Final Report

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Final Impact Evaluation of UDWDP

Prepared for

Watershed Management Directorate

Government of Uttarakhand

The Energy and Resources Institute

...towards global sustainable development

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TERI Project Team

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Abbreviations

AGB	Above Ground Biomass
AI	Artificial Insemination
ASEED	Asian Society For Entrepreneurship, Education & Development, New Delhi
CA	Chartered Accountant
CBED	Centre for Business and Entrepreneurial Development
CHEA	Central Himalayan Environmental Association
DLT	Drainage Line Treatment
DPD	Deputy Project Director
DSA	Divisional Support Agency
EDP	Entrepreneurial Development Programme
EPIC	Erosion Productivity Impact Calculator
ETC	Extension Training Centre
ETM	Thematic Mapper Plus
EUROSEM	European Soil Erosion Model
FGD	Focus Group Discussions
FIGs	Farmer Interest Groups
FMD	Foot and Mouth Disease
FNGO	Facilitator/Field NGO
FPO	Food Products Order
GDP	Gross Domestic Product
Gen	General
GIS	Geo Informatics System
GKVS	Gramin evam Krishi Vikas Samiti
GP	Gram Panchayat
GPWDP	Gram Panchayat Watershed Development Plan
HARC	Himalayan Action Research Centre

HYV	High Yielding Variety
IDA	International Development Association
IGA	Income Generation Activity
INHERE	Institute of Himalayan Environmental, Research and Education, Masi, Almora
IWDP	Integrated Watershed Development Programme
KVIC	Khadi Village and Industries Commission
KVK	Krishi Vigyan Kendra
MAI	Mean Annual Increment
MDT	Multi-Disciplinary Team
NBC	Natural Breeding Centre
NGO	Non-governmental Organisation
NRSC	National Remote Sensing Centre
NRSC	National Remote Sensing Centre
OBC	Other Backward Class
PAD	Project Appraisal Document
PD	Project Director
PDO	Project Development Objective
PME	Participatory Monitoring and Evaluation
PMU	Project Management Unit
PNGO	Partner NGO
PRA	Participatory Rural Appraisal
RF	Reserve Forest
RUSLE	Revised Universal Soil Loss Equation
RV	Revenue Village
SC	Scheduled Caste
SHG	Self Help Group
ST	Scheduled Tribe
SUDHA	Society for Uttarakhand Development and Himalayan Action
TERI	The Energy and Resources Institute

TM	Landsat Thematic Mapper
ToR	Terms of Reference
UDWDP	Uttarakhand Decentralized Watershed Development Project
UG	User Group
USLE	Universal Soil Loss Equation
VG	Vulnerable Group
VGF	Vulnerable Group Fund
VP	Van Panchayat
WDC	Watershed Development Committee
WEPP	Water Erosion Prediction Project
WMD	Watershed Management Directorate
WWC	Water and Watershed Committee

Executive Summary

This report presents the findings of the Final Impact Assessment of the Uttarakhand Decentralized Watershed Development Project (UDWDP), undertaken by The Energy and Resources Institute (TERI), New Delhi during 2011-12, the final year of the seven year project.

Project background

As mentioned in the Project Appraisal Document (PAD), the Project Development Objective (PDO) was to "improve the productive potential of the natural resources and increase incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable objectives". The three components of the project were Participatory Watershed Development and Management, Enhancing Livelihood Opportunities and Institutional Strengthening. The project covered 2.34 lakh hectare of 76 micro watersheds, spread over 18 remotely located Development Blocks of 11 hill districts of the state. The project was implemented over a seven year period, beginning in September 2004. A total of 468 Gram Panchayats were covered by the project.

The project was built on the experiences of earlier projects implemented in the Uttarakhand hills but with a few value additions. These include the role of the GP as the main implementing agency, the significant responsibilities given to NGOs, the adoption of a strong multidisciplinary approach and the coordination across various line departments, a special emphasis on Vulnerable Groups and a thrust on agribusiness and post-harvest techniques.

Methodology

The sample for the final impact assessment was 50 Gram Panchayats (GPs) out of a total of 468 project Gram Panchayats. These were selected out of the 100 GPs that were covered under the baseline survey. The sampled GPs for the final assessment comprised about 50% of the GPs that were selected for the midterm impact assessment. For every GP selected for the final assessment, two Revenue Villages were sampled on an average and for every RV selected, 8 households were sampled on an average with due representation to socio-economic status. Attempts were made to visit the same households that were visited in the baseline survey, as far as practicable. In addition, a control group comprising 16 GPs, 30RVs and about 300 households was also surveyed. The control GPs had similar socio-economic features as compared to the sample GPs but did not have any watershed intervention in the past 4-5 years.

The key survey instruments were a set of questionnaires at the GP, RV and household levels. These questionnaires were field tested and also vetted by the WMD. In addition, Group Discussions (GDs) were conducted in all the sampled villages to elicit qualitative information on the project impacts. Estimation of biomass increase in the treated micro watersheds was based on remote sensing techniques.

