

Perennial Fodder Grasses: Key for Management of Community Forests in Indian Himalaya

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Abstract:

The village communities in Himalayan state of Uttarakhand (lies between 28° 44' & 31° 28' N Latitude and 77° 35' & 81° 01' East longitude) in India have been involved in community forestry management as well as to fulfill their daily needs of fodder, fuel wood and biomass for agriculture. The village level institute known as Van Panchayat (VP) or the village forest council was introduced in 1920s by the colonial rulers as the mechanism to resolve agitation which was initiated by the local communities against the government's move to have control over the forests. The VPs were formed within the village boundaries and have since been managed by village level committees.

A recent project on strengthening of the VPs has indicated that to restore the efficient functioning of the VPs village communities should have tangible benefits from the community forest areas. The livelihoods based management of natural resource approach was followed by developing perennial fodder grass plots on the VP land and simultaneously breed improvement programme for local milking animals. A balanced approach between breed improvement through artificial insemination and increased availability of fodder grasses yielded enthusiastic results.

The participation of the community has increased and 40% of members are directly involved in VP activities. The presence of community members in VP meeting have reached to 32%. Easy access of fodder grasses and management of fodder feeding through advance practices has assisted in time saving of women community by 300-335 hours in a month resulting in initiation of income generating activities at village level. The dependence for fodder on trees and lopping has reduced by 10.5% during past two years while 52% reduction has been recorded over uncontrolled lopping. Availability of nutritious fodder has also accelerated the AI for improved breeds as milking capacity of existing improved breeds has increased by 16.4%.

Thus, awareness among villagers has immensely increased for management of community forests by promoting fodder grasses in barren lands and ridges on one hand and adoption of improved breeds on the other.

Key words: *Management of Natural Resources, Community Forestry, Fodder grasses, income generation through natural resource based livelihoods.*

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Introduction

Uttarakhand state in India, having approximately 65% forest area out of its total geographical area, is blessed with natural resources. Although approximately 80% of the state's population depends on agriculture, only 14% agriculture land availability indicates the limited scope for the agrarian society. In such prevailing conditions relationships of communities with the forest resources is quite natural and has been in existence as a part of tradition. Encompassing close to 0.6 km² of forested land and extraordinarily wide ecological range from tropical to alpine forests, meadows and snow, the Himalayan region is possibly the most important eco region of the world after Amazonia in terms of biodiversity and ecosystem services.

The Indian Central Himalayan oak and other broad-leaved forests are known for their rich biodiversity. The threats to forest are many, and all are linked to acute poverty and lack of livelihood options. One of the approaches of conservation is linking it positively to economic growth, and a Biodiversity Conservation Network (BCN) sponsored research has shown the usefulness of such an approach. The main hypothesis is that the people will conserve the biodiversity/ forests if they get economic benefits out of it. Various stakeholders working on mountain related issues, from local communities; NGOs, governments and international organizations also share a common view of the importance and uniqueness of mountain areas and cultures. Accordingly through the proposed project we plan to conserve biodiversity by linking it with livelihood issues and by capacity building of the communities.

The VPs (Village Forest Committees or Village Forest Councils) were introduced to Kumaon in 1920s following agitation against British expansion of control over forest areas. These VPs represent an appropriate example of an institution involved in "prevention of deforestation and managing their common forestry resources." Much of the biomass extraction from their community forests is in the form of lopping of branches collection of herbs and ground litter. Consequently, a present day VP forest at its worst can be in a highly degraded stage, warranting restoration work, but complete loss of stock does not occur.

The responsibilities of VPs are laid out in the law to ensure that village forestland not to be diverted in any other use and utilization of forest produce to the best advantage of village community. Protection of forest from fire, illicit felling and preventing damage to trees due to lopping along with grazing is also the responsibility of VPs. The functioning of VPs is generally carried out by the community through watching the forest on rotational basis or a guard is appointed and salary is paid by community contribution. The VP also grants permission for cutting grass, grazing and collection of fallen wood and charge fees with government permission. The rights of extraction of resin, NTFPs and trees are also given to VPs on recommendation of government. The VPs also have right to punish or fine for violating the rules. Besides, each VP makes its own rules and regulation as per needs and wisdom.

Thus, Uttarakhand occupies a special place in participatory management of common natural forest resources because of its VPs. Till 2002 there were approximately 6,000 VPs in Uttarakhand, occupying nearly 30% of the total forest area of the state. However, the state government recently undertook a drive of "each village

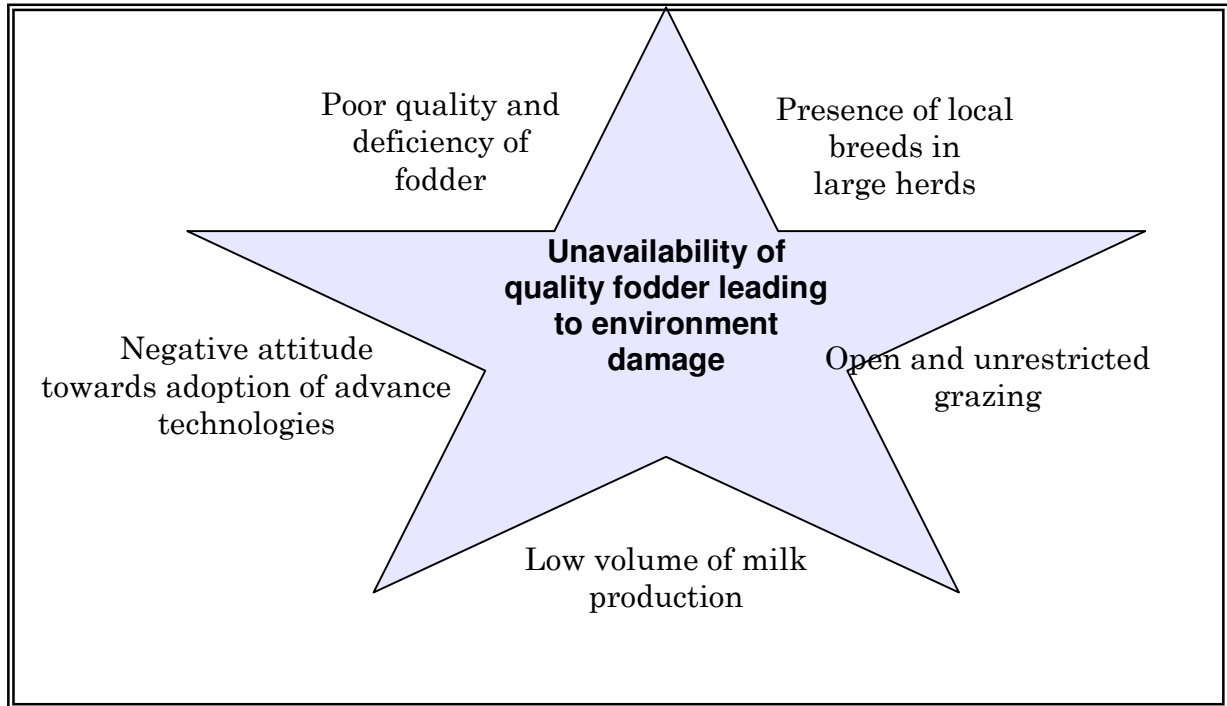
should have their own VP". As a result the number of VPs increased to 12,089 in the hilly district only against the total 15,761 habetated villages in the state (VP Atlas, Uttarakhand 2006). Most of VPs formed in the drive phase are formed to achieve the target, hence they often lack the spirit of a process generated community based institution. The geographical area of the VPs formed differ largely and indicates the haste to achieve the target i.e. the smallest reported VP Bhirou ke Aali (Takula block, Almora district) was formed in 2004 with an area 0.024 ha while Bhundar (Joshimath block, Chamoli) one of the VP with largest area has 22,959.902 ha under its command. The studies have indicated that 01 ha forest area is required to meet fodder and fuel needs of an average village family of four to five persons on sustainable basis.

