundant tree. The small new branches of Bheemal are cut every winter for fodder, fuelwood and rope. The bark of these same cut branches also holds a natural medicinal shampoo that the hill people have used to wash their hair for hundreds of years. *It cures dandruff and is gentle and moisturising as a conditioner.*

A dry and/or liquid shampoo can be developed from the same. With possible addition of the locally occurring amla and reetha (soap nut). It is also a gentle yet effective cleanser of clothes. Washing soap in liquid or bar form could also be made.
Most of the varied ropes of local use come from the beautiful light golden fibres of bhimal and these are also sold in the local markets. As a value addition, some of these *ropes* could be *dyed with locally available natural dyestuff*. In particular kala bansa, from which we have the know-how for getting the colours green, yellow and grey, could be used. This could, thankfully, also serve as a control (and use too!!) for *kalabansa*. There is need to explore these possibilities.

Strategy W14

PAN–CHAKKI CATCHMENT CONSERVATION

Background:
A new pan-chakki (water mill) has just come to the area. This was a chosen strategy in the BCPP plan for the following primary reasons. To bring sorely needed relief from lugging heavy sacks of ground flour up long steep slopes and other benefits. The only way the pan-chakki will run for more than a few months is by substantial protection and regeneration of the catchment biodiversity and ecosystem. We believe this will enhance the stake of the local communities for conservation of the catchment and biodiversity therein. With multiple benefits.

Action Points:

W14.1 Immediate catchment conservation works, especially treatment of the main gullies above. Protection and planting of moisture retaining and enhancing species of trees, bushes etc.

W14.2 Protection, regeneration and sustainable use in the overall catchment. Primarily from fire and overgrazing/ overlopping for fodder and fuel wood. And all other degrading pressures and uses.

For details, see Strategy, conservation and enhancement of soil and moisture, action points: above and around terraces level, enhancing flow and perenniality of springs and streams, bringing back the oak etc.

W14.3 Integration of other functions like husking etc. with the pan-chakki, to enhance usefulness of pan-chakki and value of stream catchment conservation.
Responsibility: Village community, Vividhara

Strategy W15

PARYAVARAN VIKAS SAMITI

W15.1 Action Point:

Facilitating the formation of a local village based organisation comprising environmentally and socially oriented and knowledgeable elders, women and youth for engaging with key issues of environmental conservation and sustainable development. Treating both as equally important, harmonizing not compromising. It can also play an important role in facilitating the implementation of this BSAP.

Particularly the Samiti can undertake and oversee the awareness campaigning and projects that link up environment conservation with local needs and livelihoods like a *pan chakki* (water mill) and a value addition and processing unit to make natural products from sustainable use of local diversity. See Strategy : livelihood - conservation link up, for details. A specified percentage of all proceeds from such activities will go to a *kosh* (fund), which will be utilised to undertake priority environmental initiatives and works, such as check dams, contour bunding, maintenance of *joharhs* and control of exotic weeds. It can facilitate in choosing areas and building consensus for protective rotational closing of areas. Addressing any new environmental threats and finding locally acceptable solutions.

Responsibility: Vividhara

Strategy 16

REVIVING THE BHIDALNA RIVER BANK FOREST

Background:

Twenty five years of reckless and wanton limestone mining (from 1962 to 1986) in and at the top of Sinsyarukhala/Bhidalna valley caused widespread ecological havoc. Till the mining was non-violently opposed by the local communities and then banned by the Supreme Court of India in response to a petition filed by the local communities and Kalpavriksh (The Doon Valley Limestone Mining Case).

One of the most serious impacts of the mining was on the Bhidalna river. Due to convenience most of the mining blasting operations were along the main river and its numerous stream and spring sources and right at the top of the valley. This resulted in streams and springs being choked under mining landslide debris. A mountain of blasted and loosened boulder and rock flowed into the Bhidalna turning

it into an angry rau of hurtling boulder and stone. With its bed covered heavy with boulders, leaving it without a defined, distinct bed and course it swung and swerved every monsoon and swept its forested and agricultural banks and deposited boulders on lands tens of kilometers downstream. Drinking and irrigation water for a dozen villages is solely dependant on this little water rich valley. This was the major reason for widespread and determined opposition to mining from downstream villages like Thano, RamNagar Danda, Talai, Kurhiyal etc.
Over the 16 odd years since mining ceased, natural processes of restoration and regeneration have been underway. In severely impacted and ravaged valleys these are expectedly slow and gradual. The forest department undertook some bank stabilization and restoration works many years back. These were limited in scope and extent to the mining leased area (for a few years) and the river bed. The villagers of Nahinkala, Barkot, Kotla have meanwhile been active meeting the new big threats to the forest catchments like forest fires, migratory goat grazing etc.

Current Status and Gaps: The good news is that new forests are growing at the base of Bhidalna valley, in the wide rock, bouldered bed, as the river flows gentler and longer carrying a lesser load of rocks boulders and stones. Evident in the stretch along the base of the Sindhwal hill and across the river from loniya pathar, where the river emerges from Sinsyarukhala. The forest from the base of Bavan Morh to where the path/road descends into the river bed has got remarkably dense and increasingly diverse over the last 8-10 years. The new forest are the khair – sissoo riverine forests. Observedly, from a river of hurtling boulder and stone the river first turned into a rapid rain torrent with some boulders and stones. In the last 3-5 years it has perceptibly moved to less and less of boulder and stone and infact as the catchment regenerates it does not swell and hurtle downsteam in big rapids, but flows gentler and longer and more and more to a course. The hills soak far more rain and some springs and streams are more perennial than even five seven years back.

To enhance this snail paced, slowly manifesting process some considered actions need to be undertaken.

There is need for measures to encourage and hold the river to a course. The right bank particularly needs effective bank erosion control measures. With well considered and effective natural processes encouraging measures forests could regenerate in this area and well downstream along the banks of the Bhidalna and Jakhan rivers. This would add tens/hundreds of hectares of riverbank forests to the Dehradun valley. With positive ecological and climatic influences.

Action Points:

* **Protection to the new emerging khair sissoo forests** as well as the existing older neighbouring forests.
* **Effective check on riverbed mining**. The dramatic negative impact of this on the Jakhan river and the traditional irrigation system of Suryadhar village are clear indicators of disastrous consequences.

- Elaborate, appropriate, effective **watershed treatment/conservation measures in the catchments of the springs and streams** of the area, especially the spring/stream and vulnerable gullies.

The entire upstream catchment area, the surrounding hills are Reserve Forests other than the village lands and no such measures have been undertaken in almost the entire area since mining operations were halted. Detailed in Strategy, Water Matters. This will regulate the water flow from the streams and prevent rock, soil erosion and landslides. Making the task manageable and much simpler at the river bed level. Trying to manage a mountain (that too Himalayan) river at the valley base/bed level alone is doomed to failure and stupidity.

* Considered, effective and non-wasteful **bank erosion control measures**. Moving from upstream to downstream, in stages. The needs and processes of the river and nature (natural regeneration and erosion control) must be understood, respected and given full play and participation. Human intervention need must be in support and in tandem with the natural restoration and regeneration processes that are already underway.

Responsibililty: Forest Department, Vividhara

Section Two

CULTIVATED BIODIVERSITY CONSERVATION STRATEGIES

TYPES OF STRATEGIES:

1. Spectrum/Overall Strategies –
Strategies relevant to all or many crops and varieties.

2. Creative Enhancement and Strengthening Strategies –
Creative interventions that address, harmonize key linked issues or aspects like livelihood needs/economic sustainability and enhance energy flows and productivity in the agroecosytsem etc. In all instances compatibility, complementary nature and overall multi-dimensional positive impact have been kept center stage.

3. Crop Specific Strategies --
For particular crops or small groups/family of crops.

Spectrum / Overall Strategies

Strategy C1

REDUCING CROP LOSSES TO WILD ANIMALS AND HARMONISING PEOPLE -WILDLIFE RELATIONS

Background : Agriculture in these hill villages is facing dramatically increased crop losses due to raiding by a diversity of wild animals. This is regarded by the local communities as the No.1 threat/disincentive to farming and agrobiodiversity. Many important traditional crops like mandua, jhingora, makki and wheat are highly preferred by wild animals too. In combination with the unpredictable weather and other threats, agriculture becomes a highly uncertain risky activity. Hence, declining interest, abandoned terraces and changes (detrimental to biodiversity) in cropping patterns. See section on Issues facing Agrobiodiversity, Chapter 3.

Large forest tracts that local communities have played a role in protecting, the best in the area, are the big factor behind the increased wild mammalian concentrations in this area and increased crop raiding.
As a knowledgeable local person puts it, such islands of good diverse forests, in a sea of degradation are an imbalance of a kind too, that is difficult to sustain. This ironical conflict between the imperatives of wild biodiversity and cultivated diversity conservation needs urgent attention and harmonizing. For both to survive

and thrive. This issue is also increasingly being faced by other hill communities that have protected and regenerated their forests.

As action is needed both at the level of the forest habitat of the animals and at the agricultural terraces level, this strategy has been divided into two sub-strategies, with specific Action Points.

Sub-Strategy 1
C1(A)
FOREST HABITAT LEVEL:
ENHANCING WATER AND FOOD AVAILABILITY IN THE FOREST HABITAT

Background : Many perennial water sources in the forest have become seasonal and some others have been choked by landslip rubble. Further, tapping of natural springs in the forest for drinking water supplies has been undertaken in such a way that the entire source is tapped/covered, leaving no water for wild animals and the ecosystem. Various other pressures have also contributed to causing a scarcity of water sources in the natural habitat of the animals. The perennial water sources near the villages play a role in attracting wild animals to the village environs.
Due to diverse degrading pressures preferred wild foods for wild animals in the forest have depleted. This is an important factor that has led to an increase of crop raiding by wild animals. Enhancing such preferred food sources in the forest is an important part of the strategy for lessening crop losses to wild animals.

Action Points

C1.1 De-choking, Reviving, Enhancing the Flow and Perennial Nature of Natural Springs in the Forest
Priority: V.High

Details: Over the last few years, the local communities have de-choked about half a dozen springs that were buried under landslide and landslip rubble. Some protection structures like check dams/retaining walls and little pools have been made at these sites. Further protection and conservation measures need to be undertaken in the gullies (immediate catchments) of these springs ___effective and innovative watershed works like brushwood dams, gulley plugs, check dams, contour bunds etc. according to context requirements and possibilities.
Further, all choked, dried, reduced flow and seasonal springs need to be revived and/or enhanced.
The catchments of natural springs (especially the gullies above and surrounding slopes) need a high degree of protection from grazing (especially by goats), lopping and other pressures.

There is need to revive an old tradition of the area (usually not followed any more), of the zone immediately above water sources being out of bounds for grazing cattle. Forest fire prevention and control is a priority action, for the entire catchment.
For all this to work, the local community must be a critical player in undertaking watershed works, as this will enhance involvement and responsibility, as well as provide employment. Further, for long term sustainability, there needs to be a system of incentives and compensation for opportunity costs to the local communities. This can be linked to responsibility for maintenance of works and protection of catchments.
Inputs from a hydrologist to understand and determine the overall catchment areas for natural springs will be valuable.
Plants known to hold water in their root zone, such as *tun* and *banj* (oak), need to be accorded highest protection and planted, where needed and possible, in the catchments of these springs. Other selected moisture retaining and gulley stabilizing species are: *paiyan, tilphara, sinsyaru, kingora, binda* etc. (???)

Many villagers and Vividhara members have considerable experience in undertaking innovative watershed works.
As many springs and /or their catchments fall in forest areas, the Forest Department can play a leading role in this endeavor or be an important partner. Technical expertise, advice and finance could be two key inputs.

Responsibility: Village communities, Forest department, Vividhara.
Time frame: Immediate/ Short term

C1.2 Ensuring wild animal and ecosystem needs while tapping water for human needs from natural springs in forest areas
Priority : High

The impact on wild animals and the ecosystem needs to be taken into account while planning and implementing drinking water and irrigation schemes, from natural springs and streams in forest areas. Currently the entire source is tapped leaving no drinking water even for wild animals. A fixed proportion of the overall water available in a spring must not be tapped or a maximum percentage of springs that can be tapped in a given area needs to be determined and fixed. So that at least some water continues to be available for the well being of the ecosystem and its constituents.

C1.3 Ways to protect and conserve the catchment of springs/streams tapped for human needs
Priority: High

A practical and holistic mechanism for securing water sources (ensuring water security) and biodiversity conservation, with equity, empowerment, participation as the way.

While most of the springs and streams in this area are being tapped for human needs, no attention or concern is given to protection and conservation of the catchment on which these springs depend. These have seen widespread degradation over the last 10-15 years and no one is even looking that way. The hill villages and proximate forest areas, the BSAP area, are exceptionally water rich providing critical drinking water to a dozen villages plus irrigation water pipelines.

Details : A certain fixed portion of the cost of all such water schemes needs to be set aside for protection and conservation of the catchment. Simultaneous or prior to the undertaking of the work on the water pipelines, catchment treatment and conservation work should be undertaken. Villagers from proximate communities must be important players in this endeavor. The responsibility for design, monitoring and the quality of the work can be that of the forest department. Further, each year, for each water source tapped a certain fixed amount of money should be paid in royalty by the Jal Nigam to the forest department or directly to the proximate village, for maintenance of the health of the catchment of natural springs. This money can be generated by setting aside a certain fixed percentage of the money charged from end users.

