National Biodiversity Strategy

AND

Action Plan

NAHIKALAN SUB-STATE PLAN

draft

SAPs

June 2002

National Biodiversity Strategy and Action Plan

Nahikalan Sub-State Plan

Uttaranchal

The Nahikalan Sub-State Site lies on the Outer Himalayan range, overlooking the Doon valley, on the border of the districts of Dehradun and Tehri Garhwal in Uttaranchal.

Overall, the draft Strategies and Action Points chapter has the following sections/ format for most strategies and action points, with variations when needed __

- Strategy name
- Priority rating (for Strategy and/or separately for Action points)
- *Brief background/introduction to Strategy or action point (including local contextual factors, threats or factors behind loss of diversity), wherever needed. This is to enable readers to better assess the strategy in the light of the local contextual and other factors.*
- Occasionally a small statement of objectives of strategy when these are not obvious. Justification and gap analysis are also done when needed.
- BCPP strategy/action point evaluation (whenever a similar strategy/AP was formulated under the BCPP and was implemented/experimented with in the last four years.
- Action points (listed and marked distinctly), are usually elaborately detailed. The basic format described here is followed for Action points separately whenever needed or at the strategy level when common to all action points. Elaborateness of details depends on the priority status of the strategy/action point, importance and need of details and time possibilities. Given this we've attempted to work out strategies and actions as much as possible.
- Responsibility for implementation
- Time Frame

Abbreviations Used : LC - local communities ; FD - Forest Department
SAPs - Strategies and Action Points

Chapter

STRATEGIES AND ACTION POINTS

For Conservation of Wild and Cultivated Biodiversity

WILD BIODIVERSITY CONSERVATION STRATEGIES __

Evaluating Learning and Planning Anew

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 (BCPP, from now). As a part of this BSAP, the BCPP Plan has been evaluated for its effectiveness and appropriateness in meeting its objectives. The key threats and pressures on biodiversity were examined to detect changes and trends over the last four years. Assessments were made of site and species level changes, if any (especially for prioritised and threatened species and sites). And all the strategies were evaluated for their effectiveness. Other than micro-site assessments, extensive discussions were held with all categories of local communities.

These evaluations are presented as a separate section towards the beginning of many individual strategies/action points.

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. The primary players in whatever has been happening and attempted so far have been the local communities themselves, with facilitation by Vividhara.

Strategy

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.

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?

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 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 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. They said this four years back.*
And they did !!!

The first big sign of a new awareness and concern about forest fires and their destructive consequences was witnessed in 1999. In a community effort, a large forest area with recent afforestation was substantially saved. The fire also entered a small village and the band of local fire fighters out to save the forests also managed to save the village. Subsequently, there have been other efforts at controlling fires from

spreading thereby saving forests. This is only the beginning and much more needs to be done.

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 could 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 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 also observed. Lack of natural regeneration was an important and worrying finding of the BCPP study. Then, 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.

The rains too have played a role, in lesser incidence of fires. There haven't been many long dry spells. Some winter rain (lots this 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... these were strikingly creative.

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.

Creative activities; 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 Remain :
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

- 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 ___

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

- 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

- 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). And in other seasons too adequate and 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 promoting grasses, needs to be discouraged.

Responsibility: Local Communities

CONTROLLING FIRES !

Action Points: headings are in bold, below.

Priority: V. high

❖ 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

❖ Encouraging Communities that Prevent and Control Fires :

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

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...

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.

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.

BCPP Strategy Evaluation and

- Action Points -

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 and further up north, Sateli etc. 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.

- 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. These are not enough and better ways like some community generated sources of sustainable funds need to be worked out.

- 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.

- 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**.

- 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. In terms of alternative grazing lands for the winter months. Suitable and sustainable locations and systems need to be found for them. One way would be to spread the time duration out over different areas. There may need to be restrictions on the size of the herds 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

To find out :
What is the current FD policy/working plan on this issue/ for this area ?

Do migratory goats still come into the Barkot area ?

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 -

➢ 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.

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.

➢ 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.

➢ 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

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 -**

Highest Priority Issues and Themes for Action :

Priority: V. High

- **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.

- Local Contextual Imperatives for Biodiversity Conservation

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

These are 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.

➢ **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.

➢ 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

SUSTAINABLE AND REGENERATIVE GRAZING, FODDER, FUELWOOD COLLECTION AND OTHER LOCAL UTILISATIONS 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 messages 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 -

❖ Awareness, Sensitisation and Training

- **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 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

- **Treating 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.