Both for agri-horticulture and animal husbandry rural people depend heavily on forest biomass. It is established through research that at least seven units of forests are needed to sustain one unit of agriculture in the mountains. Thus, in the present context the glorious community based institution of VP is at a junction where it is required to develop a strategy to strengthen these councils and villagers managing them.

The livestock in the Himalayan region of India are mostly nondescript. It is undisputed that in the hill regions percentage of improved breed cattle is nominal in spite of the fact that various programmes are under going. Still the improved breeds are not very common in hills and majority of families have cattle of local breed. The livestock is kept for agricultural activities, cow dung and production of milk for their own consumption till recent. However, in present context the trend has changed and many rural households now sell milk in nearby market. As yet the milk yield is lower due to lack of improved cattle breeds. Thus, there is need of promoting improved breeds and commercialisation of milk.

As the cultivable land in the Himalayan regions is very limited and there is ever increasing demand of food crops itself. The cattle rearers do not grow fodder as a crop and entirely depends on forests, wastelands, pastures and crop residues for it. Grazing is almost universal in forests, community forests, wastelands, etc. The unrestricted grazing has resulted in degradation of vegetation and the undergrowth of plants is also adversely affected due to grazing, browsing and trampling. The deficiency of fodder is about 42% and the managed way of feeding is also not very popular among the common masses. Adoption of stall-feeding and chapped fodder is still awaited in rural areas indicating the requirement of lots of efforts in this regard.

Most the time of women residing in rural villages of the hills is devoted in collection of fuel, fodder and water. The collection of fuel wood is mostly (95%) carried out by the women. Similarly the pressure of collection of fodder could be easily seen in all the areas. Women in the Himalayas spend most of their time (8-10 hours a day) in

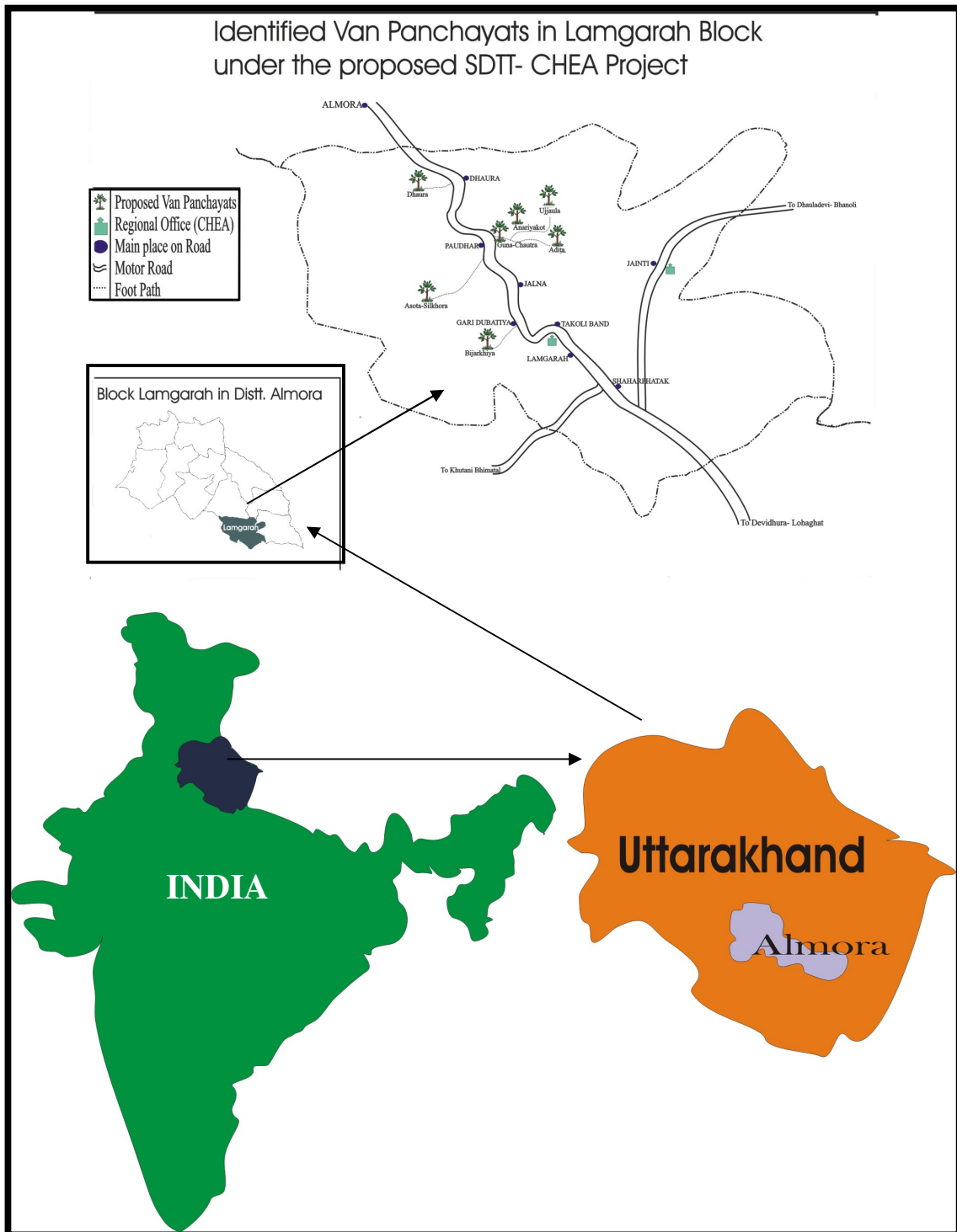


drudgery by walking long distances to collect fuel wood and fodder from degraded forests. Thus, livelihood improvement could be only possible if the above problems should be brought down in the region.

It is accepted that from a healthy forest about 200-500 ton dry fodder could be harvested every year. However, practically about 2.5-5 ton of fodder is generated from the forests. Thus, community forests could be a fodder banks if proper plans and activities are conducted which would result in reducing the women drudgery on one hand and better options of livelihood on the other.

Study area and methodology:

After receiving the response to initiate the activities in all 07 Van Panchayats (VPs) of hill state Uttarakhand, India were selected to undertake the activities. The site map of the project area is as follows:

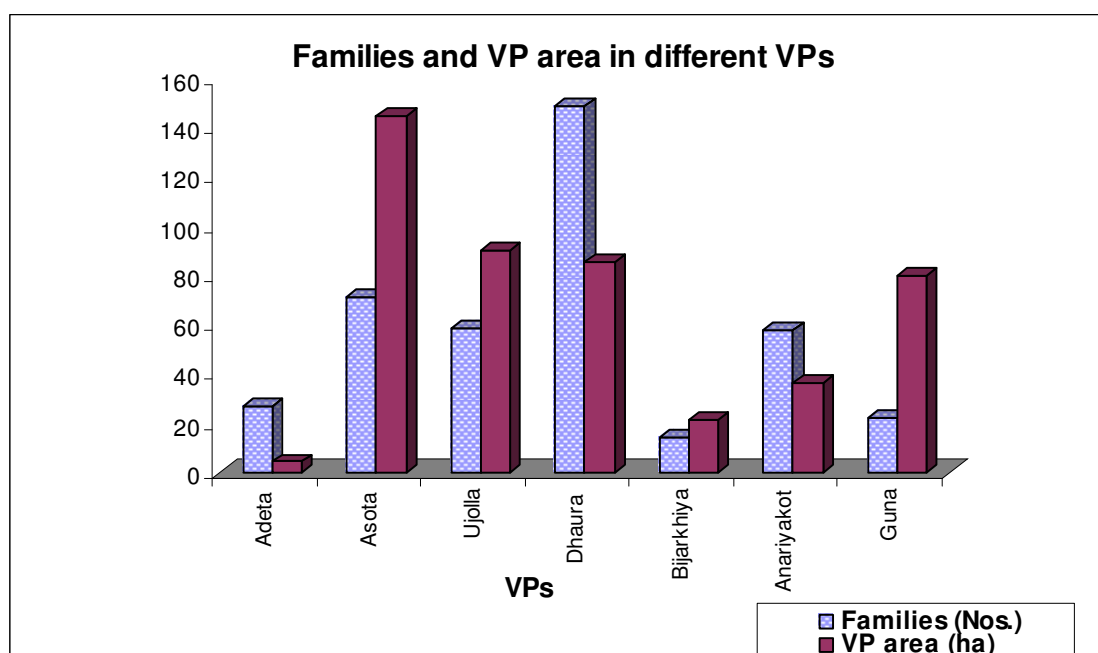


also taken into consideration by using GPS for developing a proposed monitoring mechanism in the near future through satellite. The VPs lies between $29^{\circ}32.749'$ and $29^{\circ}35.164'$ latitude whereas the longitude was at par in all the VPs. On the other hand altitude indicated variation among different VPs and was minimum (1328 m) at Dhaura and maximum (1919 m) at Bijarkhiya. The details of sites undertaken for different activities are given in following table:

Geographical details of different VPs

Sl.	Van Panchayat	Latitude (N)	Longitude (E)	Altitude (m)
1.	Asota	29°33.620' to 29°33.654'	79°41.387' to 79°41.478'	1657 to 1790
2.	Adeta	29°34.206'	79°41.687'	1716
3.	Guna	29°34.033' to 29°34.453'	79°41.415' to 79°41.561'	1749 to 1802
4.	Ujolla	29°34.720' to 29°35.164'	79°42.298' to 79°42.739'	1341 to 1485
5.	Anariakot	29°34.641'	79°41.642'	1670
6.	Bijarkhiya	29°32.749' to 29°32.787'	79°43.582' to 79°43.591'	1912 to 1919
7.	Dhaura	29°34.564' to 29°34.712'	79°39.704' to 79°40.214'	1328 to 1545

The project outreaches almost among 400 families residing in 07 VPs. The total population of these VPs is 2258 with females a bit over 50%. The total area under VPs is about 462.9 ha and Asota VP accounts alone for almost 1/3 of the total area while newly formed VP Adeta has an area of only 4.4 ha.



The figure depicts that on the basis of VP area Asota has maximum area whereas in terms of families Dhaura indicates maximum families among 07 VPs. In comparison to population the VP area is lower in Adeta, Dhaura and Anariyakot indicating enormous pressure on forests. While in rest of the VPs the pressure is slightly lower on forests and other natural resources.

To assess the impact of perennial fodder grasses in managing community forests (VPs) a baseline was developed before implementation of project during first quarter of 2006. The base line was developed in consultation with forestry and socio-economic specialist and sample size was kept 25% (100 households) of total households for unsurpassed outcome. The Participatory Rural Appraisal (PRA) was taken into consideration for generating accurate information from VP and households identified. In addition different tools were adopted to obtain useful information on the scope of the study and their advantages the successful intervention. The brief of methodology adopted is given as under:

- Collection of data from line department and institutes.
- Transit walk to access the general conditions and to observe the potential for sustainable development in selected VPs.
- Focus Group Meetings following Nominal Group Technique (NGT) as it offers scope for active participation of all members present in the meeting and also ensures contribution of all the participants.
- Personal interviews with different stakeholders for obtaining diverse information regarding project intervention.
- Manifold of gender dimensions for having holistic view of benefits of proposed intervention in different VPs.

Secondary data collected by concern departments were also taken into account for cross checking the data and avoiding variance between primary and secondary data. The data were recollected at regular interval up to January 2008 for fodder production, milk yeild and its impact on time saving. The livelihood generation activities were also documented from each VP to evaluate the impact.

Results and findings

Experience shows that genetically superior animals rapidly deteriorate in yields and productivity if they do not get adequate balance feed and fodder. Thus, to sustain the improved breeds and to ensure the supply of nutritious fodder it is essential to promote fodder grass cultivation in the vicinity of house, barren and waste lands along with VP area. The cultivation of improved varieties of fodder has resulted in quality fodder supply time to time and reduction of pressure on forests and fodder trees.

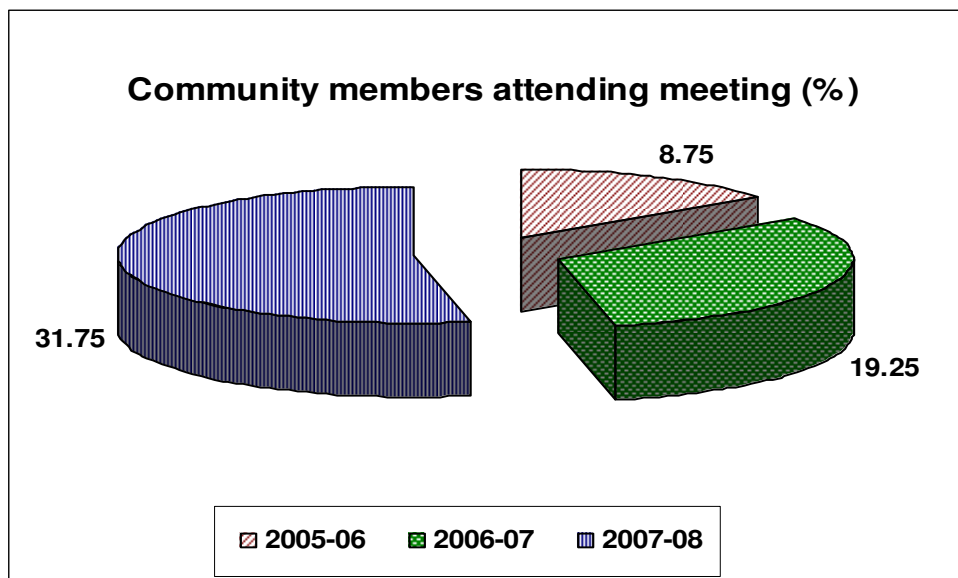
Livestock, especially cattle and buffaloes are reared in the hill areas under adverse climatic and environmental conditions. The rearers generally are small and marginal farmers or landless labourers. Majority of them perceive animal husbandry as a subsidiary occupation or as a necessary corollary to their agricultural pursuits. Thus, to promote the concept of modern dairy management integrated approach was attempted.

The problem of poor genetic potential, near absence of feeds and acute shortage of fodder was endeavor to resolve to best level through project intervention and important factors for management i.e. promotion of improved varieties of perennial fodder grasses, disease control, proper care of cattle and climatic factors were also considered. The project activities are focused on Artificial Insemination for breed improvement of indigenous cow and buffalos. To ensure optimum utilisation of efforts devoted on fodder collection and time invested, the promotion of manger is attempted. This is worth mentioning that traditionally in hilly region stall feeding, use of chop cutter and cattle care is not a practice and there is scopes to introduce stall feeding and veterinary care.

Community participation: The pilot phase of the project have revealed an increasing recognition that rural communities derive a far wider range of benefits from VPs that has previously been acknowledged, and that local forest management has made a critical difference to the socioeconomic sustainability of rural populations. The VPs has also offered the opportunity for socially marginalized people specifically women to be involved in community decision making.

The study revealed that in past the participation of community was very low and they were not interested in activities related to strengthening of VPs due to lack of knowledge and poor status of funds for VP in comparison to village council. Although, the frequency of meetings is still same as was before initiation of project but number of participants during meetings has immensely increased. The data collected from different VPs indicates significant improvement in attitude of community towards sustaining the VPs for long run and active role in developing action plan.

It is evident from the figure that of total population only 8.75% were representing in meeting related to VPs and allied activities before initiation of project which has increased to about 32%, a presence of 1/3 of majority for making plans and having discussion over various issues regarding management of available resources and their management.