The best way to ensure that the catchment is in fact conserved and the water sources are secure, is for this money along with the responsibility to be entrusted to the local communities, whose job it will be to undertake such conservation and protection measures. This will also enhance their stake in the conservation of water sources and their catchments. Currently communities proximate to and dependent on a certain forest area have no stake in the conservation of water sources therein if these are tapped for providing water to other villages. They can often be primary actors, connivers or passive onlookers to the degradation of the catchments of the said sources. Water availability is plagued by huge seasonal fluctuations, the sources can be smothered by small and big landslips, usually a regular flow of stones, silt… The forest department and the Jal Nigam can monitor and evaluate the status of the sources and the catchments from time to time. Many highly desirable objectives can thus be met.

There are two major natural spring zones within this site. We propose that the main one, pan-ghatta khala, a site of numerous perennial springs and their catchments (darhwa and ghorha peti) that provides critical drinking water to nine

villages and irrigation water, other than its biodiversity values and ecosystem functions, be declared **a water reserve.**

To our minds, this is a good way to meet various objectives and make them compatible. The management of the water reserve should primarily be the responsibility of the local communities, with checks and balances. Vividhara is willing to facilitate, especially at the community level. For more details, see Action Point, A Water Reserve, in strategy, Water Matters, in strategies for wild diversity conservation.

Responsibility : Jal Nigam, Local Communities, Forest Department.

C1.4 Reviving and making of *joharhs* and *pokhars* (ponds and pools)

Some half a dozen joharhs have been revived in the last few years. These need to be improved and enhanced. Appropriate sites for some others have been identified, in joint field visits and discussions at the village level.
For details, see action point, by the same name, strategy: Water Matters, in Wild Diversity Conservation Strategies section.

C1.5 Identification and propagation of wild animal preferred food sources in the forest areas, away from the village.
Priority : High/Medium

Details: Some wild animal preferred plants have been identified by the local communities. Ficus species and other keystones amongst trees, e.g. jamun, chanchri, banjh, timla … Shrubs like hinsar, kingor and some grasses.
Through consultations with wildlife experts and local knowledgeable people more species need to be identified. Bamboos were suggested as a major preferred species for deer by Dr. John Singh at WII (Wildlife Institute of India).
Protection and propagation of identified species through seeding and planting.

The measures proposed above for reviving and protecting springs and their catchments and making joharhs (ponds and pools) in the forest will also regenerate flora and provide enhanced food for wild animals. So will implementation of other strategies notably those for preventing and controlling forest fires and nomadic and local goats etc. For details see strategies for wild diversity conservation.

Responsibility : Vividhara, Village Communities, Forest Department

C1(B) Sub-Strategy 2

AGRICULTURAL TERRACE LEVEL:

MAKING CROP RAIDING DIFFICULT FOR WILD ANIMALS

Priority: V.High

Action points for making crop raiding more difficult for wild animals through a combination of effective, innovative techniques.

The basic approach is to encourage community level engagement with the problem, choosing and undertaking synergized and joint actions, wherever needed and possible. Also, selecting effective methods to make this effort and time consuming task more effective and easier.

We found many mainstream and in-vogue ideas amongst wildlife crop raiding experts, for example electric fencing, to be exorbitantly expensive, non-replicable and of doubtful safety.

Many of the action points for this sub-strategy emerged out of an invitation to local communities to use their creativity and ingenuity to come up with high potential innovative solutions to crop raiding, *without killing or hurting the animals*. And we offered them support and facilitation to field test all highly promising ideas. The idea was to throw up lots of promising local, viable, cost effective ideas from which people can choose the best and appropriate for them. This effort is still very much underway. We share our current considered action points.

The specific action points are mostly ideas that emerged and were tested and found to work, in the local contexts.

This search and experimentation has been on during the preparation of this BSAP and over the last 3-4 years.

- **Action Points**

C1.6 Serious Revival of Tands/Machans (small watchtowers on agri-terraces)

Background : This was and still is the most important and effective traditional method. Its practice and effectiveness have both declined in recent years due to a host of factors such as :

Fewer people are available for agriculture and protection. There is extreme fragmentation of the already scattered agricultural lands. The better off families take less interest in agriculture and particularly protection. Greater numbers, wider diversity and changing habits of wild animals now call for protection round the clock (a really tall order), in place of the solely night vigils of yore. When some families stop putting up watchtowers it creates gaps and the system does not work half as well.

This problem is most serious for the main village of Nahikalan, primarily as the village is in one location and not spread out, as is more prevalent in the hills, and also as it has good, large community protected forests above and around it.

For making protection through tands viable again the following actions would go a long way:

Consolidation of scattered and fragmented land holdings. This is elaborated in the next Action Point.

Integrating creative and innovative ideas with tands to make protection less effortful, more effective and enable it to cover a wider area. Ideas such as rattlers, bells etc. on a wire ; whistles, dhapli and bhompu (hooter); gophle and bharhooka. Some of these were tried successfully over the last few years and are a good part of the relatively greater interest and effort at protection including tands. (these actions are elaborated a little further in this strategy as action points).

Encouraging farming families to set up tands or little huts/homes wherever they have enough terraces to protect. For this method works properly only as a network of tands.

Since experimentation with limiting crop raiding has started in the last years, a perceptible increase in the numbers of tands being set up has been observed. This indicates proactive hope in place of resigned despair.

Responsibility : Village communities, Vividhara

C1.7 Consolidation of Land Holdings
Priority: High

A very important way to make protection of crops more possible and feasible would be to remove fundamental structural handicaps. The single biggest handicap is that the scattered land holdings have got very fragmented (small), over the generations. And most farming families now have one, two or three terraces scattered all over the place. This makes protection of all or even most terraces a near impossible task. Consolidation of land holdings would primarily mean creating a few big clusters of khets, for each family. Such a consolidation will go a long way to form the basis for effective and sustainable protection from crop raiding, which can then be primarily driven by the self-initiative of farming families.

This would enormously enhance the value and possibility of tands/ machaans. It creates conditions for farming families to make small or big huts or homes on consolidated lands for seasonal or year round residence. Let us elaborate:
Dispersal of the village: An elderly villager suggested that every family should make one or two rooms in their agricultural fields. The government should give some help for this. It could even be in the form of a loan that is to be returned. There is a need to find ways to support such efforts. Is there any governmental or other agency that can provide support?. Can some money from Indira Awas Yojna be used for this? This could be explored. Deep consideration of the problem of raiding has often brought up this idea as a long term multi-benefit solution.
Substantive and thought out consolidation of terraces, followed up by the movement of homes (seasonal or perennial) near terraces has the potential of making a sea change not only to the problem of crop raiding, but to the productivity and well being of agriculture as a whole -- lands near homes are inevitably the most fertile, best cared for and protected. Essential work linked to agriculture becomes simpler and more efficient, leading to productivity jumps and lesser hardship.
Currently for many, nearly half the time and effort is spent on the way, to(ing) and fro(ing), headloading and lugging materials and self. And the animals will likely get the crops.

Basic guidelines for consolidation of holdings, for each farming family:
* Clustering maximum number of *khets* together, at least 2-3, wherever possible.
* One location with a substantial number of *khets*.
At least some (one or more) khets near home (for a homestead and for important but wild animal preferred crops).

Caution : There is a great variation of soils, aspect, drainage, proximity to home/village, altitude, gradient etc. across different agricultural terraces and each family has some lands in this diversity of contexts. There are important reasons behind this. Given the rainfed nature of farming, the diversity of crops and needs of the people, this is important strategy to maximize success and security of agriculture. So absolute consolidation of lands on one location (as happens in the plains) is not recommended in this hill, rainfed farming context. This will also be detrimental to agrobiodiversity and meeting the diverse food and other needs of the people. It is extreme fragmentation of holdings that needs to be addressed and rationalized. The relative values of different khets are also not easy to assess by an outsider and these are best known to the local community. The best way to ensure that the ends are holistically desirable is for the local community to have a primary role (and a veto vote) in the process. These factors will need to be kept in mind in this hill context.

Land consolidation work is to be ideally facilitated by the relevant government department dealing with landholding.
If this takes a while to materialize the villagers need to be encouraged (and facilitated, if needed) to undertake some community led mutual exchanging/ consolidation of terraces.
Responsibility : Concerned Government Department, Village communities, Vividhara.
Time frame: Short to Medium term

C1.8 Ringing, Rattling Drums, Tins, Bells on a long Wire.
Priority: High
To scare animals as well as to alert the *tand* man.
A variety of rattling materials in diverse combinations can be attached strong and loose on a strong iron/GI wire to produce different types and frequencies of sounds. Different kinds of tins, cans, etc. can be used with varied materials of varying sizes tied to them.
Tied on along a wire this will make the sound travel in a wave over a large area.
These alarms would be set off when a visiting animal walks into the wire. And it could sound, though softer, with the breeze too. A watchman pulling the wire will also set off the sounds.
Initial experiments with this method have been very successful, especially for deer family, wild boar and birds.

Responsibility: Village communities, Vividhara and JuJuJu (???).

C1.9 Damru, Dholak, Dhols and Nagarha's…
Whistles, D*aphli* and *Bhompu* (hooter)
Sounds like folk music concerts during the crop protection season, under the mountain night sky.
Priority: High

These could be used on a round of the agri-terraces before sleeping or by the tand man to blow now and then, giving his vocal cords a break and building his lung power. They can also be used in community/group efforts to chase away monkeys and langurs.

C1.10 Upale/kande (dry cowdung smoky fuel cakes) and fire crackers

Lit kande left in ripening agri-fields overnight is a traditional method to keep away boars and deer, the former particularly.
Experiments with bursting of fire crackers to keep away animals have been very successful over the last few years. Combining these two methods, by thoughtful placement of the cracker on the slow burning dungcake, one can roughly set the

timing of how many hours later the cracker will go off. This has been attempted very effectively by many local farmers.

Some Other Methods:
Encouraging local communities to find holistic, cost-effective solutions to raiding also brought forth other ideas with potential that are being experimented with, e.g. two traditional methods that local people fancy and are experimenting with are **bharooka and gophia** .
Taped or radio **music played loud** is an idea that has not been tried yet, perhaps due to the huge cacophony it may create or *could it bring the animals in*, for **the concert**.
Wire barriers or traps is another idea that enterprising men try now and then. Set up properly, it works. And there are others.

C1.11 Medicinal plants and fruit trees for far-off terraces

Most of the far-off agricultural terraces have been abandoned due to difficulties in protection from animal raiding. Undertaking the cultivation of medicinal plants and fruit trees, of known economic value and/or local use that are not favored by wild animals is the most promising possibility for far-off abandoned terraces.
Complementarily or alternatively these farthest from village areas can be developed further as fodder and fuelwood lands.
Fruit with economic value, medicinal plants are also recommended for small and/or steep sloping terraces and kalnas (land between terraces).

The local communities are enthusiastic about this idea. Market linkages: In addition to economic/market value, the ease or difficultly of market access and forming of marketing linkages will be an important factor in selection. Possibilities of farmer or local community/group management of marketing need to be additional factors in selection of species.
More details in Strategy, Integrating chosen fruit, medicinal and other plants into the agroecosystem.

C1.12 Bio Fence between Agriculture and Forest lands

A Barrier could be erected around the agricultural zone, adjoining the forest, especially on the sides that animals primarily come from -- from Salmundi to Kunda pani (local area names). This will significantly protect the agricultural lands of three villages. This idea has been regularly mooted by various village people, particularly knowledgeable elders. It has been coming up over the last many years. And it is their belief that this can significantly bring down crop losses. The difficulty and

challenge has been what type and size of barrier will be effective in keeping out the diversity of crop raiding animals and the cost factor.
There have been many aspects to consider and after long consideration, the current optimization of the idea that holds promise and cost-effectiveness is:

- A closely planted bamboo barrier. Help for identification of appropriate bamboo species, that can be grown in a row, can be obtained from: The Bamboo Institute, Earth and Grass Workshop, Y.S Parmar University of Horticulture and Forestry, Nauni, Himachal Pradesh.
- A combination of thorny cacti (like rambans/agave and nagphani), hedges, vines etc.
- A wall or a trench, depending on contexts like availability of stones and gradient suitability.

Responsibility: Vividhara

C1.13 Actions For Bandars :
Currently the biggest crop raiders and most difficult to keep away.

* *Bandarwals* (village agriculture guards): Selected people with the responsibility of protecting crops of the entire village or a part thereof, from bandars and langurs. They would be selected for each cropping season. Everyone whose crops are in the area pays a certain amount of money or share of the produce. This idea was strongly expressed and endorsed by many villagers. Now and then everyone may need to join them (say once or twice a week, at least one person from every family) to chase bandars far away. Various benefits will include enhanced productivity, time saving for other work, children can be relatively freer from crop protection role.

* Bandars are best and easily chased away at *brahm mahurat* time, first morning light, before sunrise. This is an old Garhwali belief, from another region.

Some other high potential principles and tried ideas of effective protection, from wise elders, women, exceptional farmers (from the area and other parts of Garhwal):

*** Community joint effort is the key. Bandars shouldn't get used to easy and successful raiding. It shouldn't form into a habit.**
If they get food they won't go away. And if they don't, they won't come. So this has to be ensured through joint community effort (Kotla village view). But we shouldn't hassle them too much or they will hassle us back.
* It is more effective if people go in 'big' teams to chase bandars and other animals away far.
* Groups of trained dogs, preferably kanjar dogs .