- **No lone forest wanderings for non tree climbers:** Grass and fuelwood gatherers

who 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.

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

Other Methods/Paradigms of Sustainable Use:

Priority: V. High

❖ 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

❖ Reducing hardship for women through easier availability of fodder and fuel wood :

Priority: V. High

Enhancing agroforestry amongst agri-terraces, abandoned terraces, ghas pakhas and common lands.
Details in strategy by the same name in cultivated diversity conservation strategies.

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 on cultivated biodiversity strategies.

➢ **Identification and propagation/protection of rare/threatened/ endangered species.** Tree and shrub species that have declined dramatically have been identified. These need to be accorded protection and taken up for propagation and planting where needed.
Target groups: Youth, women and children in particular.

Responsibility: Village Community, Vividhara (awareness and training)

❖ 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, Conservational and other benefits and viability were assessed. It was finally chosen as **a highly preferred strategy**.

Locals feel 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 rest of the inhabitants 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 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: Relevant government agencies, Vividhara (Facilitation, and coordination if needed)
Time frame: Short term

❖ 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. Then there is the world of **bamboo crafts**.

Responsibility: Vividhara

Strategy

WATER MATTERS

❖ Action Points -

❖ 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.

- 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 (esp. of *bachharwad* and *ghorha peti joharhs*) and depth 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.

- **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, birds... 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

❖ De-choking, Reviving and Enhancing the Flow and Perennial Nature of Natural Springs

Priority: 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.

- 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 first and big primary step in this direction would be to gulley 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 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.

- 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 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

❖ 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.

❖ 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. Simultaneous or prior to the undertaking of the 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, Local Communities, Forest Department.

❖ 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.

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, 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.

To our minds, this is a good way to meet various objectives and make them compatible. Ideally, 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.

Strategy

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.

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

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 on Cultivated Diversity Conservation Strategies, in this Chapter.

Strategy

THE REGENERATION WAY TO REFORESTATION

Protect and Regenerate ! Why Plant ?

Priority: High

❖ 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 villages of Garhwal.**

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.

Strategy

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 -

In all landslip/slide and other vulnerable areas **all cattle and human pressures need to be eliminated**. Especially **strict prohibition of goat and cattle grazing**. Strictly out of bounds. They should be also protected from any loppings whatsoever for fodder and fuelwood. n.

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

All such ECO SOS areas were identified, priority sites listed and eco-restorative strategies discussed.
Some of the priority sites that need stabilization attention:
Patniyan ka dabbar, slopes below semalsari, next to 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

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

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.

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 have been trying. But for a widespread and substantial difference this alienation needs to be addressed at other levels, as we suggest below.

Action Points -

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 livelihoods and survival needs, traditional role and relationship and long term stake in conservation and sustainable use need to be acknowledged. This will enhance their stake and role in the long term survival and well being of biodiversity and the ecosystem. It is also important to arrive at *clear responsibilities and obligations of local communities in conservation* of the same resources. This will generate feelings and attitude of responsibility and enable LCs to play their real and invaluable role in conservation.

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. 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. This is what we have attempted in most of the strategies, notably and elaborately for the high priority strategies and action points for controlling fires and goats, securing natural springs etc. 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 .

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 existing system of kukath trees and PD needs to be examined from this angle.

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

❖ 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.

❖ **Mandatory approval/concurrence** of most relevant local community bodies for any new projects and schemes for the area, esp. any proposal for non-forest uses. There is an MOEF circular stating this.

Strategy

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 -**

❖ **From dramatic loss of biodiversity to restoration/return of the native and creatively pushing back the invaders:**
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 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. Kala bansa has no human, cattle pressures, nor any insect pests bother it. It is 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 the highest priority action point and approach. It is also the most time and resources efficient way and the most holistic. 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.*

❖ **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 – there leaf tender stem sap of kala bansa is an excellent medicine for cuts and wounds.

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.

➢ 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

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* and *gilloe.* To allow regeneration, no extraction of these plants should be allowed.

❖ **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.

• **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.

❖ 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.** This area is a meeting point of biodiversity and plants from the outer Himalayan range, with altitudinal and climatic similarities could also be grown. 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 on cultivated diversity conservation.

Responsibility: Vividhara

❖ **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.

Strategy

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.