Project outreach: The result indicates that due to project (2006-2008) intervention in 07 VPs, 400 families were benefited either in a form of inputs or through capacity building programme. About 40% of the families are directly involved in project activities viz; plantation of tree species and perennial fodder grasses, livestock improvement and trainings/capacity building programme. The participation of women was found more prevalent than men. Each household was involved in activities for propagation and extension of perennial fodder grasses along with adoption of improved breeds of cattle through artificial insemination (AI). The involvement of families under different activities is given in following table:

Sl.	Activity	Families involved	Involvement of families (%)
1.	Trainings and capacity building	94	23.5
2.	SHG	68	17.0
3.	Creation and maintenance of micro reservoirs	79	23.3
4.	Plantation and maintenance of tree species	230	57.5
5.	Cultivation of perennial	310	77.5

	fodder grasses		
6.	Promotion of improved breeds	54	13.5
7.	Vaccination and treatment of cattle	304	76.0
8.	Stall feeding and chop cutter	48	12.0
9.	Cash crop cultivation	127	31.6
10.	Vermin composting	55	57.5

The above table reveals the wider outreach of the programme among community. The involvement of families varied from 12% (Stall feeding and chop cutter) to 77.5% (Cultivation of perennial fodder grasses). The lower values for some activities were due to project targets set and availability of funds in particular heads.

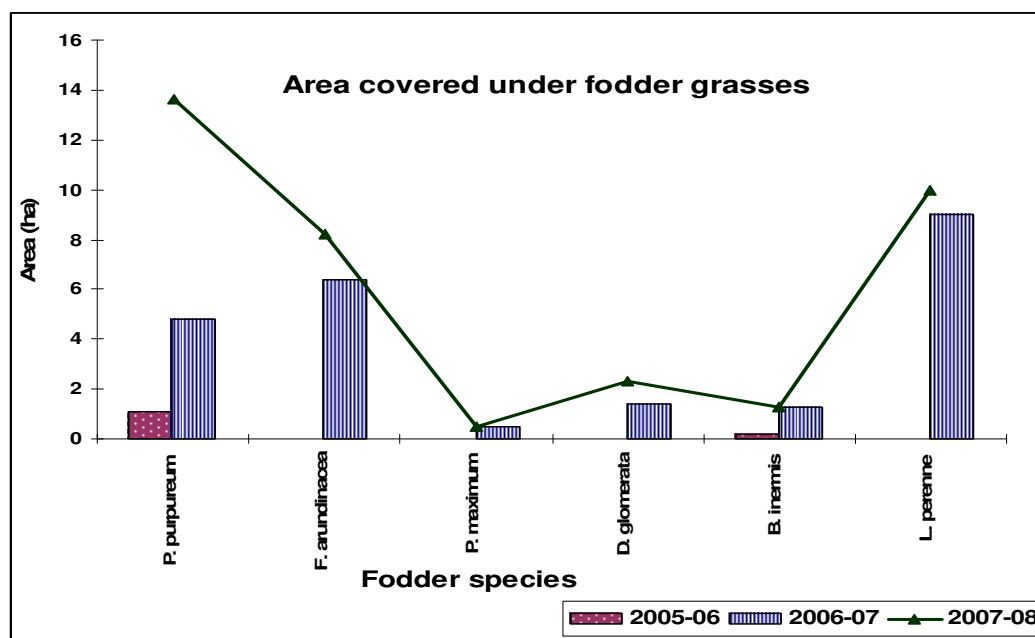
Promotion of improved perennial fodder grasses: It is evident that the cultivable land in the project areas is very limited and there is ever increasing demand of food crops itself. The cattle rearers do not grow fodder as a crop and entirely depends on forests, wastelands, pastures and crop residues for it. Grazing is almost universal in forests, community forests, wastelands, etc. The unrestricted grazing has resulted in degradation of vegetation and the undergrowth of plants is also adversely affected due to grazing, browsing and trampling. The deficiency of fodder is about 42% and the managed way of feeding is also not very popular among the common masses. Adoption of stall-feeding and chapped fodder is still awaited in rural areas indicating the requirement of lots of efforts in this regard.

The data collected during last two years for promoting improved varieties of perennial fodder grasses was significant. In all the area covered under fodder grasses is 35.9 ha and details are given in following table:

Sl.	Name of fodder species	Area (ha)			
		2006-07		2007-08	
		Root stock	Seed	Root stock	Seed
1.	<i>Pennisetum purpureum</i>	4.8	-	8.8	-
2.	<i>Festuca arundinacea</i>	0.4	6.0	0.8	1.0
3.	<i>Panicum maximum</i>	0.5	-	-	-

4.	<i>Dactylis glomerata</i>	0.4	1.0	0.9	-
5.	<i>Brumus inermis</i>	0.3	1.0	-	-
6.	<i>Lolium perenne</i>	-	9.0	-	1.0
	Total	6.4	17.0	10.5	2.0

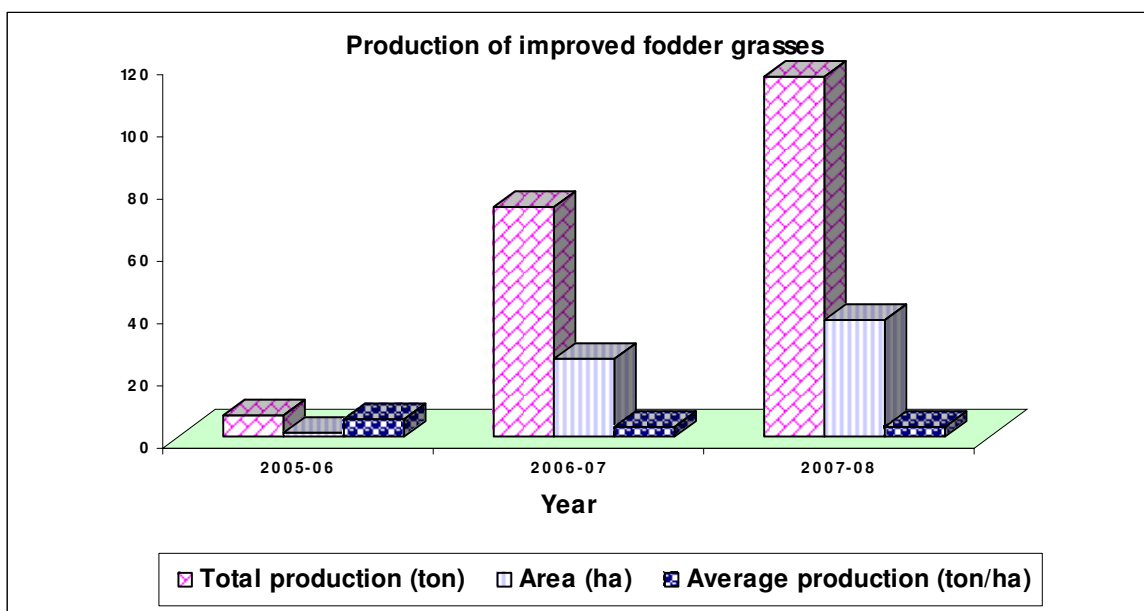
The performance of species varied from site to site. On the basis of first year survival and growth performance, it was observed that rootstock growth was significantly higher than cuttings and seed. Keeping in view the results during second year rootstock was given preference over other means of cultivation as being given in above table.



The figure indicates before project intervention the community were not aware about the quality fodder grasses and dependent on traditional fodder species for fulfilling their requirement. During first year, six species were tried of which the production was very high of *Pennisetum purpureum*. However in winter due to frost and low temperature twigs turn dry, which later produced new shoots during February-March. Growth of another species *Festuca arundinacea* recorded better in higher altitudes than valley areas. Beside *Lolium perenne* and *Dactylis glomerata* also showed fine growth in few areas. Thus, during second year only four species were standardized for further propagation. The figure also revealed that *Pennisetum purpureum* and *Brumus inermis* was planted in few VPs in small scale before project intervention, however the plantation and sowing was carried out for the first time in VPs in mass scale after identification of suitable species in different areas.

Production of fodder from different species: As mentioned in previous section 35.9 ha area was covered under quality fodder grasses. In general the production of various fodder species is around 30 ton/ha as reported by different institutes. However, data recorded from the community and VPs is relatively lower than above. In general the production varied between 2.6 to 5.4 ton/ha with total production of 179.9 ton after projection intervention from improved fodder grasses which was recorded only 70 quintals before project intervention.