* There is a need, once again, to plant crops all over the agricultural area, and seriously undertake protection. This way animals are controlled in the far away terraces itself. Rest of agriculture becomes much safer and overall crop losses are significantly less. This links up very well to observations about monkeys. That they are mostly found on border and fringe zones, interfaces. Planting away from the village will make that the fringe. And they can be controlled there. Today, as agriculture has shrunk, to near the village, with few cultivated fields below the village (the side the monkeys come from), they are virtually landing up in the village. And no area is safe from them.

Responsibility: Village communities, Vividhara

C1.14 Wild Boar Control

According to local people boars arrived in this area only some 30 odd years back. And their numbers have multiplied rapidly, though the numbers appear to fluctuate hugely, over the years. Current controls are hunting by leapord/tiger, hunting by humans, and they appear to migrate to and fro in the broad area.

Details: Local communities and some wildlife experts are of the view that hunting of wild boars should be allowed. Local people argue that in addition to crops, they cause a lot of damage to the forests, and their population spirals to unacceptable levels. Further, FD should take the responsibility to keep numbers down, or tell the local people that they are free to do so.

We feel that the Forest and wildlife department needs to address this issue to find a satisfactory solution. Anger and frustration with one or two species of crop raiding animals tends to spread to others and provides a fillip to wild animal hunting. We feel addressing genuine problems can help broaden the support base for protection of wild animals

Responsibility: Forest Department

C1.15 A Design Option

An overall design option for agriculture to make protection of crops simpler and more possible. This locates and integrates different promising ideas/possibilities, into a geographical agri-landscape design :

<u>Zone 1</u>

This area comprises mainly of farthest off terraces and surrounding grasslands (private and commons). Many of these terraces are today abandoned, primarily because crops grown here are nearly impossible to protect from animal raiding. Many of them have turned into grasslands (grass terraces).

* A barrier around the agricultural zone. On the outer fringes, where village common lands meet the forest lands. Detailed above as Action Point, Bio-fence…
* Fodder and fuel wood and other locally useful trees, bushes and grasses, including some bamboo.
* Non-favored fruit trees like amla, lime and lemon family.
* Cultivation of medicinal, aromatic and other economically valuable plants, that animals are not interested in. Particularly for the abandoned and/or impossible to protect terraces. Details in strategy in enhancements section.
* Non-preferred by wild animals crops like filanga, a big favorite of bees and butterflies and left absolutely alone by wild animals), haldi, buckwheat, amaranthus etc.

Zone2

The farthest currently farmed terraces, currently very difficult to protect.
* Non-preferred crops like : turmeric, buckwheat, mustard varieties, chilies, amaranthus, filanga etc.
* There must be a zone of non-preferred crops before the preferred ones begin. If some preferred by animals crops are to be grown on the inner side of this zone it is recommended that they are grown in intercropping and/or mixed cropping with the non-preferred. This way the wild animals will need to travel a good way in for preferred crops and they will know it.
* This is the time and stage for the rattlers on wires and other such chosen methods (listed in this strategy) to start being used. Wires with rattlers can be across wild animal preferred pathways or/and connected to tands(watchtowers). These methods start to be used as the preferred crops start.

Zone3

* This zone is for valuable crops that are also preferred by wild animals. This has to be with back up protection by tands or close to village/hamlets/houses.
*Other chosen innovative methods are to be used such as rattlers, crackers, bandarwals, trained dogs etc, which have been listed earlier.

C1.16 Better Scarecrows

for bird amusement ?

There is scope and need for making the currently made scarecrows much more realistic and hence effective. An innovative beginning has been made in the last year.

C1.17 Actions For Controlling Rats

Rats are big raiders of agricultural crops in this area. The following methods were short listed, as they are simple to do with locally available materials.

- Leaves of the chhirna tree, which grows abundantly locally can be put in rat holes in the terraces. This makes the rats abandon the holes and move on elsewhere.
- Similarly horse dung, easily available locally can be placed in the rat holes and near them. This also repels rats and makes them leave the area.
- The oil cake of *chullu*, the wild apricot, is roasted and placed in the rat holes.

All rat control methods are from traditional garhwali folk knowledge, accessed from the farmers of the Beej Bachao Andolan.
Responsibility: Vividhara (sharing), LCs (implementation)

Strategy C2

ENHANCING AND WIDESPREADING AWARENESS OF THE DIVERSE VALUES AND CHARACTERISTICS OF BIODIVERSITY

Priority: V. High

Background : There has been a steady erosion and devaluation of the tremendous local knowledge and appreciation of the diverse attributes and values of traditional agrobiodiversity --- especially amongst the young. All this needs widespread sharing in a locally meaningful, affirming and celebratory way. The role of agrobiodiversity in local food and nutritional security and to meet other diverse local needs including future needs and aspirations needs to be discussed and explored locally.

- **Actions –**

At the following levels:
1. Local level : farmer/household, village, cluster of villages/valley, local area
2. Consumer level: sharing awareness of biodiversity and linked concerns in an interactive and dialogue form, mutually beneficial selling and buying.
3. Media and government policy and program level.

LOCAL LEVEL
Action Points:
C2.1 Documentation of special values and characteristics of traditional crops and varieties including in comparison to hybrids and exotics.
C2.2 Enhancing and spreading awareness of local agrobiodiversity, on the following themes through creative methods.

C2.1 and C2.2

Themes For Documentation and Awareness Enhancement:

Some key aspects, values and characteristics to be considered and addressed in documentation and awareness building :

- Adaptation and hardiness for growing in special local Himalayan rainfed farming conditions, especially the following : Climate of the area including wide rainfall and temperature variations (including major and minor drought resistance and ability to withstand exceptionally heavy rainfall and some frost, humidity variations and heavy dew).
- Edaphic factors : exceptional range of soils, all agri-terraces are predominantly of stones and pebbles, with minimal or moderate soil.
- Resistance to pests and diseases.
- Gradient, drainage and aspect
- Fertility and productivity of land under biodiverse crops and monocultures, immediate and long term. Under organic manures and local growing conditions. Including of diverse fodders from crops in addition to grain output.
- Cultivation practices: the vast, local knowledge potential, evolved and refined over centuries. What, when, where and how to grow.
- Crop rotation cycles and combination/companion planting/intercropping, knowledge and practice.
- Food and nutritional security of local population and beyond: historical , current and future ability to meet these needs.
- Ability to meet diverse local needs: Food, fodder, fibre, medicine, local exchange and income.
- Storage qualities.
- Cultural and religious dimensions.
- Economic aspects: Livelihoods and income, current and possibilities.
- Comparisons with alternative paradigms of hybrid crops, chemical fertilizers and pesticides (high external input agriculture) esp. for aspects in this section.
- Challenges and constraints facing agrobiodiversity and farming.
- Strategies, Actions and Ideas for meeting challenges and opportunities. Including as elaborated in this BSAP.
- Enhancing market value and returns through better knowledge, access and value addition. Possible links with rest of society, including consumers through melas, exhibitions, outlets, based on principles of fair trade.

C2.2 Contd.- Different Chosen Media for Spreading Awareness at the local level:

Awareness through folk music, lyrics and poetry, riddles… The local languages of Garhwali and Hindi have many exciting songs and poems and riddles on agrobiodiversity, agriculture and ecological knowledge.
Folk, Street and Forum Theatre: People of this area have a recent tradition of theatre on biodiversity and ecological issues.

Both the above ideas are communicative and fun, with wide outreach amongst different sections and ages. Experiments with these methods, by the Vividhara team, over the last 4-5 years have been very successful and heartening. As a village elder said about awareness methods, "for any method to work it has to be enjoyable too".

Informative and Communicative Literature on agriculture, especially biodiversity and linked areas, for different reading and knowledge levels. To be located in and made accessible through the existing local library and activity center in Nahikala.
Slide shows- considerable material for slide shows already exists with Vividhara.
A Kheti-Sanskriti Mela at the broad local area level. Either at the Bhidalna micro-watershed level comprising some 25 odd villages, plus some neighbouring ones. Or at the hill villages level. In collaboration with the Beej Bachao Andolan and other movements and NGOs working on this and linked issues. An exhibition on Uttaranchal Himalayan agro biodiversity, interactive sessions, fruit trees, medicinal plants, folk music, crafts, theatre and activities for children.

THE CONSUMER LEVEL:
C2.3 The Nature Bazaar at Dilli Haat. For 8 years running the farmers of this area have been holding an annual exhibition on Himalayan agricultural diversity, with live displays, awareness materials, wide ranging dialogues, folk street theatre, songs. As well as a sale of indigenous biodiversity based organic foods and natural products. In these 9 years, this program through interactions, sales, exhibitions and cultural programs, has outreached to well over one lakh people of diverse backgrounds and ages.

- **Action :** The entire endeavor (above) has been entirely non-funded. Financial support for producing awareness materials, better and larger displays, street theatre and folk music can hugely enhance the scope of awareness outreach at this best regarded annual crafts fair in Delhi, as well as participation in other exhibitions/festivals. A fuller fledged exhibition on Himalayan biodiversity is another exciting possibility.

Strategy C3

SOIL, MOISTURE CONSERVATION AND ENHANCEMENT & FARMING RAINFED IN TIMES OF CHANGING/SWINGING LOCAL CLIMATE

Background: An entirely rainfed agricultural context with steep slopes (including sloping terraces), rocky soils, heavy downpours and long dry spells. This makes adequate soil and moisture critical factors in agriculture. Today, agricultural terraces and the entire agroecosytsem are characterized by heavy soil erosion and rapid moisture loss.

Effective and urgent actions to prevent excessive soil erosion and rapid moisture loss are critical to the productivity of the agroecosystem and agrobiodiversity.

On top of these contextual factors there is dramatic local climate change over the last fifteen years, characterised by increasing unpredictability. The biggest expression of this is exceptionally heavy downpours (usually in the monsoon months) on the one hand and long dry spells on the other. Other expressions of this are unseasonal rains, lack of snow/hail in winter/spring, late arrival and abrupt withdrawal of monsoon. Even for a rainfed farming community the sky is increasingly impossible to predict. This new factor makes focused and effective action on soil and water conservation all the more important and urgent.

What and how to farm in times of changing climate? This is a big challenge facing this and other rainfed farming communities.

Action Points:

Proposed actions have been divided into two different areas/zones of the agroecosystem to enable greater focus and details:
Above and around terraces
Agri terraces and kalnas (between terraces)

C3A ABOVE AND AROUND TERRACES:

C3.1 Restoration and Protection of Oak and other chosen species, known for their water/ moisture holding and soil binding properties.

Priority: V. High

Background: The main villages are situated strategically at, or just below, the oak line, with forests above, as this implies maximum soil moisture and fertility. Due to excessive biotic pressures, viz. fodder and fuelwood collection and lopping for vine stakes, the tree density esp. oak has diminished drastically and forests above are degraded with huge consequences for rainfed agricultural productivity. The oak line has in fact been moving up and away from the village and agriculture.
One of the best and surest ways to a productive rainfed agriculture in the middle Himalayas is a good forest, usually of oak and associated species, above the agriculture. These forests ensure soil moisture, fertility, microclimate, accessible sources of fodder, manure and mulch etc.

Action Details: Enabling and undertaking to provide conditions for regeneration of oak and other appropriate species and undertaking complementary planting of the same, where needed.
Location: The hillside and the forest area above the agriculture all the way to the hilltop. With special focus on the area right above the agri terraces and the gulleys, big and small, running between the agricultural terraces.
Some of the identified species: *Oak, tun, tilphara, paiyan, sinsyaru* etc.

- Enhanced protection to all existing species of flora of all sizes and ages of identified preferred species, through awareness and physical protection.
- Ensuring sustainable utilisation and regeneration in the entire area, through awareness and sensitization initiatives, participation and ownership by the local community.
- Propagation of spectacularly appropriate species, wherever natural regeneration needs to be supplemented:

  a) Through direct sowing of seeds, e.g in small channels along contours and covering the same with primarily oak leaf mulch. Thorny bushes can be grown on the sides for protection.

  b) Raising of saplings of chosen species and planting them at carefully chosen spots/zones.

  c) Protection of the above saplings to ensure survival. Planting will be undertaken in small patches that can be protected. In addition to physical barriers, some villagers have already expressed willingness to undertake responsibilities for protection.

  Full attention to be given to the critical component of protection.

Responsibility: Vividhara
Time frame: Immediate and Short- term.

C3B THE TERRACE AND KALNA LEVEL –
Action Points:
C3.2 Widespreading awareness of enormous soil erosion/ moisture loss – the causative factors and consequences.

C3.3 Implementing prioritised measures for structural stability and erosion control on kalnas and agri-terraces.
Priority: High

Kalna Level Action
Kalnas (the slopes between terraces) are typically very steep, upto more than 80 degrees. Unlike many other hill areas, they are only occasionally of stone retaining walls. Typically, these are of soil/loose stones and held in place (despite the slopes) by a diversity of wild plants—trees, shrubs, grasses and herbs. This abundance of wild and useful trees etc. on kalna's provides a good part of the fodder needs of the village cattle. And makes this a traditional agro-forestry system.
This is a critical traditional livelihood strategy as animal husbandry is as important and more reliable a livelihood option than agriculture.