❖ To our mind, a small scale unit in this area is the best way to realise 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 details of this promising action point, see strategy/action points in cultivated diversity section.

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

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:

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

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

PARYAVARAN VIKAS SAMITI

Action Point:
Facilitating the formation of a local village based organisation for engaging with key issues of environmental conservation and sustainable development. Treating both as equally important, harmonizing not compromising. It can 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

~~Section 2~~

SECTION 2

CULTIVATED BIODIVERSITY CONSERVATION STRATEGIES

TYPES OF STRATEGIES:

1. Spectrum/Overall Strategies -
Strategies that are relevant to all or many crops and varieties.

2. Creative Enhancement and Strengthening Strategies -
Creative interventions that meet the imperative of biodiversity conservation by addressing, harmonizing key linked issues or aspects like livelihood needs/economic sustainability, enhancing 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

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.

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

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

- **De-choking, Reviving, Enhancing the Flow and Perennial Nature of Natural Springs in the Forest**

Priority: 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

❖ 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.

❖ 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.

❖ 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.

- 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

Sub-Strategy 2
AGRICULTURAL TERRACE LEVEL :
MAKING CROP RAIDING DIFFICULT FOR WILD ANIMALS

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

❖ 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

❖ 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 place with substantial number of *khets*.
At least 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.

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.

Time frame: Short to Medium term

Responsibility : Concerned Government Department, Village communities, Vividhara.

❖ 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.

❖ 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.

➢ 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.

❖ 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.

❖ 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 difficulties have 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), nagphani, hedges, vines etc.

- A wall wherever stones are available, and a pit wherever that's a contextual possibility.

Responsibility: Vividhara

❖ 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

➢ 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

❖ 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 :

Zone 1

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.

➢ 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.

➢ 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

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:

- **Documentation of special values and characteristics of traditional crops and varieties including in comparison to hybrids and exotics.**
- **Enhancing and spreading awareness of local agrobiodiversity, on the following themes through creative methods.**

Themes For Enhancing and Widespreading Awareness:

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 dimension
- 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.

Different Media for spreading awareness at the local at the local level:

Awareness through folk music, lyrics and poetry, riddles... The local languages of Garhwhali 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 – an effective interactive way of sharing awareness. Some visuals already exist 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.

AT THE CONSUMER LEVEL:

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 8 years, outreach through interactions, sales and other programs have reached out, in mutually enriching exchanges, to lakhs of urban people of very diverse backgrounds and ages in the capital city.

- **Action** : Financial support for producing awareness materials, better and larger displays, street theatre and folk music can significantly enhance the scope of awareness outreach at this best regarded annual crafts fair in Delhi. An exhibition on Himalayan biodiversity is another exciting possibility.

GOVT. MEDIA LEVEL

This is a dark area and lot of creative thinking needs to be put in here, for there is a long way to travel. We need to think this through more. At present, we don't have anything really creative and effective to offer.

The thematic working group on cultivated biodiversity and the education and awareness thematic paper needs to come up with thought out, creative and effective action points for this.

Strategy 3

JUJHARU JUGARHU JUMBISH -- Jujuju

An experimenters, innovators, seekers, sharers collective

- 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 4

SOIL AND MOISTURE CONSERVATION AND ENHANCEMENT
and
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)

ABOVE AND AROUND TERRACES:

❖ **Restoration 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 trees and plants, 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 undertaken responsibilities for protection.
  Full attention to be given to the critical component of protection.

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

THE TERRACE AND KALNA LEVEL -

Action Points:

❖ Widespreading awareness of enormous soil erosion/ moisture loss – the causative factors and consequences.
❖ 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.

- **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

- **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).

- **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.

- **Mixed cropping and cover crops**

To afford greater cover and protection to soil from forces of erosion.

- **Adequate mulching for all crops that are benefited by it**

- **Increasing organic matter content in the soil through farmyard manures and other means.**

- **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 them like demonstration terraces.

Responsibility (Terrace and Kalna Level): Vividhara, Village Communities, Jujuju

Time Frame: Immediate to Medium Term

❖ 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

❖ Support irrigation for rainfed agriculture through rainwater harvesting and spring stream water collection.

Priority: Medium

Action Details _

- **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.

- **Spring/stream water collection tanks**

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.

Priority : Medium

Strategy

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. Lets add the following agricultural scenario to the workload described above 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.

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:

- 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.

- 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.

* 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 takes us to the next strategy.

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

❖ Reducing effort in fodder and fuel wood collection

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.