The figure illustrate that production has increased due to project intervention. However, production per unit area is comparatively lower than documented. The main cause behind poor production was that during 2006-07 although 23.4 ha area was covered from perennial fodder grasses but 17 ha was under seed which germinated poorly and further due to lack of technical skills the results were not up to mark. Further



in open area of VPs the production was under privileged due to open grazing and trampling of root stock. The specific success of the project was that women were actively involved in activity (77.5% households) and they transported the root stock on their head immediately from nearest road head for its transplanting timely.

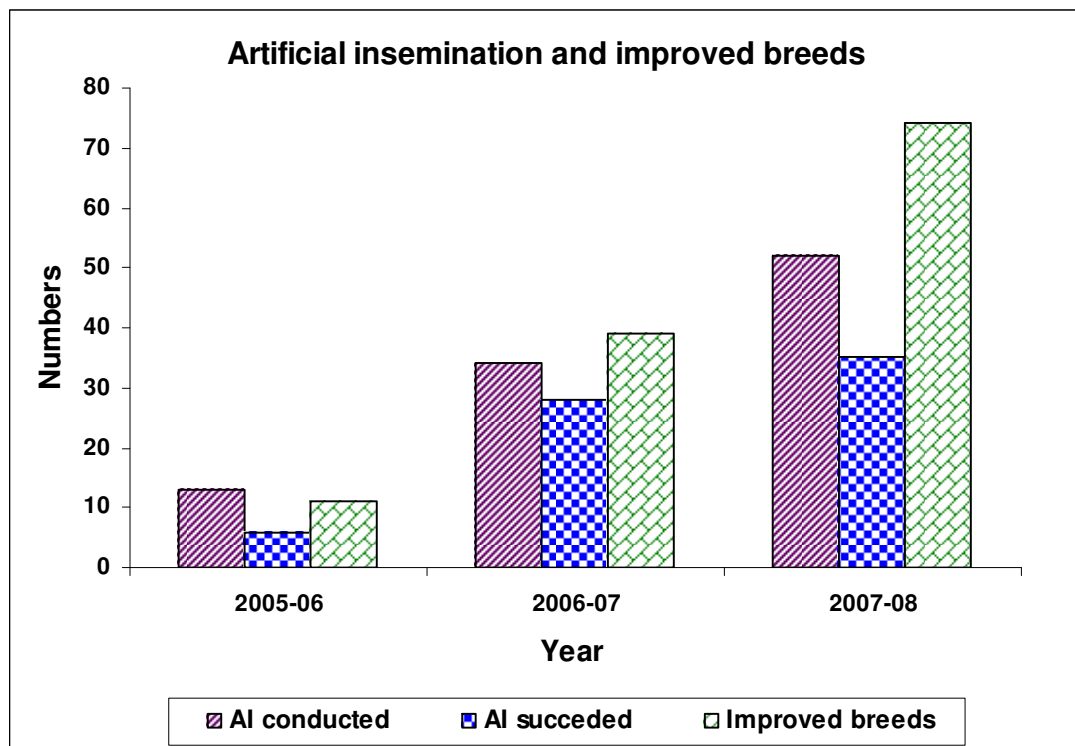
The average production increased during 2007-08 as previous factors were taken into consideration to enhance production by providing root stock rather than seed. The production also uplifted due to cultivation of fodder at homestead by majority of families which were taken care by them. The knowledge has also been upgraded through capacity building and training which were followed practically by the community.

Adoption of artificial insemination: The animals in hills are generally small, sure-footed and hardy whereas yield of milk per animal primarily depends on the quality of

breed and the cattle feed. The low milk yield is as much the result of poor breeds as of inadequate feed and fodder and out dated cattle rearing management. The major constraint identified before project intervention behind poor status of livestock and productivity were lack of awareness among the community for cross breeding and quality fodder for livestock.

Livestock numbers tend to increase in proportion to increase in human population because every land cultivating household attempts to maintain a pair of bullocks, a cow to produce bullocks, milk and a buffalo to produce milk. Thus, in today's world still livestock is kept for agricultural activities rather than commercial usage in hills.

The above was taken into consideration and village consultation workshops were organized to transform the mind set of the community through examples and by bringing forward the farmers

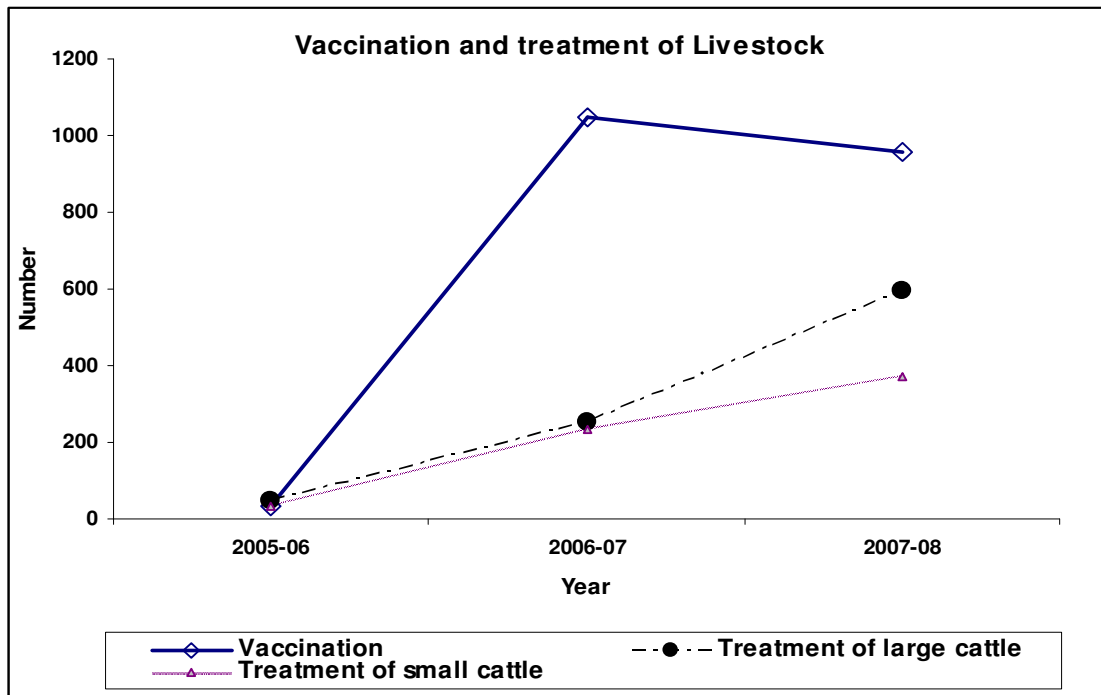


those have adopted the cattle as an option for income generation. The results were encouraging and artificial insemination (AI) was carried out for the first time in 02 VPs having around 89 families. Similarly the number of AI increased phenomenally in rest of the VPs. In all 86 AI has been conducted with success rate of 73.25%. The adoption of AI on buffalo is also a significant feature of project intervention.

Above figure revealed that the AI was not popular among villagers due to lack of knowledge and healthier communication with technical experts. Poor rate of success was also observed due to partial information regarding the best time period for insemination in cattle. The rate of AI and its success has enormously inflated after efforts made under project. The improved progenies of Jersey, Sahival and HF are now present in each VP along with Murrah in two VPs. Beside number of improved breeds

has also increased due to enhancement in awareness and availability of nutritious fodder.

Acceptance for vaccination and treatment of livestock: The vaccination was negligible and community has their own doubts for not carrying out vaccination before project intervention. In general, community was not interested in participating in treatment camps as they have insufficient knowledge for managing their cattle. The presence of community was deprived however, after project intervention the community turned enormously for vaccination and treatment of cattle.