C3.3.1 Planting of chosen moisture retaining, soil binding locally useful trees, shrubs, grasses and herbs on kalna's.
The stability of agri-terraces is linked to the stability of the kalna's. When a kalna falls or seriously erodes, the terrace erodes and often collapses. The critical stability elements are trees, shrubs and grasses. Many unsatisfactorily stable kalna's need more of a carefully chosen compatible to agriculture vegetative cover. This will play a big role in minimizing soil erosion and consequent moisture loss. Stable and non-eroding kalnas will provide a foundational base for erosion control measures outlined in the next few action points.
Details of this action like identified species and other important considerations and synergies are in the Strategy for Enhancing Traditional Agroforestry System.

Terrace Level Action
C3.3.2 Avoiding ploughing on edges of terraces, to prevent terrace collapse and heavy erosion

Details: An awareness intervention to make farmers avoid ploughing on the 1 to 2 ft. outer and inner edges of terraces. This is a major destabilizing factor that leads to heavy soil erosion and kalna and terrace collapse. The outer edge of terraces needs to be left undisturbed as a walking and retaining *mend*. These walking pressed soil mends will prevent heavy seepage of water into the fragile edges of terraces and minimize this cause of kalna and terrace collapse. It may also partially deter large

field rats from burrowing right under this fragile zone (another causative factor of collapse).

C3.3.3 Reducing gradient of agri-terraces to no more than a gently sloping one
The considerable slopes/gradient on many terraces are another major reason for heavy soil erosion and moisture loss. Typically, the rainfall is a heavy downpour. A huge difference in soil moisture retentivity and productivity of crops was observed between sloping and relatively level terraces. Reducing the slopes of agri-terraces to gentle levels is critical for bringing down erosion losses and enhancing soil moisture levels. This is crucial for the productivity and viability of rainfed agriculture.

Action Details: Tilling of land to be undertaken in a way that gradually reduces slopes rather than enhances them. The traditional *pata*, a plank of light wood, used for leveling the soil, should normally be run after every sowing. This can be used to reduce the terrace slopes by gradual movement of soil from higher areas to lower ones. Over the seasons and years, not at one go.

Stones to plug rain gullies and channels to prevent them from growing bigger and spreading. At the edges of terraces or on them.

Small *mends* of stones/soil or vegetative matter (weeds/ dry wood) can be made across the gradient on sloping terraces.

C3.3.4 Mixed cropping and cover crops
To afford greater cover and protection to soil from forces of erosion. There are numerous traditional crop combinations and experimentation on more needs to be encouraged. Traditional multiple crop combinations too need to be encouraged, as their practice is dwindling.

C3. 3.5 Adequate mulching for all crops that are benefited by it

C3.3.6 Increasing organic matter content in the soil through farmyard manures and other means.

C3.3.7 Experimental and demonstration terraces for soil and moisture conservation

Every family to seriously experiment on one terrace.
Vividhara/JuJuJu to undertake experiments on some terraces to develop demonstration terraces.
Responsibility (Terrace and Kalna Level): Vividhara, Village Communities, JuJuJu

Time Frame: Immediate to Medium Term

C3.4 Enhancing Flow and Perennial Nature of Natural Springs and Streams in the Agricultural Zone

Action Details:

a) Preventing and controlling fires in the catchment of springs and streams, above and in the agroecosystem. (Details in strategy for preventing and controlling fires).
b) Sustainable and regenerative use principles for collection of fodder and fuelwood in the catchment areas.
c) Special protection measures for natural regeneration and planted native diversity.
(especially in gullies where natural springs occur and adjoining slopes).

d) Effective and innovative watershed works/structures in gullies and immediate catchment of springs and streams.

Responsibility: Vividhara

C3.5 Support irrigation for rainfed agriculture through rainwater harvesting and spring stream water collection.
Priority: Medium

Action Details _

C3.5.1 Roof top rainwater harvesting. For homesteads/sagvarhas/kitchen gardens.
Furthering and reviving homesteads/kitchen gardens is the chosen strategy for conserving the diversity of traditional vegetables, herbs and spices and to meet the nutritional security and health needs of local communities. To meet the water needs of these homesteads rooftop rainwater harvesting appears to be the best way. The water sources are at a fair distance from many homes.

C3.5.2 Spring/stream water collection tanks

Priority : Medium
For support irrigation for some agri-terraces. In conditions of increasingly unpredictable and yet overall abundant rainfall, this appears a promising approach. If the rains exit too soon and suddenly or fail, at least the crops on some terraces can be saved and/or some essential foods can be cultivated. For adequate water for a substantial number of terraces, this action is also linked to the last action point -- enhancement of flow and perenniality of springs.

Strategy C4

JUJHARU JUGARHU JUMBISH -- JuJuJu

An experimenters, innovators, seekers, sharers collective

C4 Action Point -

Priority: High

Formation of a group of exceptionally motivated and knowledgeable individuals from the local communities to encourage, create an atmosphere for, undertake and support experimentation and innovation in agriculture. As well as facilitate sharing and spread of promising ideas that have been tried out.

Agrobiodiversity will be a key focus area, the foundation along with organicity, in the larger effort to evolve a sustainable productive agriculture for the area, able to meet key local needs and aspirations. This group and individuals therein, will play a key role and responsibility in implementing many of the strategies and action points in this BSAP. Some specific focus areas before the JuJuJu will be:

conserving and enhancing biodiversity and organic productivity through meeting challenges of moisture, fertility, pests & diseases… and evolving and developing combinations & rotations, agroforestry, integrating compatible horticultural plants (fruit, medicine, aroma…)etc.

Specific Actions and Some Methods

- Finding and demonstrating in the field answers to identified (in this BSAP) and future challenges before local agriculture. Undertaking experiments to test out and detail promising ideas.
- Sharing the results of such experiments.
- An attempt to keep shining light on the key issue of What, When, Where and How to plant, in the rainfed agriculture of the area.
- A forum for collective search, inquiry and support.
- Monthly or bi-monthly meetings. Definitely before and in the middle of the two main cropping seasons. Farmers of the whole area can be invited, now and then into these meetings, for collective discussions and brainstormings, especially on problem and key areas and issues. In any case, the meetings and the process will be open to all interested people.
- Visits to other exceptional areas and farmers.
- Training programs.
- Building of a small focused section on biodiversity and sustainable agriculture in the existing library and activity center. Subscription to best journals and periodicals on the subject, in Hindi.

Responsibility : Facilitation - Vividhara

Strategy C5

REDUCING EXCESSIVE WORK AND DRUDGERY

Backgrounder --

A key member of our team once said, everything is diverse here, the forests, agriculture and our never ending work.

This is especially true for the areas women. Most of the hardest work is reserved for them. And the sheer number of tasks. From before 6 a.m to past 11 p.m its near ceaseless work.

There's a lot of hard, repetitive and long hours of work involved in traditional biodiverse agriculture, on top of the other work. This is usually not considered and engaged with by anyone, including proponents of diversity in agriculture, like us. To near sole responsibility for fodder, fuelwood collection, cooking(including washing and cleaning), looking after kids and cattle, carting water and washing clothes lets add the following agricultural scenario to appreciate the life of a hill woman, in the context of agriculture. So that real and holistic answers can be sought. Diverse crops and varieties mean more and longer seasons of work. Cultivation practices of many traditional crops, especially weeding and hoeing can be back breaking drudgery. Women have stated this to be one of the biggest drudgeries and some even stated that unless ways are found to lessen this back-breaking work, crops like mandua and jhingora will not be cultivated for long. Clearing and carrying headloads of diverse dungs to far-off terraces is another drudgery area --- women are almost never walking without some load on their heads. Then, increase in wild animal raiding of crops is demanding increased effort at crop protection, in the form of day and night vigils. All this work is a big contributory factor behind decreasing cropping area of crops that are difficult to grow and protect, including important traditional crops like mandua and jhingora. On top of the above constraints, most crops face a combination of other threats and pressures, as well. So, whether all this work over months will bear fruit or not is highly uncertain, making agriculture a risky, uncertain activity. This uncertainty may well be making the work feel harder and makes people wonder at purposefulness of it.

What we share in this section are local women's perceptions/feelings regarding work levels, for assessments by others especially men and outsiders are likely to be very subjective and judgemental. The alarming neglect of this issue appears to be because most of these activities are seen as solely women's responsibility.

From any holistic and just perspective it is imperative that ways be found to lessen these unacceptable levels of work drudgery as well as effective strategies for other threats, so that work adds up to something.

Action Points:

C5.1 Lessening drudgery in weeding and hoeing, of monsoon crops, esp. mandua and jhingora.
Priority: High

Experimentation and adoption of a Himachali technique of mandua cultivation. This involves first growing a nursery patch of seedlings and then transplanting them in rows, in prepared fields. After some weeks ploughing is undertaken in the space between rows to overturn soil and control weeds. More farmers have decided to experiment with this method this year (2002). It has been tried by two farmers in this area and they recommend it too.

Responsibility: village community, JuJuJu, Vividhara.

C5.2 Forest leaves, fire lines and fertility – a wholesome way to less drudgery
Priority: High
Objective: Lessening drudgery of carrying head loads of fresh cattle dung to terraces far from the village and many other simultaneous benefits (see below) :
Details and Expected Positive Outcomes: Clearing/collection of leaves from forest paths and carrying them to make manure or direct use as mulch, especially for the far from village terraces. See action point in Forest fire prevention strategy (W1) for more forest level details and benefits.
* Mulch and manure from forest leaves is a tried and trusted source of exceptional quality fertilizer in the Garhwal Himalayas. This new source of good fertilizer will reduce the need for carrying numerous head loads of cattle dung to the far-off terraces. The dependence on forest leaves as fertilizer can be a new and sustainable dependence, further enhancing the stake in forest conservation. As oak and other forest leaves are excellent substitutes for the overexploited and dwindling semla that is cut for green manure and mulch for preferred crops like ginger.
* The cleared forest paths will double up as effective fire lines, controlling the spread of forest fires.
* To further lessen the work involved in carrying cattle dung. Manure making sites need to be located close to where the animals are kept. Prepared manure, which is a few times lighter can then be carried to the agricultural terraces, by horses/mules or people. This proximity can also make it easier to carry out improvements in

process and quality of manure making. The need for these enhancements leads us to the next strategy.

Responsibility: Village communities, Vividhara (awareness and monitoring).

C5.3 Reducing Effort in Fodder and Fuel wood Collection

Priority: V.High

Background: Village women spend numerous hours every day to collect fodder (travel, find, cut and carry heavy headloads over long precarious slopes, twice a day), round the year, come rain, hail or scorching sun.

Details: The most promising way to relieve the effort and time involved in fodder and fuelwood collection is to enhance the production and availability of diverse preferred fodders from the relatively nearer agri-terraces, private and village common lands. This will also serve to lessen pressure on the natural forests and diversity therein.

This can be achieved through protection, propagation, nurturing and sustainable utilization of diverse preferred fodder plants, esp. trees on private and common lands as well as kalna's of agri-terraces. Soil and moisture conservation on these lands to enhance sustainable productivity.

For details see Strategies: Strengthening Traditional Agroforestry and Soil and Moisture Conservation.

C5.4 Popularizing and facilitating adoption of Biogas as an alternative source of cooking fuel instead of firewood

Priority: V. High

Objectives, Contextual suitability and Expected Outcomes :

* Drastic reduction in need for firewood collection will lessen currently significant pressure of lopping on forest trees especially the Oak, semla etc.. It will create a further context for eliminating all lopping of non-dry branches, thereby enabling conservation and regeneration.
* Lessened work/drudgery and time savings.
* Dramatic drop in alarming smoke levels in the small inadequately ventilated kitchens.
* There are plentiful and varied cattle and livestock manures. In fact, a good bit is wasted.
* Quicker and better farmyard manures.
* Experiments with two bio gas plants over the last 3 years have been very successful.

Details: Easy access to contextually appropriate design/model of biogas plants at reasonable/subsidized rate. More details can be seen in Action Point by same name in Strategy for Sustainable Utilization of fodder and fuelwood, in Strategies for Wild Diversity Conservation.
Time Frame: Short-term
Responsibility: Relevant Government department, Vividhara

Strategy C6

CONSERVING VEGETABLE, HERB, SPICE DIVERSITY AND MEETING NUTRITIONAL NEEDS – REVIVING and DEVELOPING ***SAGVARHA'S***

Background/justification: Interviews with local doctors about patterns of health and disease among the local population and their underlying causes and our own experience and observations over many years, suggest huge nutritional imbalances in the local diet. The prominent factors are : Considerable reduction in availability and consumption of wild foods – fruits, berries, flowers, tubers, leaves, pods…Production of many nutritionally important traditional crops has declined drastically, particularly cereals and millets. Even more alarming is the decline in production of pulses and beans, which is down to negligible levels. Market buying of pulses is a fraction of the traditional consumption levels. Locally grown vegetables are available only for 2-3 months in a year. Vegetables and fruits from the market are very rarely or occasionally brought (some variation across families), due to remoteness and lack of cash availability. The health implications of these changes are as yet inadequately explored and understood. But local doctors feel this strongly indicates **nutritional imbalances and deficiencies.**

Action Point:
C6.1 Developing Sagvarhas (Traditional Homesteads) for Conservation and Nutritional Security
Priority: High

Details of AP: Furthering and developing the traditional homesteads (sagvarhas) can play a significant role in meeting the nutritional needs of the local communities and simultaneously ensure the conservation of the significant indigenous vegetable, herb and spice diversity of the area.