❖ 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

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 our own experience and observations over many years, reveal 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 declined drastically, particularly cereals and millets. Production of pulses and beans 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 vary from rare to occasional across families, due to remoteness and cash availability.

All this strongly indicates nutritional imbalances and deficiencies.

Action Point:

- 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 terrace level can fulfill most of the 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

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. The fertility and productivity of agriculture is directly and immensely linked to these organic manures.

Action Points:

- ❖ **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.

- **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.
- **Forest leaves for far-off terraces**: Details in Action Point in Strategy for Lessening Drudgery.
- **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.
- **Biogas slurry as enhanced fertilizer** : experiments to make a high quality and quick to make fertilizer. Some attempts have been initiated during this BSAP, by Vividhara.

Strategy

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.

Priority: High

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- Action Point - same as strategy name

Dimensions and Details -

- Documentation of current and overtime local practice and knowledge of crop and varietal rotations and crop combinations/ companion plants.
- 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.
- Rotations and combinations with similar crops in other, especially west Himalayan areas.
- Sharing with the local communities.

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

Responsibility : JUJUJU, Vividhara, Beej Bachao Andolan

Strategy

ORIENTING GOVERNMENTAL POLICY PROGRAMS AND EXTENSION - TO CONSERVE AND FURTHER AGROBIODIVERSITY

❖ 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.

❖ 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.

❖ **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.

SOME MORE SPECIFIC SAPS AGROBIODIVERSITY CONSERVATION, EMERGING FROM THIS BSAP, WITH SPECIAL RELEVANCE FOR OTHER BSAPS, ESPECIALLY FOR UTTARANCHAL AND WESTERN HIMALAYAS.
BRIEFLY STATED, SEE RELEVANT STRATEGIES FOR DETAILS. This list is not comprehensive and is not a substitute for reading through the strategies, to find relevance for other and broader areas.

- 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/integrations, instead of supplanting alternatives to the local production system, and 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 a high priority area in all agriculture and horticultural policies and programs for hill areas.

For elaborate chosen actions and approach, 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. Bio-pesticides is another important area and the first preference needs to be on local formulation from available biological resources.

This initiative has very high potential in enhancing productivity of agrobiodiversity with numerous benefits.

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 may also help in the context and age of IPR's and patents.

Enhancement Strategies

Like most other parts of the Himalayas and other 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 drudgery, 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 of them suggest 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 and the environment, hence long-term unsustainable. This is true, as well, of almost all horticultural interventions in the Himalayas, as they were conceived and implemented as replacements rather than complementary integrations/ additions. We believe from our own experience as well as some other experiments that carefully planned and implemented additions need not, necessarily, be at the cost of indigenous diversity.

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

Strategy and Action Point

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.

Details of Action Point -

Key Features:

- In the search for selecting appropriate plants for cultivation, primacy and preference will be given to native wild plants -- medicinal, fruit/berry etc.
- The critical criteria for selection of species will be agroclimatic suitability, hardiness, local utility and 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 have repeatedly expressed their interest in wanting 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

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.

❖ 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 and desirable anywhere in agroecosystem:

- 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 / hosts 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, saikna/sakina 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.
For tree species addition on agri-terraces in addition to species types (principles stated above), specific location too needs consideration to prevent long winter shadow shade, when possible.

Responsibility: Vividhara

Strategy

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 interaction, 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.

- **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.
- **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.
- **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

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 -

❖ 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..

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.

❖ 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.

For 8 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.

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.

- **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, run by the Union Ministry of Social Welfare.

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 registrations that may be needed under law for undertaking all of 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), Vividhara

Crop Specific Strategies

For specific crops or groups/families of crops.

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 :

Priority: V. High

❖ Action Points -

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.

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, 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.

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.

4. *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

❖ **Action Points -**

- **Saving from wild animal raiding (details in Strategy no. 1 for cultivated diversity)**

- **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.

- 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

- 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.

❖ **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.

❖ 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 was on the sunny and well drained outer edges of a terrace where there was anadrak crop on the rest of the terrace. 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.

❖ 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 pest 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

❖ 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

❖ 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

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

Chillies

- 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.

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

❖ **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 regularly for the last 10 odd 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.

❖ 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

❖ 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

❖ Action Points

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

Details in strategies by same names.

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

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. Importantly, it is not favoured by wild mammals. Yet, it is hugely neglected today, despite its very high market value.