The vaccination was not taken up in 04 VPs and was popular to an extent in 02 VPs. Similarly, treatment was also made by families having improved breeds and is nurturing cattle for milk production. In all 1670 cattle's were vaccinated and 780 cattle were given treatment. Castration was also carried out by the villagers after intervention of project and also contributed in cash towards the activity.

The vaccination has enormously increased since project intervention as depicted from the figure. The slight decrease in vaccination during 2007-08 was due to control over diseases through adoption of proper management techniques of livestock. On the other hand community is more aware about the health problem of their cattle as number of treated cattle has increased gradually.

To tackle the problem of non-descript animals the first step is to castrate the scrub males so that only improved breeds can multiply. In the project area the efforts were made for castration of scrub bulls through participatory manner. After accepting the concept, castration of 45 scrub animals was carried out by progressive villagers to avoid suppressed progeny.

Adoption of advance techniques for management of fodder grasses: It was common phenomenon in project area that cattle were either given fodder in open ground or sent for open grazing resulting in waste of about 40% of fodder due to trampling under feet. Further chopping is not in regular practice and was not popular among community in project area.

To overcome from the above constraint and for maximum utilization of resources the concept of manger was shared with the farmers and 43 structures were constructed under project. The chap cutters were also provided to 11 families for promoting the better practices in rural areas. The contribution in cash and in form of labor was appreciable for the above and beneficiaries contributed 50% for the above activities.

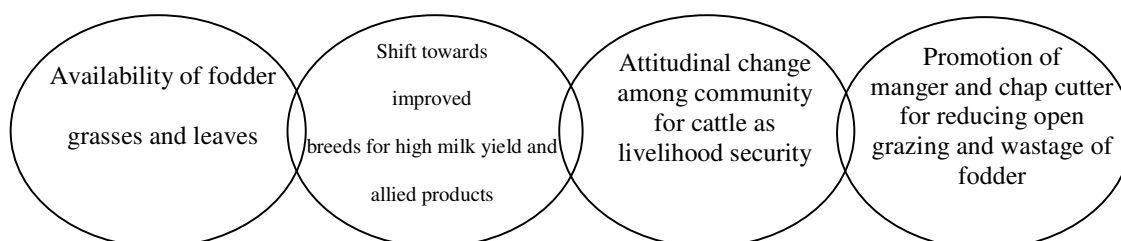
The results of manger are outstanding in reducing the wastage of fodder on one hand and healthier status of cattle on the other. The integrated approach of cultivating improved perennial grasses and promotion of manger along with chopped fodder has positively affected the livelihood of villagers. The time saved due to manger and chopped fodder were recorded and given in following table:

Sl.	Van Panchayat	No. of stall feed	Saving of fodder grass (ton/year)	Increase in milk production (cattle/year)	Time saved (hour/year)	Increase in income (household/year)
1.	Guna Chautra	7	15.0	85	360	1450.00
2.	Anariakot	5	8.0	35	240	450.00
3.	Bijarkhiya	5	6.5	80	180	1100.00

4.	Dhaura	6	14.0	50	380	650.00
5.	Ujolla	6	15.0	70	440	800.00
6.	Asota-Silkhora	8	20.0	90	520	2150.00
7.	Adeta	6	14.0	40	380	700.00

A change from the age-old practice of grazing livestock to stall-feeding is a pre requisite for successful community forestry (VPs). The unrestricted grazing has also been controlled. In addition chapped grass were mixed with other cattle feed or green fodder to supplement nutritious fodder. The increase in milk yield was also supplemented by chapped fodder as it reduces the energy of cattle consumed while chewing fodder. According to experts there is need to provide animal a proper well chapped fodder along with minerals, salt, cattle feed and water instead of whole bundle of fodder to save the energy and to fulfill the requirement of improved breeds. However, lot of modifications has to be made in consultation with experts to popularize stall feeding and improved feeding practices.

Positive linkage between quality fodder, income generation and environmental conservation

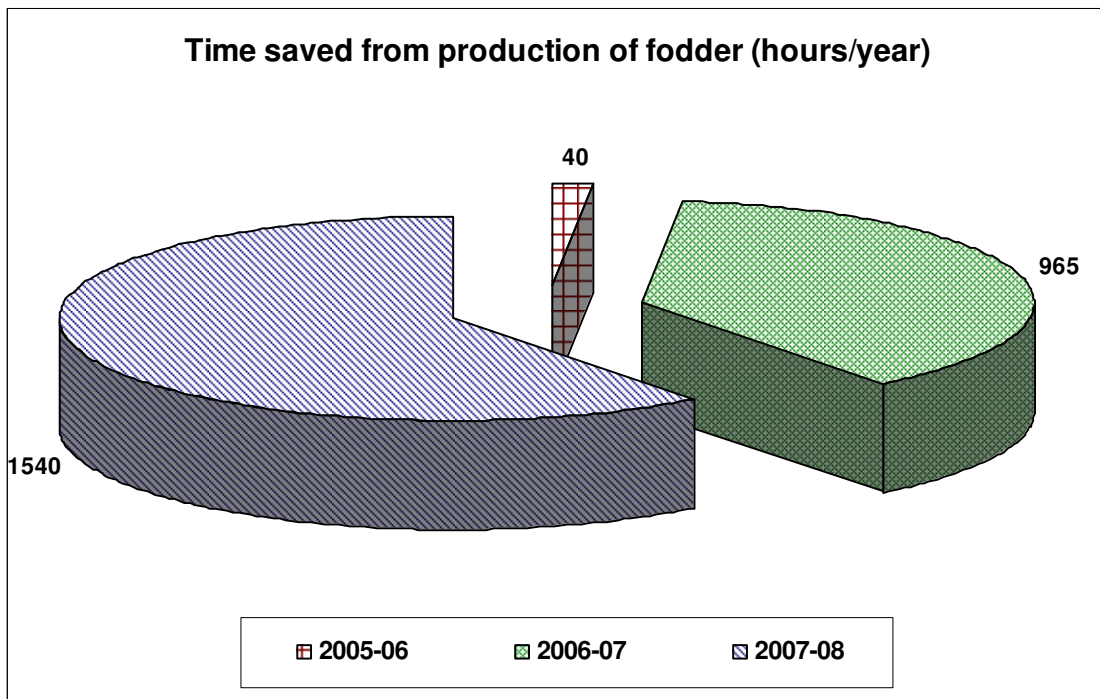


Reduction in drudgery of women: In Himalayan region most the time of women residing in rural villages is devoted in collection of fuel, fodder and water. The collection of fuel wood is mostly (95%) carried out by the women. Similarly the pressure of collection of fodder could be easily seen in all the areas. Women in the Himalayas spend most of their time (8-10 hours a day) in drudgery by walking long distances to collect fuel wood and fodder from degraded forests.