- This can enable the growing and availability of some and varied vegetables and herbs in every season.

- Location can be adjacent to homes wherever that is possible and on nearby terraces for other families.
- Water is a scarce and limiting factor in hill agriculture. Reusing kitchen and other used water can meet much of the water needs of sagvarhas when they are adjacent/near to homes. Many families carry water across some distance.
- Simple, locally appropriate techniques of roof-top rainwater harvesting at the home level need to be undertaken.
- And rain/spring/stream water collection tanks at the agri-terrace level can help fulfill water needs of the homesteads, gardens.
- We have experimenting with harvesting and utilizing dew for the cultivation of winter vegetables. Results are very promising and we have more ideas to try out.
- Locally available resources like kitchen peelings, wood ash can be used maximally for fertilisation.
- Every family needs to have one sagwarha/homestead or nearby herby-spicy patch (terrace or a part thereof).

An initial selection of vegetables and herbs : *bara masi chhemi* (sem beans), *rai, methi, palak, tamatar, mooli, pudina, tulsi, dhania, karela* and *meetha karela*, the gourds (ridge, bottle, *tumba*, snake), *zimikand*, pumpkin, *bhang jeer*, etc.

Time frame: Immediate to Short Term
Responsibility : Vividhara

Strategy C7

IMPROVED AND LESS EFFORTFUL FERTILIZATION

Background :
The currently followed methods of manure making suffers from several shortcomings:
* Inappropriate siting and size of heaps. They can be in full sunlight and of any size. Resulting in loss of nutrients due to overdrying of heap and lack of aeration of deeper layers.
* Wastage and sub-optimal utilization of several abundantly available excellent organic materials. Organic materials like cow/buffalo dung, diverse green leaves and twigs are available in plenty.

* Cow dung is carried as heavy, wet headloads over long distances and dumped inappropriately.

For most families it essentially appears to be inadequate and unmindful engagement with this important aspect. So a lot of time is spent on this task with an unsatisfactory outcome. Inspite of the fertility and productivity of agriculture being directly and immensely linked to organic manures.

Action Points:

C7.1 Traditional method enhancement : proper siting and size of heaps. Keeping away from direct sunlight will prevent moisture and nutrient loss. Addition of adequate and diverse leaves, grasses etc. Manure for far-off terraces can be prepared near cattle sheds and then carried to reduce labour involved. This will enhance quality and speed of manure preparation.

C7.2 Vermiculture – there is abundant availability of cattle dung as well as leaves/grasses/twigs (including from fodder left uneaten by cattle) etc. make this a location suited for a greater role for earthworms in fertilisation. Promising techniques and experience exists and collaborations are possible with the following organisations: Center for Science for Villages (CSV), Wardha ; Trees for Life, New Delhi, Kullu Karishma, Himachal Pradesh. In addition to the above possibilities it would be interesting to evolve local methods with local worms.

C7.3 Forest leaves for far-off terraces: Details in Action Point in Strategy for Lessening Drudgery.

C7.4 Bio-fertilisers: Especially rhizobium cultures for the local pulse and bean family are a promising experiment. Azitobacter and other such methods to enhance cereal production can also be tried.

C7.5 Biogas slurry as enhanced fertilizer : Experiments need to be undertaken to develop and processes to make a high quality and quick fertilizer. This then needs to be followed by popularization, adoption of discovered locally appropriate methods. Some attempts have been initiated during this BSAP, by Vividhara.

Strategy 8

RESTORING AND DISCOVERING CROP AND VARIETAL ROTATIONS AND COMBINATIONS

Background: There is enormous local knowledge and practice of crop rotations and combinations, though this is fast diminishing especially amongst the youth. Wild animal raiding, increased planting of certain cash crops like ginger and rajma, excessive work and drudgery involved in certain traditional crops, economic and social devaluation of traditional crops, pest and disease problems, changing climate, declining fertility of soils and productivity etc. have led to substantial breakdowns/changes in crop and varietal rotations, seriously detrimental to traditional agro biodiversity.

The role of crop rotations and combinations, particularly in organic, biodiverse and rain fed agriculture needs no elaboration here. It is our understanding that a good part of the solutions to the challenges before agrobiodiverse agriculture lie in carefully planned rotations and combinations, traditional as well as innovative new ones.

C8 Action Point – same as strategy name

Priority: High

Dimensions and Details -

C8.1 Documentation of current and overtime local practice and knowledge of crop and varietal rotations and crop combinations/ companion plants (any examples you can cite here?).

C8.2 Assessing through field observations and discussions the significance and value of the above, including sets of the most suitable rotations and combinations for this area.

C8.3 Rotations and combinations with similar crops in other, especially west Himalayan areas.

C8. Sharing the above with the local communities.

C8.5 Identifying and experimenting with promising rotations and combinations, especially for crops that are facing cultivation and other threats/challenges.

C8.6 Rotation of seeds (varietal rotations), every 3 to 5 years, is a neglected yet very important aspect of crop rotation, that needs to be addressed urgently.

C8.7 New seed varieties for the following crops need to be sourced, from within the Himalayan gene pool : lal marsa/ramdana, rajma/chhemi varieties (with monsoon and pest/disease resistance), kulath, tor (monsoon and pest disease resistance) mandua (for enhancing diversity and productivity). The Beej Bachao Andolan's collection is a certain source. Pant Nagar Agricultural University and the NBPGR could be other sources.

Responsibility : JUJUJU, Vividhara, Beej Bachao Andolan

Strategy 9

ORIENTING GOVERNMENTAL POLICY, PROGRAMS AND EXTENSION – TO CONSERVE AND FURTHER AGROBIODIVERSITY

C9.1 All policy interventions and programs in the Himalayas need to **adopt the mountain perspective**. Whether they are in the area of agriculture, poverty alleviation, horticulture, forests ….or any developmental area including infrastructure. Otherwise they will not have the desired positive effect and sustainability and equity are the almost certain casualties. Negatives may outweigh positives and the intervention/initiative may even have an opposite effect, to the desired one.

The three critical features of mountains in this perspective are Fragility, Poverty and Remoteness. In this context, the survival strategies of the local communities that have enabled both them and biodiversity to survive and evolve over centuries or millennia assume special significance. These few critical factors need to be understood, appreciated and kept in mind at all times while formulating strategies and interventions for mountain areas. As well as in implementation.

C9.2 Review of agricultural policy and programs from the perspective/imperative of agrobiodiversity conservation, environmental impacts and sustainability.

The exceptional agrobiodiversity of this area and the Himalayas is the basic foundation pillar on which alone sustainable agricultural development of this and other mountain areas can take place. Conservation of this exceptional agrobiodiversity needs to be a focus area of agricultural policy, programs and extension. All policies and programs need to based on and reflect this. Various agricultural programs need to be made compatible and harmonized with this objective so that they do not impact traditional agrobiodiversity negatively.

The only official agricultural program components that occasionally manage to touch these hill villages are those promoting hybrid seeds, chemical fertilizers and pesticides. A government watershed project which came to this area also brought along these inputs and distributed them free.

These thrust areas of government policy, if adopted by local communities, are certain to have a negative impact on the vast diversity of traditional crops and varieties. Not only is there no positive programmatic component linked to agriculture as the people practice it, they have never heard anything positive about

agrobiodiversity or other aspects of their rainfed agriculture, in any official extension program.

Where are the policies and programs to strengthen traditional biodiverse hill agriculture. To meet challenges, constraints…

There needs to be policy support for traditional crops and for small and marginal farmers who grow them. Even when these crops have a good market value, farmers are not able to get the benefits. Ramdana and buckwheat, e.g., have a far higher market value than wheat and rice. (See strategy on marketing support and value addition).

There should be no pushing of exotic hybrids/GM crops and subsidized associated inputs as alternatives to indigenous biodiversity. In many parts of the Garhwal hills hybrid crops from elsewhere have been encouraged and aggressively popularized as an alternative to traditional crops and varieties. This can have numerous serious consequences.

C9.3 The research bias/block towards traditional agriculture as a system needs to be comprehensively corrected. Specifically, there's little scientific work on traditional crops, on understanding their diverse relevance and roles. Or sustainably enhancing their productivity. On non-chemical ways of managing fertility and preventing and controlling pests and diseases, on the vast store of indigenous knowledge of crop cultivation and local agroecological conditions etc.

If there are any doubts anywhere about the impacts of past and current official policies and programs on traditional agrobiodiversity, then a study of the impact of agricultural policy and programs on traditional agrobiodiversity, soil fertility and health, insect pests and diseases, should be undertaken.

Government policies and programs have also played a big role in the emerging social and cultural factors that add to the devaluation of traditional crops. Making their cultivation and consumption a sign of backwardness, with strange discriminating concepts like coarse and fine, dark and fair etc.

Enhancement Strategies

Like most other parts of the Himalayas and mountain systems the world over, traditional agriculture in this site is high on biodiversity but low on economic sustainability for the local population, in the current context. There is a scenario of livelihood and employment paucities, hard and never ending work, especially for the women, and not enough or very uncertain returns for labour put into farming. From the fairness and sustainability viewpoints this needs engagement and improvements. The presence of spectacular cultivated and wild diversity (though challenged), on this hill site, implies that there is no abject poverty here, but these strengths need to be built on.

Economic unsustainability of traditional mountain agriculture is of course a widespread view amongst Himalayan and mountain experts of various hues. Unfortunately, most suggest (or end up) throwing the baby out with the bath water — most solutions, theoretical as well as implemented, have been economic development at the cost of local biodiversity, associated knowledge and the environment, hence long-term unsustainable. This is true of almost all horticultural interventions in the Himalayas, as they were conceived and implemented as replacements rather than complementary integrations/ additions. Some experiments and our own understanding and experience make us feel that that carefully conceived and and implemented additions and enhancements need not, necessarily, be at the cost of indigenous diversity.

There is a great need and possibility to address economic/ livelihood issues from within a biodiversity, ecology and sustainability perspective/paradigm, seeing them as complementary and not as exclusives. This has been an underlying endeavor throughout the formulation of this BSAP, and is elaborated most clearly, explicitly in this section.

Strategy C10

INTEGRATING CHOSEN FRUIT, MEDICINAL AND OTHER PLANTS INTO THE AGROECOSYSTEM

Priority: V. High

- **The Strategy statement is the Action Point,** in this instance.

Background and Justification : Given the above stated increasing climatic constraints, wild animal raiding, topography, the need for sustainable local livelihoods etc. and the higher ability of trees and shrubs to withstand climatic

variations, their greater productivity in a high gradient and often small terrace context, and most so the many abandoned terraces and private fodder lands ---- **we feel there is a strong case for a careful, gradual and studied introduction of fruit, medicinal, aromatic, natural dye etc. plants into the local agroecosystem**.

Examples show that carefully planned crop additions do not always replace other crops in the agroecosystem. New crops can have their own niche and play a complementary role.

C10 Details of Action Point –

Key Features:

- In the search for selecting appropriate plants for cultivation, primacy and **preference be given to native wild plants** -- medicinal, fruit/berry etc.
- Other **critical criteria for selection** of species will be agroclimatic suitability, hardiness, local utility, economic value and non-preference by wild animals.
- A **short listing** of the most promising fruit tree species has been done, including sources for planting materials.
- Identification of rare and **economic value medicinal plants** is underway.
- The **local communities are extremely keen** to experiment with cultivation of medicinal and other economic value plants, especially on the distant terraces abandoned due to raiding and because they are difficult to protect. On these lands, non animal preference will be the critical criteria.
- Other appropriate and promising locations for fruit trees are the small and sloping terraces and kalnas (slopes between terraces).
- Fruit trees that are preferred by wild animals but otherwise suitable, can be planted on terraces around and near habitation, for greater protection.

An initial list of chosen fruit trees:
Citrus family esp. lime and lemon, mausambi, Walnut, Anar, both wild varieties(darhim) and cultivated, Peach, Pear, Plum, Banana
For lower elevations: Papaya, Guava

Strategy C 11

STRENGHTENING THE TRADITIONAL AGROFORESTRY SYSTEM WITH COMPATIBLE LOCAL SPECIES

Background and Justification:
To meet the big challenges of rainfed crop production in unpredictable climate and other priority livelihood needs, one high potential way is through careful introduction of complementary agroforestry species that strengthen the system through preventing erosion and rapid moisture loss, enhance the nutrient cycle etc. thereby enhancing productivity of agriculture and the agroecosystem. In addition to taking agriculture towards food security, this will also help meet the other needs of the agri-pastoral communities like fodder, fuelwood, fibre…..

Fodder collection involves a lot of hard work and drudgery. Ways to make diverse nutritious fodders available closer is a priority expressed by the women.

C11.1 Action Points:
Principles for Species Selection :
For compatibility and overall enhancement of existing system chosen tree species must have following attributes especially for growing amongst / between terraces. These attributes may be desirable for elsewhere in the agroecosystem too:

- Partial sunlight blockers only or winter deciduous. (this is a sub-temperate hill context).
- Moisture retainers/holding species (in the least non-heavy feeders of water and nutrients)
- Soil fertility improving species like leguminous plants and others

Other desirable attributes:

- Green or dry leaf mulch source species
- Insect disease repelling plants and host species for beneficial insects

Some examples:
Planting of leguminous trees, shrubs and vines on the kalnas between terraces is a high synergy, multi-value action point – bringing in various benefits like additional fodder, enhancing soil fertility, erosion prevention, terrace stabilization -- a high compatibility with crop production needs. Most of them are partial sunlight blockers and winter deciduous. So far chosen amongst the trees are Bauhinia semla and guriyal (Bauhinia sp.s), saikna/sakina (local Indigofera species) amongst bushes, sem and servala amongst vines etc.The local indigo bush variety (saikna), a legume, is variously useful as fodder, food and medicine and can be widely encouraged /

nurtured on kalnas, grass patches and abandoned terraces etc. Seed broadcasting/ sowing can be undertaken.

Kalna's with inadequate floral cover need special attention to prevent erosion and ensure terrace stability.
While planting tree species on agri-terraces, in addition to species types (principles stated above), specific location too needs consideration to prevent long winter shadow/shade.
Responsibility: Vividhara

Strategy C12

HONEY BEE, INDIAN HIMALAYAN

Priority : V. High

Objectives:
Conservation of endangered Himalayan honey bee.
Enhanced crop productivity.
Honey
Greater local knowledge and stake in conservation of wild flowering plants.
The ultimate inspiration for a beautiful sustainable relationship—*rishta ho to aisa !*

- **Action Points -**

Three most promising and appropriate methods/techniques have been selected for upgrading/adoption. Know-how and collaborations have been worked out.

C12.1 Ahinsak (non-violent) Madhu – a method of gathering honey without harming the bees or the pupae, developed by Mr. Ghatge, Wardha, Maharashtra after spending decades of his life with honey bees. As a child he was inspired to work with bees, by Mahatma Gandhi. Discussions on technological collaboration and training have been held with CSV (Center of Science for Villages, Wardha, Maharashtra) and they are willing partners.

C12.2 Traditional method -- The local knowledge, skills and successful practice of traditional bee-keeping has already dwindled dramatically. There is a great need to revive and spread this dying tradition. This can be done through training by traditional experts from the local area or elsewhere in Uttaranchal.

C12.3 Upgraded Traditional Method -- the traditional method has been significantly upgraded for higher productivity by Devbhumi Madhu, an agency

working in the Garhwal Himalayas, with an office near this area. They need to be asked to provide training in this method.

Time Frame: Short Term to Medium Term
Responsibility: Vividhara (coordination and facilitation)

Strategy 13

ENHANCING ECONOMIC VALUE OF CULTIVATED INDIGENOUS DIVERSITY THROUGH CREATIVE MARKETS AND OTHER MEANS

Objectives :
Enhanced stake and keenness arising also from higher economic value (the usually missing factor !) to conserve indigenous crops and varieties. Through –
Better market value and appreciation of indigenous crops and varieties.
Better returns to cultivators of indigenous crops and livelihood generation (in small scale unit and marketing) at the village level leading to more sustainable livelihoods for local communities.

Action Points -

C13.1 Small Scale Unit for Natural Products

Setting up a smale scale unit in the local area for value addition by processing and making natural products of local cultivated diversity.
After long consideration and experimentation over many years, such a unit has emerged as the most holistic option as quality and hygiene are premium in making any food products. It is almost impossible to ensure this at the level of households in a rural area..

Whenever any naturally occurring plant is utilized, sustainable and regenerative use principles will be paramount. So far the few wild plants that have been utilized, namely amla, a wild marigold and curry leaf, have seen an increase in their numbers. The main principles followed so far need to continue. Namely, only choosing plants where the leaves, flowers, fruit can be utilized. Leave sufficient plants untouched. As the economic value of a plant emerges, undertake simultaneous special measures to increase its numbers through seed broadcasting, plantation etc. Undertaking cultivation of identified high value plants is ofcourse the next course. This section refers primarily to cultivated plants. A certain fixed percentage of the earnings from such an unit will be kept in a fund for local environmental and developmental initiatives.

Some identified crops and products :

HALDI -- haldi powder, stone ground in a water mill. Haldi can be made into a healthfull achar. The exceptional local Himalayan variety of haldi that grows verdantly here has high medicinal properties. Haldi powder is being marketed in exhibitions and through direct marketing for the last many years to highly appreciative consumers in Delhi. There is a large number of committed consumers who now use only this variety of Himalayan haldi in their homes as spice and/or as medicine.

ADRAK – Adrak candy (the local Vividhara team has evolved a recipe that has been very successful in the market, also known as mithai dawai, a medicine for sore throats and coughs. This is popular amongst singers, actors, teachers, activists and all others who utilize their vocal cords a lot. Some other possible products are sonth (dried ginger), powder, pickles, ginger ale…

RAGI/ mandua – Ragi Malt from mandua/ragi (Eleusine corcana), a traditional, exceptionally nutritive and high energy drink, very high on vitamins and minerals, esp. calcium. One of the healthiest foods for babies, growing children and the elderly.

AMLA products – Some products that have been experimented with and that have proven to have a high marketability are amla achar, candy, churan, jam, murrabba, dried amla , amla powder. One of the most exciting forms of edible amla is an amla candy, this is like a dry murabba, though in small pieces. We need to find or discover the exact recipe for making this. It tastes wonderful and can be a great alternative sweet for children, with all the amazing benefits of this ayurvedic king of fruits. Amla is naturally occurring on private lands, village lands and in the forest. Hundreds of trees have been planted over the last few years by villagers and Vividhara members.

WHEAT and OATS – Whole foods and breakfast cereals like sprouted wheat and oat porridge, pressed flakes, wheat puffs, suji, atta (flour) etc.

JHINGORA – Natural food products need to be made from millets. Millets, despite being one of the most exceptionally healthy categories of foods are most neglected. They are called coarse cereals, wild crops etc. This like the other products will be good for both cultivators and consumers.

CORN – Amongst the possible options are corn flakes, pop corn, corn flour.

C13.2 Marketing of Biodiverse and Organic Foods and Natural Products

Background :

There is a need to pay attention to traditional cash and barter crops, such as ramdana and phaphra/kuttu(buckwheat) etc. and other traditional crops with an existing or potential economic value/market potential such as the medicinal haldi

(turmeric), mandua/ragi etc. Pulses are another valuable category, good for soil, local nutritional value as well as market potential.

As shared earlier, for 9 years running, the farmers of the area with Vividhara, have been holding **an annual exhibition on Himalayan agricultural diversity as well as sale of organic foods and natural products** at the Nature Bazaar, Dilli Haat, Delhi. The very **first experiment in marketing of organic foods in Delhi, was initiated from this area**, in the early 1990's. In a nutshell this long experience and the responses of consumers and farmers have been very encouraging and it has confirmed our hypothesis that there is a market for traditional biodiverse organic foods and natural products made from them. In the last couple of years, there are several indicators that the organic market is ready to take off in a big way. The vast number shops, restaurants and exporters who have contacted us in the last two years is one such indication. Were we to engage substantially with the marketing aspect alongside awareness enhancement, there is a real possibility of keeping cultivated biodiversity at the center of this emerging scenario. This could aid conservation as well as sustainable livelihoods, alongside ecological and human health.

The marketing component of biodiverse organic foods needs to be strengthened, building on the experience and learning of all these years. This experience has enabled us to identify key areas for action.

C13.2.1 **Identifying and developing markets for diverse indigenous crops and varieties -**
Exhibitions, retail outlets, wholesale markets, ayurvedic pharmacies and ayurvaids and naturopaths have been identified as the main marketing avenues. Some specific ones have also been identified and spoken to. Amongst others, a collaboration has started with the shop, TRIBES, in Delhi, run by the Union Ministry of Social Welfare. The
For many devalued and neglected Himalayan crops enhanced market value and appreciation can also help in turning around recent negative social and cultural values about traditional crops. It may help in affirmation of local cultures and restoring local preferences for these crops.
In many important indigenous crops, such as *jhingora* and *mandua*, this has been identified as a priority action.

Registration - Determining and completing legal and regulatory processes that may be required for undertaking the above activities.

Transportation - Safe and cheap ways of transporting organic foods and natural products need to be explored and chosen.

Packaging and labeling - For retail marketing of organic foods and natural products, proper packaging to ensure safety, shelf life and a simple and elegant look, is an important part of the overall effort . It will be important to use environment friendly and to the extent possible natural materials.
Discussions have taken place with designers and others in the field and The Earth and Grass Workshop and Dastkar have offered to collaborate in designing the packaging and labeling.

Responsibility: WOHI (Wild Organic and Himalayan) a name under which the organic marketing initiatives have been underway, comprising local villagers and some Vividhara members. Vividhara

Crop Specific Strategies

For specific crops or groups/families of crops.

C14
Ramdana (amaranthus)

Studies have shown that Ramdana has a higher productivity than other cereals in rainfed farming conditions in the Garhwal hills.(Dr, Vir Singh, Pant Nagar Agricultural University, Uttaranchal.) In drought conditions, the hybrids wilt, the other traditional crops go into a sustavasta, and may recover with rains to post some yields, ramdana is way ahead of other crops but comes up with higher yields than normal years. It has an ability not only to withstand but to grow miraculously in drought conditions. This makes it an ideal drought proofing crop. It is also one of the most major traditional barter and then market crops of the hills.

Ramdana cultivation in the hills has been under threat for the last few years. In the area under consideration, the locally dominant white variety is for the last 5-7 years not being able to withstand major pest attacks in the concentrated and excessive mid-monsoon rains. This is the big and only problem facing ramdana across all the villages. In 2001, the ramdana crop across the Garhwal hills was virtually wiped out.

Following a search for solutions to ensure the health and cultivation of this exceptional crop, through extensive field visits, discussions and observations, across three different contexts (including the plan area) in the Uttaranchal

Himalayas, during the last cropping season, we present with confidence the following ramdana mini action plan :

❖ **Action Points -**
Priority: V. High

C14.1 Cultivation of ***local red variety****, in place of the white.*
Wide ranging and close observations across many areas and years have revealed that a local red variety is able to withstand heavy rain and pests, especially when grown in sunny and well drained soil conditions. As also when grown late in the monsoon.

C14.2 Planting only ***on or near the mends*** *(outer edges) of agricultural terraces.*
Plants growing on and near the *mends (*the outer edge of terraces), were observed to grow well and remain free from pest attacks. This was particularly true of the red varieties.
The distinctive and likely critical feature of this location is that the soil here is well drained, there is full sunlight and free air circulation. In these conditions, the red *ramdana* variety has been over the years observed to withstand heavy mid-monsoon rains and pests. When trying to grow ramdana on other locations or as a combination crop (traditionally so), these factors (full sun, air and drainage) must be kept in mind.
In the prevalent traditional cultivation practice of growing ramdana as a companion crop with *mandua* (finger millet), *ramdana* is inevitably falling prey to pest attacks, for the last many years.

C14.3 ***Herbal pesticide*** : In the unlikely instance of a pest occurrence and damage, despite the above measures, a home made herbal pesticide from locally available ingredients can be made to repel the insects and save the plants from any damage. This was tried and found effective in 2001.
Ingredients and Application : Neem or Persian lilac leaves and garlic, pounded and soaked overnight in *gomutra* (cow urine). Next day : Dilute the concoction with water. Add a few drops of kerosene. And spray/sprinkle on the affected plants and their neighbors. Spray three times in all after intervals of three days.

C14.4 As a ***late monsoon or winter crop****.*
One other effective method of avoiding pest problems is to grow ramdana late, i.e towards the middle or in the second half of the monsoons. It can also be grown well as a winter crop.

Sharing and popularizing all of these findings amongst the local farming communities.

Time Frame : Immediate/ Short term
Responsibility : Vividhara, JuJuJu

Mandua/Ragi

C15 Action Points -

C15.1 **Saving from wild animal raiding (details in strategy no 1)**

C15.2 **Lessening the backbreaking work and drudgery in weeding and hoeing**. Experimentation and adoption of a Himachali/Gujarati technique of mandua cultivation. It has been tried by two farmers in one of the hamlets and has been very successful. It involves first growing a nursery patch of seedlings and then transplanting them in rows, in prepared fields. After some weeks ploughing is undertaken in the space between rows to overturn soil and control weeds. Some more farmers have decided to experiment with this method this year (2002). More farmers need to be encouraged likewise.

Responsibility : Village Communities, JUJUJU, Vividhara.

C15.3 Awareness of the various **cultivational and nutritive values** of mandua - Mandua is an exceptionally appropriate crop for the local rainfed hill context. Among other attributes it is highly adapted to withstand climatic variations, pests/diseases etc. It has exceptional nutritive and health properties. Yet it is today socially devalued.
Its diverse values need to shared as part of an awareness campaign amongst the various sections and ages of local people.
Responsibility : Vividhara

C15.4 **Enhancing awareness and market value** of mandua, beyond the local context, amongst urban consumers, with the help of nutritionists, naturopaths and ayurvaids.
Responsibility : WOHI, Vividhara

Jhingora

Lessening the back bending work and drudgery in **weeding and hoeing** and in **hand pounding** to dehusk, These are the biggest constraints before jhingora cultivation and its declining popularity and cultivation area. Wild animal raiding is the other big threat. Clearly, too little attention has been paid to these aspects, maybe because it's the women who undertake two of the three tasks.