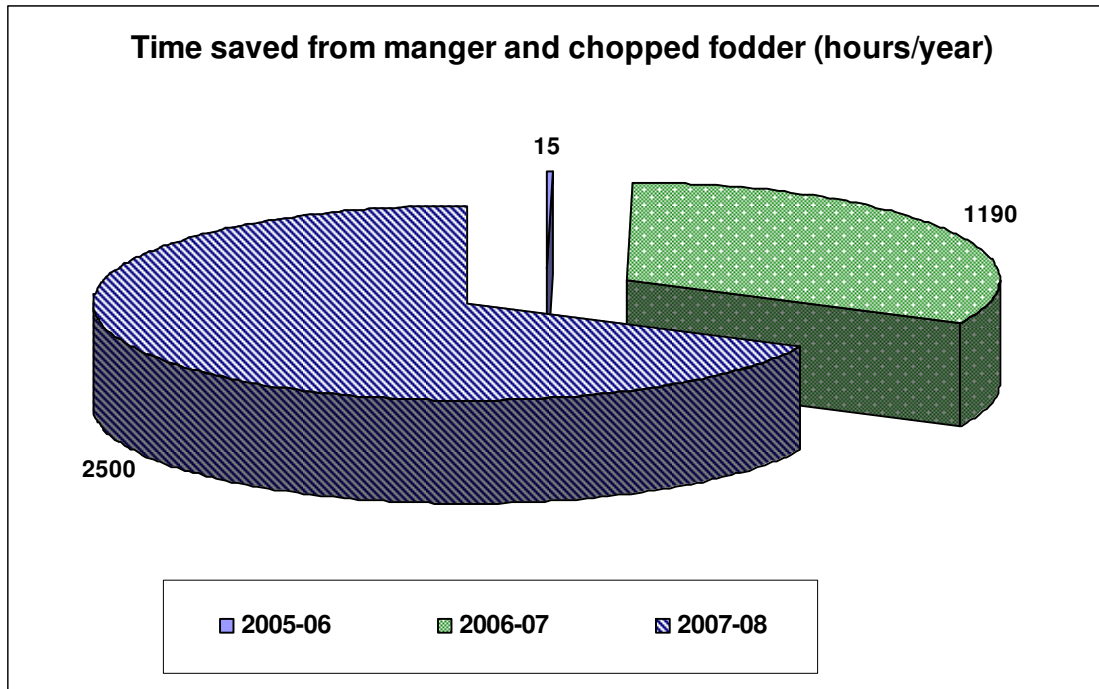
The efforts made through increasing the area under improved fodder grasses has definitely improvised the livelihood through time saving of women as revealed by the records generated during last two years. The data collected from each VP revealed a change in management practices of livestock in comparison to past. Although, buffaloes were mostly kept at home but feeding in manger was not popular and other cattle i.e., cow, bulls, goats, etc. were generally sent to forest for open grazing. However, after project intervention attitudinal shift towards keeping livestock in a managed way has been observed. The distance covered for collection of fodder is almost same, whereas time consumed has come down due to easy availability of fodder in VP area and vicinity of household time to time. The purchase of fodder from outside

has also reduced indicating the enhanced production of fodder and reduction of fodder waste in different VPs.

In general, there is improvement in the status of fodder availability in most of the VPs, as majority of families has harvested quality fodder from bunds and fields. Further, number of families having progenies of improved breeds has increased from 11 to 43 families. About 48 families have learned the lesson of stall feeding and its significance for betterment of livestock as well as themselves. The quality fodder with diverse varieties is visible in different VPs indicating the bright prospects in coming time. The time saved due to fodder production was only 40 hours in a year during 2005-06 which has increased up to 1540 hours in a year in 2007-08.



Similarly the results of managed way of feeding has also significantly reduced the time consumed in collection of fodder as time saved has been recorded 2500 hours in a year which was only 15 hours in a year before project intervention.



The above figures indicate significant saving in time that was gained by the women for collection of fodder. Significant variation was recorded in different VPs for production of fodder through improved perennial grasses and adoption of various techniques of management of fodder. The variation in production was affected by the climatic condition of the area, area covered under fodder grasses and maintenance of production sites through sustainable means. The impact of fodder grass promotion assisted by its management in time saving during 2007-08 is given in following table:

Sl.	VP	Time saved (hours/year)		
		Production of fodder grasses	Adoption of manger and chopped fodder	Total
1.	Guna Chautra	225	360	585
2.	Anariakot	60	240	300
3.	Bijarkhiya	85	180	265
4.	Dhaura	180	380	560
5.	Ujolla	600	440	1040
6.	Asota-Silkhora	150	520	670
7.	Adeta	240	380	620

The maximum time saved in Ujolla VP as few of the community members have tried improved variety *Pennisetum purpureum* and was well aware form its benefits. Further, favorable climate and adoption of best practices for fodder production since initiation of project was also main cause behind the results. On the other hand time saving in Anariakot and Bijarkhiya VP were lower since the involvement of community was less and those adopted came into main stream later.

Adoption of livelihood activities as an option for income generation:

It is a common feature that women are the main stakeholders of natural resources and intensively influence the status of natural resources. As mentioned earlier the activity of fuel and fodder collection is mostly carried out by the women for fulfilling the household needs thus the attitude of women is of utmost value in sustaining the natural resources. The production of improved varieties of fodder grasses have indicated significant change in daily routine works as enough time is saved due to easy availability of fodder and reduction in wastage of fodder.

Women SHGs formed in each of the VP are actively participating in the project for sustaining activities and motivating whole community. The meeting is fixed for each group on a monthly basis, and women in each group prepare its proposal under the supervision of the project functionary. The women groups are contributing an amount on monthly basis and also utilise the deposit amount in sustaining the activities. The money is provided to members as a loan, which is given back in a given time frame. The available funds are being utilised for personal use, fruit preservation activities, bee keeping, livestock improvement, etc. Collection of money and inter loaning was visible during the project implementation indicating the positive change among the women in different VPs. Further, the SHG has leaded in 04 VPs towards conservation of plantation.

The major activities undertaken by the women due to save times are given in following table:

Sl.	Activity	Women involved		
		2005-06	2006-07	2007-08
1.	Cash crop cultivation	15	69	97
2.	Trainings and capacity building	20	84	108
3.	SHG	24	63	68
4.	Vermin composting	06	38	47
5.	Pickle making	06	31	48
6.	Squash and juice making	04	25	39
7.	Bee keeping	01	05	05

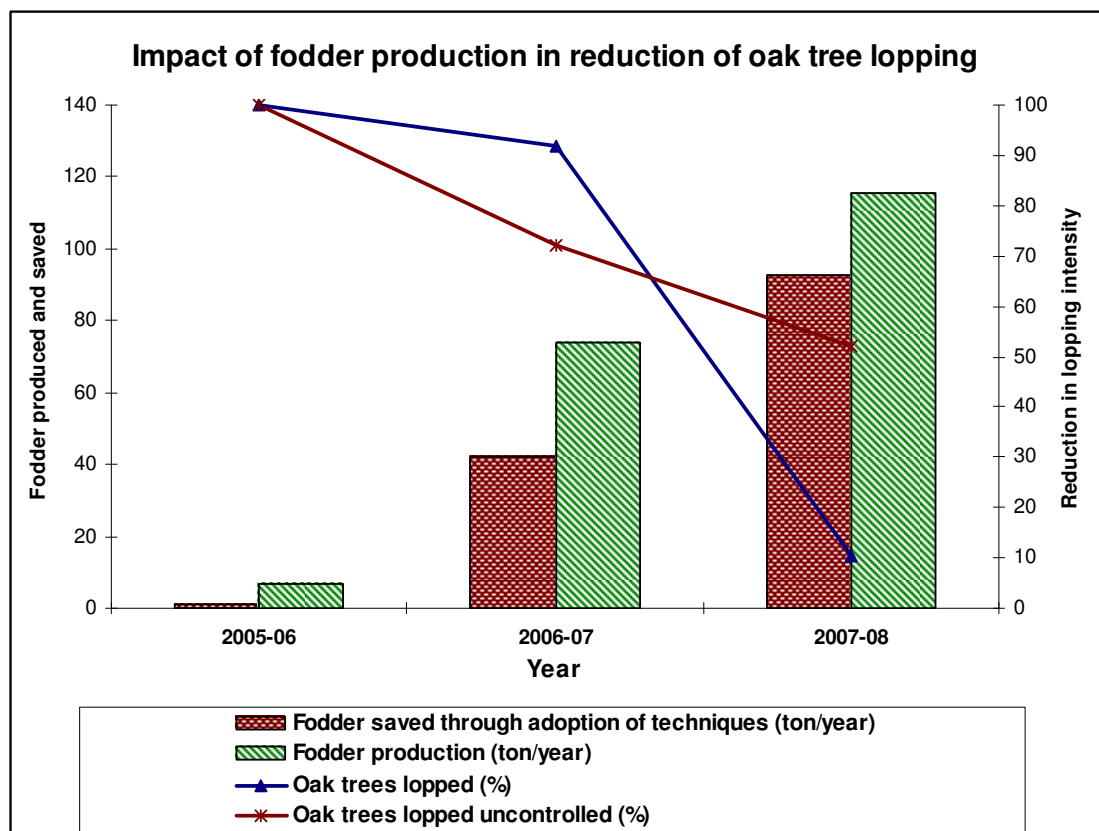
7.	Money collected by SHG (Rs.)	6500.00	35,600.00	55,100.00
8.	Loan taken by women	04	13	25
9.	Plantation and maintenance of tree species	00	45	80

Beside the impact on punishment has gradually increased and women are assisting VPs (Adeta, Guna and Asota) to control the illicit removal of available material from forest and open grazing. The families in Guna, Adeta, Asota, Bijarkhiya, Ujolla has begin to produce the squash/ juice of fruits and flower along with pickles indicating the emergence of entrepreneurs in coming time. Extraction of lichen, off season vegetables, floriculture and training on bamboo handicraft has also worked as a catalyst to motivate community for developing entrepreneurs in the area.