***C16* Action Points**

* Saving crop from wild **animal raiding**. (details in people wildlife strategy).
* Enhancing awareness of and publicizing its **amazing nutritive and medicinal values**, both at the local level and in society at large. The best way may be through vaids and prakritic chikitsaks. This is also likely to enhance markets for jhingora.
* Finding forms other than the dry grain in which jhingora can be sold as well as documenting recipes and the diverse uses and contexts it is useful in (e.g it is an exceptionally light and medicinal food for the sick and recuperating).
* Finding ways to reduce the backbreaking work involved in weeding and hoeing and then even more so in hand pounding to dehusk jhingora. There are machines that dehusk jhingora. Learning more about the cost and other factors particularly whether it can be run on the new water mill in the area.. setting up such **dehusking machine** if it is possible and feasible.
* Timely, read **early, sowing**. April sowing has been recommended by elders and the BBA. Also sowing in two stages, in chaitoli and mothi, april first week and mid may respectively. The early sowing will also imply early harvest thereby reducing the protection required during heavy mid monsoon rains. This may also reduce the need for weeding and hoeing, as maximum weeds grow in mid monsoon, by which time the crop will be nearly ready for harvest.

Tor/Tuar (Pigeon pea variety)

The tor crop has been failing for the last 7-8 years. To the point that there has been virtually no crop year after year. The entire plant wilts or there is a big pest attack when it starts to flower and fruit.

C17 Action Points

- The only likelihood of some crop has been when it is grown **on a terrace after** many **years**. The more the number of years the greater is the chance of a good crop. The crop should not be grown on the same terrace, at least not for 4-5 years. This appears to be the big mistake that was made for many years. One partially successful experiment was when it was grown on very sunny terraces after numerous years. It got some pests in the last stages but likely due to fact that it was grown very dense.

* **Very well drained soils**, sloping terraces are suitable too. Full sunlight and grown well spaced out, accounting for the full spread of the plant and free air circulation.

- After years, the one successful experiment was this year, on the sunny and well drained **outer edges of a terrace** with a ginger crop on the rest of the terrace. Further, it was grown spaced out, in a single row.

* Doesn't like soil with lots of farmyard manure.
* Wild and cultivated marigolds from the local area can be grown amongst the tor plants as a repellent.
* Sowing the seeds after coating with rhizobium culture.
* Trying other varieties of tor, from the broad region, or elsewhere.

Kulath/kulth/kulthi/gahath

Kulath, an important local crop has been failing for the last 8 odd years. It either wilts or is attacked by pests.

C18 Action Points

* Adoption of the crop rotation cycle. It must not be grown on the same terrace year after year.

- Growing wild or cultivated marigolds amongst the kulath crop as a herbal repellent for pests and diseases.
- Needs to be saved from excessive moisture, so grown on well drained and somewhat sloping terraces. The ploughing must not leave big furrows in which water collects.

* Finding and growing kulath varieties from within the indigenous crops gene pool that can withstand heavy monsoonal rain.

Responsibility : Village Communities, JuJuJu

Rajma, chhemi – kidney beans

C19 Action Points

* Encouraging the planting of more of hardier, higher productivity local varieties like chitra and pili, instead of the red chakrata rajma. Over cultivation of this red variety for the market has invited major disease and pest problems, in the last 5-7 years.
* Growing the three local varieties, viz chitkabri/chitra, pili and chakrata, together on the same terrace. Experiments with this over the last years have been very successful. In the traditional rajma cultivation areas in the high hills, this has long been the prevalent practice. This makes a lot of sense from the point of resisting pests and diseases, withstanding climatic variations and conserving and evolving biodiversity dimensions. These traditional farming communities do not

separate different varieties at any stage, including for cooking. It is most likely the uniformity and monocultural mindset of the market, the traders and urban consumers that has led to the separate cultivation and selling of distinct varieties. A few or even one variety is selected and celebrated to the neglect and exclusion of others. An example of how the market can negatively impact diversity.

* Identification, sourcing and experimentation with hardy and productive varieties able to withstand excessive mid monsoon rains and that are pest disease resistant. A few such varieties have been identified. This would include some chhemi (climber rajma varieties), which tend to be more productive. Source: Beej Bachao Andolan
* Timely sowing, especially early. It is important to grow in three stages, with one week to 10/12 day intervals. (Beej Bachao Andolan)
* Timely control of weeds, especially *marchiya ghas*.
* For chhemi, it is important to cultivate it on a sunny spot with free air circulation, well drained soil, plants should be well spaced out or thinned, excess monsoonal grass around the plants should be removed.

Responsibilty : Vividhara, JUJUJU and local communities.

Urad

C20 Action

Needs to be grown in full sunlight and air and well drained soils (water shouldn't stay on soil). It isn't growing well in the prevalent combination with mandua, for many years. Most likely reason is that in the excess rain that has been occurring it doesn't get adequate sunlight and free air, so it grows weak and pest prone. The best we saw it growing with mandua was on a terrace where the mandua was not sown densely and it had been cut on ripening and the urad had taken over and was climbing and podding profusely and healthy.

So either other combinations or alone, or mandua is not sown dense.

Bhatt

C21 * Document and share the significance and features of *bhatt*. In itself and in comparison to soyabean. It is currently highly devalued.

Chillies

C22 * Varieties must be rotated every few years and there should be more than one locally and market suitable variety.
* Wood ash from the home *chulhas* should be sprinkled in the chilly fields.
* Substantial mulching as the monsoon retreats and topping up at intervals later on. This is the best way to keep moisture which will keep the plant growing and bearing chillies well beyond the monsoon. If there is moisture availability chilly

plants last more than a year. Other benefits are that there is no separate effort for weed control and enhanced soil fertility and nutrients for the standing crop and beyond.

Adrak/ Ginger

C23 Action Point

It needs to be grown less for the sake of its own conservation and that of other crops as well as the farmers of the area.

WINTER CROPS

Winter rains have been failing for most of the last 10 years. Many years have seen near total absence of winter rain, otherwise rain has often come too late for the crops to grow well or at all. Typically, it rains little in autumn and early winter. Before and after the sowing season. Sowing seeds in a dry field, with no sign of rain and the experience of past years, is a huge act of faith.
If the rain comes, the crop raiding animals are waiting …
All winter crops are seriously threatened due to these overarching factors and a dramatic decline in cultivation and production is underway.

Gaihoon /Wheat

The traditional varieties of wheat are disappearing. Some varieties are not to be found in the area anymore, others have disappeared from particular villages. Only one traditional variety is cultivated by a few farmers. This is one important crop where hybrid seeds have more or less replaced traditional varieties. Successive failure of rains have led to not even some seeds being recovered.

C24 Action Points

- Ways to ensure adequate moisture/Soil and water conservation measures.

Spring and stream water harvesting tanks in order to provide support irrigation to some terraces in case the rain fails. Details in Strategy, Soil and Water Conservation.

- Saving crop from wild animal raiding. Details in strategy on people wildlife.
- Awareness of the significance and values of traditional varieties of this very important crop.
- Value added foods like germinated wheat porridge, suji, wheat puffs from the nutritive, tasteful local wheat varieties. Details in strategy for value addition and marketing.

Jaun/Barley

C25 Action Points

* Sprouted oat porridge. Exploring other food options.
* Awareness in local area and beyond, of the multiple nutrition and health benefits.
* Support irrigation.
* Rain.

Masoor

C26 Action Points

* Moisture conservation and enhancement.
* Support irrigation.
* Controlling wild animal crop raiding.

Details in strategies by same names.

C27

CURRENTLY NEGLECTED OR UNDERGROWN INDIGENOUS CROPS THAT ARE PARTICULARLY SUITABLE FOR THIS AREA

This section lists such crops and their significance, value and suitability for cultivation in this area. These and other factors need to be further shared with the local communities. Paying greater attention to enhancing cultivation of these local indigenous crops appears eminently sensible and no negative consequences could be identified.

- **Jhilanga/naurangi**

Naurangi – the nine coloured one. Its productivity is far higher than other pulses (upto 1 kg per plant) and it is phenomenal for soil fertility. It is also far hardier than the threatened other local pulses, it has no major disease or pest problems in this area. And yet it has been hugely neglected and devalued.

* Awareness and propagation of above values, so its cultivation can be increased.
* Developing markets for this Himalayan pulse which is unknown outside the area.

- **Haldi**

The local indigenous Himalayan variety of Haldi has very high medicinal properties and in addition to its use in cooking is also the variety used in Ayurveda as a medicine. It is exceptionally adapted to local climatic conditions and withstands wide variations (it has a greater ability to grow productively in these conditions than any other crop, traditional or exotic). It is microclimatically ideal for this area growing exceptionally verdant, healthy and productive. No pests and diseases bother it, it has wild relatives and its cultivation and processing is well understood. It combines well with various other crops. And significantly it is not preferred by wild animals. All this makes it an ideal crop for enhanced cultivation in this area.

Action - Marketing this local variety of Haldi, has proved to be a successful experiment at finding markets for indigenous crops, suited to local conditions. Almost all farming families have enhanced cultivation. This has started making a contribution to local livelihoods and incomes, which needs to be built upon.

The success of marketing experiments needs to be consolidated and systems need to be set up to enhance scale and efficiency. For marketing both the raw rhizome as well as its powder/masala form. The making of the powdered form needs to be done only at the water mills. The possibilities of supplying *haldi* in a raw or processed form to pharmacies needs to be explored. For more details see Strategy on Enhancing Markets for Indigenous Diversity.

Ramdana /Amaranth

Ramdana has a huge ability to withstand droughts. Studies have shown that its production outstrips all others in drought years and in fact it has been observed to grow better and more productively in drought years. An ideal drought proofing and famine food crop.
The locally dominant white variety is for the last 5-7 years having major problems in the concentrated and excessive mid-monsoon rains. With major pest attacks. The amaranth crop across the Garhwal hills was wiped out this year. Observations in many areas and experiments locally have revealed that a local red variety is able to withstand heavy rain and pest attacks, especially when grown in sunny and well drained soil conditions. As also when grown late in the monsoon. Details on Actions in R*amdana* in crop specific strategies.

Torhiya, Rada and Kali Sarson/ Mustard varieties

These autumn and winter oil seeds of the mustard family are traditional crops that grow very well here and are not bothered by crop raiding animals.
Perhaps the most exceptional of them is *torhiya*, this is a small sized mustard family plant/crop that has an extremely quick growth cycle between the monsoon

and winter crops, like a between season crop. In these rainfed conditions it manages on the residual monsoon soil moisture, with help from occasional light showers. It doesn't leave the soil any poorer, and it grows very productively and healthy here. An important crop for honey bees.
Rada and *kali sarson* are also highly suitable local crops. They are also consumed as greens in the early stages.

Jakhiya

A neglected typically Garhwali wild spice. It is self-seeding on agri-terraces and other parts of the village ecosystem. No ploughing, weeding and hoeing is required. It can be grown in combination with other crops or as a single crop.
It has a good market value, locally and an increasing outside market.

Kuttu/phaphra/Buckwheat

Kuttu is a very important traditional crop with exceptional nutritional and medicinal values. It is not bothered by any big wild mammals. It is hugely neglected today, despite its very high market value.

SOME SPECIFIC SAPS, EMERGING FROM THIS BSAP, WITH SPECIAL RELEVANCE FOR OTHER BSAPS, ESPECIALLY FOR UTTARANCHAL AND WESTERN HIMALAYAS AS WELL AS GOVERNMENTAL AGRICULTURE & HORTICULTURE PROGRAMS IN THE WESTERN HIMALAYAS .
BRIEFLY STATED, SEE STRATEGIES FOR DETAILS.

- **Strengthening Traditional Agroforestry Systems of the Himalayas**

  A study followed by a program on traditional agroforestry systems of the outer and middle Himalayas and ways to enhance their complementarities with crop production and their ability to meet diverse needs of the local communities.

For Details See Strengthening Agroforestry strategy.

- **Harmonizing Horticultural Development with the Imperative of Biodiversity Conservation**

Horticultural development is a high potential strategy for hill areas. Unfortunately its success is usually at the cost of agrobiodiversity, e.g., as in Himachal Pradesh. Carefully thought out, focused and monitored, horticultural interventions do not have to be at the cost of traditional agrobiodiversity, they can be complementary additions, instead of supplanting the local production system, with its biodiversity.

First preference should be given to identifying and focusing on native fruits, berries, medicinal and aromatic plants with economic value.
Policy and program support for identification, promoting cultivation and marketing need to be carefully designed.

For details on how this is proposed in this BSAP site, see strategy, Integrating chosen fruit, medicinal and other plants into the agroecosystem.

The Uttaranchal government is very keen on horticultural development, especially initiatives in the field of medicinal plants. We hear a policy is under formulation. The above points need to be kept in mind, for this promising idea to bear the desired wholesome fruits.

Responsibility: Horticulture department, Ministry of Agriculture, Rural development, Uttaranchal.

- **Soil and Water Conservation for Rain fed Hill Agriculture**

With only 10% of agriculture in hill regions of Uttaranchal under irrigation, most mountainous regions have a meager existing and limited potential for conventional irrigation, the management and enhancement of soil moisture is critical to agricultural productivity and viability. In the context of increasingly unpredictable rainfall, which even rainfed farming communities are finding difficult to predict, it becomes all the more important.

Undertaking considered and effective actions for soil and moisture conservation on agricultural terraces and the area above and around them needs to be a key focus area. In all soil and water/ watershed development projects and programs. Attention to this area is currently inadequate or missing altogether. It also needs to be an important area in agriculture and horticultural policies and programs.

For elaborate chosen actions and approach, for this BSAP site, see Strategy on Soil and Water conservation.

- **Improving Organic Fertilization**

Organic farmyard manures, are the critical driving source of soil fertility and productivity of traditional agrobiodiversity. These are based on cattle dung and locally available bio-mass. There is significant scope of improvement in methods and fuller utilization of available materials. Leading to better quality manures as well as a reduction in effort involved and preparation time.

Policy component and program support for improving/upgrading methods of preparation of organic fertilizers, from locally available bio-mass. To make better quality manures, and reduce the preparation time involved. Reduce effort involved in the process, when possible.
Highest potential organic methods and manure types need to be popularized.

More details in Strategy, Improved and less effortful fertilization.

- **Gobar gas / Bio gas as a Multi-benefit Appropriate Choice**

Large scale adoption of gobar gas is one of the simple highest potential actions where multiple objectives are integrated into a single action point. Namely, reduction in firewood needs pressure on forests, addressing the key issue of productivity of traditional agrobiodiversity through enhanced better quality and faster preparation of organic manure, huge savings in effort and time collecting firewood, dramatically reduced smoke levels in kitchens etc. Such multi-benefits appeal immensely to local communities and help adoption and sustained practice.

Action - Policies and programs to enable easy adoption of suitable designs of this appropriate technology with diverse benefits. Climatic factors and types and quantities of cattle dung are critical factors for choosing designs and assessing viability.
For details see action point in strategy for sustainable fodder-fuelwood collection.

- **The Patwari to keep Records of Cultivated Biodiversity,** of Crops and Varieties. Agrobiodiversity will get recorded and trends/changes will be evident. This recording is also likely to help in the context and age of IPR's and patents. Community Biodiversity Registers are another promising option.

ANNEXURE 1

PRIORITISED SPECIES LIST

Local Name	Botanical Name	Priority Rating	Threat Status	Population Decline (%Over20 years)
TREES				
1.Banj	*Quercus leucotrichophora*	*9.2*	*T*	*50%*
2.Amla	*Emblica officianalis*	*9.1*	*S*	
3.Sandan	*Ougeinia oojeinensis*	*9*	*ET*	*80%*
4.Semla	*Bauhinia retusa*	*8.7*	*ET*	*90%*
5.Tun	*Cedrela toona*	*8.5*	*T*	*50%*
6.Shisham	*Dalbergia sissoo*	*8.5*	*ET*	*80%*
7.Gainthi	*Boehermia ruguloso wedd*	*8.4*	*T*	*40%*
8.Timla	*Ficus roxburghi*	*8.3*	*T*	*40%*
9.Dalchini	*Cinnamomum zeylanicum*	*8.4*	*ET*	*80%*
10.Bheemal	*Grewia optiva*	*7.8*	*S*	
11.Kharhki	*Sciltis ouestralis*	*7.5*	*S*	
12.Parhanga		*7.4*	*ET*	*60-70%*
13.Chir	*Pinus roxburghi*	*7.2*	*T*	*40%*
14.Baherha	*Terminalia bellirica*	*7.1*		
15.Pilkha	*Ficus sp.*	*7.1*	*S*	
16.Paiyan	*Prunus cerasoides*	*7*		
17.Gonta		*7*		
18.Kaphal	*Myrica magi*	*7*	*T*	*60%*
19.Kaula	*Machilus duthiei*	*7*		
20.Gald		*7*	*T*	*50%*
21.Burans	*Rhododendron arboreum*	*6.7*		
22.Bakara		*6.7*	*T*	*60%*
23.Chhanchri	*Ficus sp.*	*6.6*		
24.Kathla		*6.6*		
25.Maida Lakrhi	*Litsea glutinosa (?)*	*6.5*		
26.Semal	*Bombax ceiba*	*6.4*		
27.Sinsyaaru		*6.4*		
28.Ghae		*6.4*		
29.Guriyal	*Bauhinia variegata*	*6.3*		
30.Jhingan	*Lannea grandis*	*6*		
31.Dhaura	*Woodfordia floribunda*	*6*		
32.Asain	*Terminalia tomentosa*	*6*		
33.Gauba	*Leucas cephalotes (?)*	*6*		
34.Jamun	*Syzygium cumimi*	*5.9*		
35.Raini	*Mallotus philippinensis*	*5.8*		
36.Farsu	*Butea frondosa*	*5.7*		
37.Amaltas	*Cassia fistula*	*5.6*	*T*	*40%*
38.Khenu		*5.5*		
39.Dudhel	*Wrightia tomentosa*	*5.5*		
40.Amarha	*Spondias mangifera*	*5.2*		
41.Phulu	*Cudia calycina*	*5*		

Prioritised Species List (**Contd....)**

Local name	Botanical name	Priority rating	Threat status	
42.Dhamno	***Grewia elastica***	**5**		
43.Kuree	***Nyctanthes arbor-tristis***	**5**	**T**	**50%**
44.Narra		**4.8**		
45.Mahua	***Bassia latifolia***	**4.8**		
46.Bhillarh		**4.8**		
47.Phalenda	***Eugenia jombolana lam.***	**4.5**		
48.Kali siras	***Albizzia oderantissima***	**4.4**		
49.Kakarha	***Pistachia integrima(sp?)***	**4.3**		
50.Chhirna		**4**		
51.Madara	***Erythrina suberosa***	**4**		
52.Birmahua		**4**		
53.Salu		**4**		
54.Kikalda		**4**		
BUSHES AND SHRUBS				
1.Bhararha		**8**	**T**	**70%**
2.Khaksa	***Cornus marophylla***	**7.5**	**T**	**40%**
3.Kingorha		**7.4**	**T**	**80%**
4.Hinsar		**7**	**T**	**50%**
5.Saikna	***Indigofera sp.'s***	**7**	**T**	**40%**
6.Kharainti		**7**		
7.Semali	***Vitex negundo***	**6.6**		
8.Gandhela	***Murraya koenigii***	**6.5**		
9.Itholna		**6.3**	**T**	**40%**
10.Bansa	***Adhatoda vasica***	**6**	**T**	**40%**
11.Kangu		**5.8**		
12.Padarha		**5**	**T**	**40%**
13.Kapnihatti		**5**		
14.Kali hinsar		**5**		
15.Son padarha		**4.5**		
16.Ram bansa	***Agave americana***	**4.4**		
17.Arandi		**4**		
VINES				
1. Turarh		**9.4**		
2. Malu	***Bauhinia vahli***	**8.7**		
3. Giloe	***Tinaspora cordifolia***	**8.1**	**T**	**75%**
4. Gol		**7.2**		
5. Pahari patta		**6.6**		
6. Gainthi		**6.5**		
7. Mainda singhni		**6.2**		

Prioritised Species List (**Contd....)**

Local name	Botanical name	Priority rating	Threat status	Population decline (% over 20yrs)
8. Hatha pola		**6.1**		
9. Serwala		**4.7**		
10. Bank		**4.6**		
11. Gojjla		**4.6**		
12. Gaindalda		**4.4**		
13. Shivlingi		**4**		
HERBS AND GRASSES				
1. Golda		**8.9**	**50%**	
2. Ringaal		**8.5**		
3. Pildu		**8.5**		
4. Brahmi		**7.8**		
5. Laingda		**7.7**		
6. Tachhila		**7.7**		
7. Bang		**7**		
8. Kali khatai		**7**		
9. Junglee gainda		**7**		
10. Parh kesar		**7**		
11. Sapaki		**6.6**		
12. Thundiyari varieties		**6.2**		
13. Musola		**6.1**		
14. Van bhangjeer		**6**		
15. Gauja		**6**		
16. Musli		**6**		
17. Bhimaldi		**5.5**		
18. Musa saikna		**5**		
19. Piyoli		**5**		
20. Admarkha		**5**		
21. Dhatura		**4.6**		
22. Banj kela	**4.2**			
23. Neelkanthi		**4**		
24. Bhatta		**4**		

Key for Threat Status of Species**:**
T--Threatened (between 40-60% population decline)
ET--Extremely Threatened (more than 60% population decline)
S -- Stable (less than 40% population decline)
All considered over the last 20 years.

ANNEXURE--2

TAKE ALL THE WILD ANIMALS WITH YOU

Was what the local people said? Flora, flora, ever flora -- never ever was any fauna mentioned. But what about the animals, we asked. Take them all with you, too Zoo's or cities, as you seem to like them so, was the response.

Along with the various advantages of nearby forests come the disadvantage of frequent visitations and crop raids by a diversity of wild animals. An enormous problem for the local people, as the frequency and intensity of raids and crop losses has risen dramatically, to approximately double (and about half the crop, believe locals), over the last two decades. Wild boar, sambar, barking deer, porcupine, himalayan sloth bear, rabbit, monkeys, and langurs are the main crop raiding animals. The serious threat comes mainly from boars, monkeys, and sambar. Round the clock vigil is almost impossible as land holdings are scattered and extremely fragmented.

The mere thought of a wild animal gets them angry and otherwise gentle and peace-loving elders speak of shooting all the wild animals. With severe crop losses as the big impetus, hunting becomes the logical next step and is seen as necessary to keep the wild animal populations down. With all the local anger, god save the animals if the local people had more than the two old guns that they presently do!

Annexure 3
LOCAL BIODIVERSITY KNOWLEDGE AND USE

There is tremendous local knowledge about wild flora species running into many hundred species. Almost all the species have local names and spectacularly large ranges are utilized, often in multiple ways, as the life and economy of the local agri pastoral communities is heavily and variously dependent on local biodiversity.
The large local fodder need comes mainly from the forest and knowledge of *wild fodder plants is astounding*. Special properties, including medicinal and high milk yield are well known. There is a highly evolved and intimate knowledge of timing and methods of harvesting individual species. Due to various causes, notably fires, goats and excessive local utilisation, many fodder plants have declined considerably.
For its size, the area has exceptional medicinal plant diversity. Considerable knowledge of use and distribution exists among the local people. And even more so, among some vaids of the broader local area. Many are important and highly valuable plants, known to Ayurved. There are some secret medicinal plants, considered particularly powerful and known only to a few and guarded by local belief that widespread identification will weaken their efficacy. An erosion of local knowledge and use of medicinal plants is underway. Many plants are known to be medicinal, but there is little or no current utilisation or the exact use is largely forgotten or not known. There appear to be a host of unidentified medicinal plants and we could identify some. There is great scope and need for more work on medicinal plants in this area.

Numerous wild fruits and berries are supplementary food sources for the local population. Notably *kingora, hinsar* and *kali hinsar, amla, semal* (silk cotton), *timla, chhanchri, bachhon ka kaphal* (strawberries) and *khenu*. Amongst edible flowers and leaves, often with medicinal properties, the main one's are *burans, lengda, sakina\saikna,* buds of *guriyal, pilkha, bhel papra, hatha pola, vali, gandhela* and *bichhoo booti* (stinging nettle). Some wild tubers like turarh/tald are a celebrated part of local peoples food. The food preferences of birds and wild animals are known well and highly regarded in valuing particular species.
Knowledge of tree woods for construction timber, furniture, and agri implements, is another high knowledge area, where great store is set by particular species for very specific uses. E.g, there will be a particular wood considered best for making doors, with second, third and fourth options, similarly for the door frames there will be a separate set of preferences, then for the beams and so on. Then there's the wide diversity of knowledge and use of natural fibres, fibres from

bheemal(Grewia optiva) and maloo (Bauhinia vahlii), being the most popular. *Timber trees are amongst the most severely declined category of flora.*
As village elders pointed out, "our agriculture too is dependent on the forest", referring to the animal manure powered organic agriculture and rainfall dependent nature of their farming. Other than this leaves of some chosen tree species are used for mulching, especially important for tuber crops in a rainfed agricultural system to conserve moisture through dry seasons and spells. Important here are *mohua, semla, tun, bhararha* and *tilphara*. There is considerable knowledge of ecological values of plants, particularly about water holding, soil binding, and slope stabilising capabilities.

There are species locals feel they would be happier off without. Predictably the exotic weeds like the *kala bansa, lantana camara,* & *kurre* figure in the list. But they see value in *suru*, a xerophyte and *ram bansa* (agave), a good soil binder.

When it came to fauna, far from prioritising any of them, the local people had one near unanimous response, 'Take All The Wild Animals With You', so strong was their reaction particularly towards wild boars and the hordes of monkeys, especially the ones from Rishikesh. Next in the Unwanted List were the *solla* (porcupine) and *jarhaoo (sambar)*. Even the shy ghural and serrow who don't eat any human grown crops, are not seen with much love. See box in Annexure --- 2.

There is a great variation in the local knowledge about wild flora and fauna. Knowledge and interest in birds and small fauna is limited too. Our own constraints have not permitted a detailed investigation of the areas faunal diversity. Yet, the commonly found wild fauna seen by us and from local accounts reflects considerable diversity. A detailed study of faunal diversity is needed and would complement the existing knowledge of floral diversity.