Control fire has been attempted by the community in Bijarkhiya, Ujolla and Dhaura and epidemic of fire is absent in all VPs. Women has also begun to take care of their children and cattle resulting in positive change in health status.

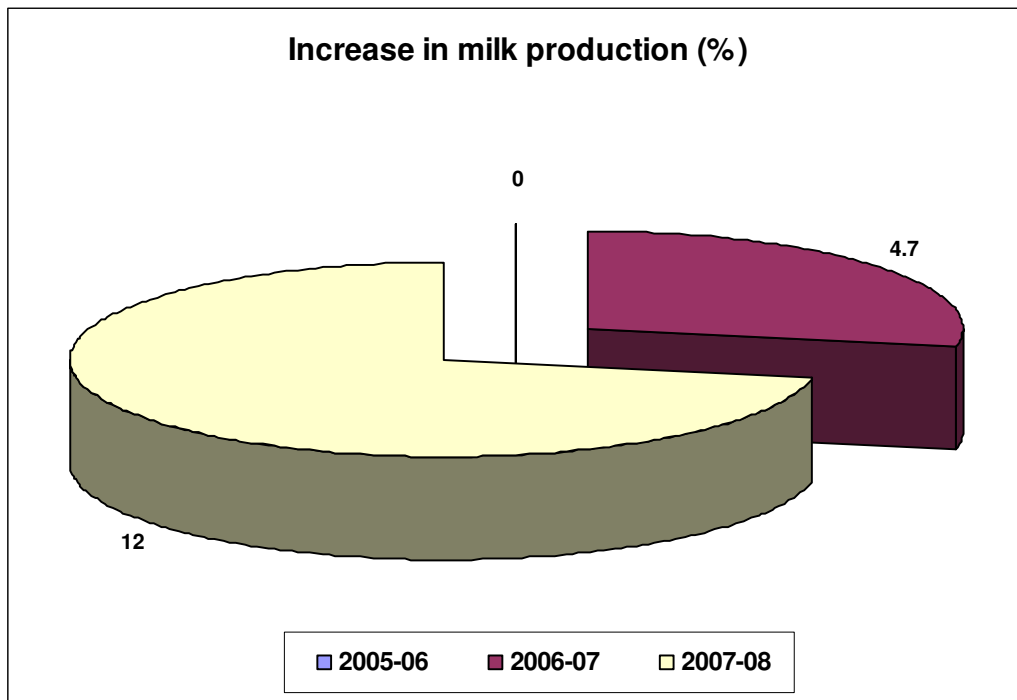
Cutback in lopping intensity and increase in milk production: It was observed that the intensity of grazing has come down along with improved status of cattle. The reduction in infection of diseases due to vaccination and treatment of cattle in appropriate time was also observed. The practice of grazing has been changed and rotational method has been adopted in 05 VPs and plantation sites are closed from open grazing till the seedlings attain proper height. The requirement of fodder has reduced and results are more prominent among families using chapped fodder along with manger. Fodder grass plantation/sowing on homesteads (kitchen gardens), wastelands and VPs was considered to evaluate the cutback of immense biotic pressure on natural resources occurred due to open grazing and status of livestock.

The increased production of improved perennial fodder grasses in the vicinity of agricultural fields and VP area has reduced the immense and uncontrolled lopping of trees especially oak for fulfilling the requirement of cattle.



The above figure illustrates positive impact of fodder production and its management techniques on reducing the lopping of oak trees. The lopping has come down by about 10% as oak provides fodder in large scale and could not be restricted if made in a sustainable manner. However, significant reduction of about 52% has been recorded in uncontrolled lopping of oak trees since last two years due to increase in awareness level on one hand and easy availability of fodder on the other.

The number of progenies for improved breeds has increased in all VPs indicating the success of project intervention in promoting the livestock improvement programme. The data revealed that average yield of milk has slightly increased due to management of livestock i.e. cultivation of improved fodder grasses, stall feeding with chapped fodder, treatment and vaccination as per requirement, etc and consumption also been slightly come down due to chapped fodder and stall feeding. The average milk yield from cattle has increased from 750 to 873 litre an increase of 123 litre from a cattle in a year as documented through selected families to time for assessing the impact of project intervention. The results are still not very significant and would be high-quality after some time.



The figure revealed increase of 12.0% in milk production from cattle. The results have disseminated the importance of chopped fodder along with mineral mixture among community by the representatives those have make an effort to adopt the technique. Similarly, to keep livestock healthy treatment of animals and vaccination has been significantly increased. The success of artificial insemination (AI) has motivated community to adopt the practices for generating maximum benefits at minimal cost.

Discussion and Suggestions:

In nutshell, the approach and methodology adopted for promoting fodder grasses and livestock management through participatory approach has resulted in up gradation of knowledge of community and their willingness to adopt the various techniques for livelihood improvement through sustaining VPs. The integrated approach for enhancing milk yield through promoting improved breeds is possible only after fulfilling the requirement of improved fodder throughout the year as been reflected from the results. The available waste and barren lands in VP and village has indicated as one of the reserve and sustainable resource for fodder production resulting in immense time saving of community on one hand and reduction in biotic interference over natural resources.

Although, the level of awareness has increased but still lot of efforts are required to bring the community in mainstream of advance approaches for livestock management. Mangers and chopped fodder need to be extended among each family for their usage in appropriate way and its popularity in near by VPs is still awaited. Use of chopped fodder along with mixture for nutrients also needs to be rectified among community. The practice of transplanting and cultivation of fodder grasses need to be

well explored among the community for its sustainability and availability for harvesting. Based on the interactions with different stakeholders, data collected and physical verifications suggestions are given as under:

1. Participatory and demand driven approaches need to be further strengthened to create ownership among maximum number of stakeholders.
2. Involvement of women for ensuring their role in preserving natural resources is a unique example and their strengthening towards retaining improved breeds rather than number of breeds for generation of income is vital.
3. Regular visits of experts at village and cluster level has resulted in enhancing the awareness level of community and their capacity to explain the issues related to management of natural resources need to be sustained.
4. The promotion of quality fodder has encouraged community to adopt the practice in large scale for reducing the pressure on forests and utilizing the waste lands through propagation of fodder grasses. The activity has to be explored at mass scale for maximum output from available resources is prerequisite. Promotion of fodder grasses in large patches should be promoted and particular species could be tried in specific area for their standardization.
5. The concept of artificial insemination (AI) has tremendously gone up and community has adopted AI for improved off springs. Awareness among community has also increased which was noticed by participation of community in vaccination and treatment camps at village level. The department also accepted that the community from project villages has shown great interest in improving the livestock. However regular technical assistance for livestock management to generating income for livelihood improvement is to be made for continuing the activities.
6. The focus on entrepreneur promotion should be made and backward-forward market linkages has to be developed for sustaining the programme and trained women in respective areas should be involved.
7. The manger and chopped cutter were utilized and their benefits in reducing the wastage of fodder and in maintaining cattle health are well accepted by selective members which, has to be further extended among masses for better outreach and developing a model cluster.

In all the results of perennial fodder grasses are prominent however the concept has to be made in wider context to provide maximum benefits to the marginalized community and enhancing the economy through usage of available resources in a sustainable manner.

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