Improving the productive potential of natural of natural resources

The key results towards this objective are summarised below (sectorwise, following the structure of this report):

Agricultural and farm activities

The productivity and irrigated area under almost all key crops show an increase. The increase in area (21%) and value (27%) are significantly higher than the target values. (The increase in value captures the combined impact of the increase in area and the increase in productivity of the key crops). A general shift towards vegetable cultivation is observed across the sampled GPs. The key reasons for such increase are the increased availability of water due to soil and water conservation activities. In several sampled GPs, it was observed that farmers have earmarked a portion of their lands for vegetable cultivation.

Community fruit plantations and homestead plantations have been key interventions and fallow lands in several GPs have been gainfully utilized for this purpose. Poly houses and poly tunnels have been a major contributing factor to the growth of offseason vegetables.

Post harvest technology has been introduced in the project, but except for improved drying, the interventions have had a relatively low impact on cereal crops where it has remained mostly traditional. But wherever processing centres have been established, post harvesting operations have been successfully adopted in the grading and packing of vegetables, spices, pulses etc, grinding and packing of spices, preservation of fruit juices, and making of pickles. Commercial packing with different trade names proved to be attractive for sale of these products in local markets, fairs and even in the outside market. Agribusiness ventures have been successful in several places and there exist several innovative cases. The agribusiness activity in Garsain deserves particular mention on account of its innovative arrangement of 'reverse profit'.

Livestock and fodder

The number of livestock belonging to improved breeds shows a notable increase. Members of Vulnerable Groups have been major beneficiaries. On the whole, there have been 19% and 191% increases in the holdings of improved breed cows and buffaloes respectively in the sampled GPs. The breed improvement programme has met with a high degree of success and livestock shelters were seen to be widely adopted in the sampled GPs.

Due to the introduction of improved fodder grasses and crops on farm boundaries and uncultivated land, increased availability of agriculture waste residues and protection of common land from grazing, there has been an overall 9.6 % increase in fodder availability over the baseline.

The average fodder production ranged between 0.5 -5.67 q/ha/year across different land uses. The highest percentage change (24.18%) in availability of fodder was recorded for irrigated agriculture land suggesting that farmers in the project area have been motivated to grow fodder crops / trees on the bunds / risers of their agriculture resulting in increase in fodder availability. The percentage change in household dependency for fodder and grasses from private agricultural/barren land/other land is the highest (13%), while dependency on fodder from forests and feed purchased from market have declined by 8% and 5% respectively. The average time taken for fetching fodder has reduced. On an average, there has been an 11% reduction in time spent on collecting fodder by a household.

Forestry and biomass

It was observed (based on remote sensing techniques) that the biomass of the treated areas has increased by 9.37% from 2004-05 to 2011-12 (across treated micro watersheds). This biomass increase excludes the areas under Reserve Forest, agriculture and habitation. The areas, which have been covered are van panchayat forests, civil and soyam forests and

barren/ fallow lands. These changes were on account of increase in vegetation cover due to new plantations under the project and natural regeneration of grasses, shrubs and tree seedlings because of the protection against grazing and over usage. The average survival percentage within the surveyed sites was around 45% in a range of 23% to 85%.

The treated plantation sites have higher values of diversity and species richness as compared to the control sites. The shrubs have higher diversity values and species richness as compared to the tree and herb species. Increase in the species richness and diversity index were largely due to effective dry stone fencing and watch and ward in plantation sites.

Soil and water conservation

The impact of soil and water conservation measures is seen in terms of increased amount of irrigated land (increase of 24.7%), an increase in crop yields and an increase in access to domestic water. The time spent in collecting water has significantly reduced with a sharp increase (48%) in the number of households taking < 1 hour to collect water and a similar decrease (39%) in the number of households taking between 1-2 hours. In terms of efficacy of impacts, it is seen that turbidity levels during monsoon months have reduced significantly in the case of successful catchment treatments.

Increase in incomes of rural inhabitants

The total increase in income across all categories is 57%, but increase in farm income is overall higher (61.1%) than non-farm incomes (56.6%). Interestingly, amongst all social groups, the highest increase in total income has occurred amongst OBC and vulnerable groups followed by SC/STs. The highest increases in non-farm incomes have occurred amongst OBCs and SC/STs. The total increase in income of 57% translates to a real income increase of 17% when adjusted for inflation using the Consumer Price Index (CPI) for rural labourers, using agricultural year average values, and accounting for the impact of non-project interventions. There is almost a doubling in the ownership of consumer durables, indicating a general increase in living standards.

The economic analysis of the project includes benefits from agriculture, livestock, horticulture, forestry, soil conservation, domestic water and employment. Following the approach used in the PAD, aggregate level economic analysis has been done. The Benefit Cost Ratio (r=8%, t=10 years) works out to 2.63 including the employment benefits. The Economic Rate of Return is estimated at 18.5%. Economic analysis has also been done for selected interventions as well as for selected IGAs. Irrigation channels and irrigation tanks return BCR values of 1.36 and 1.54 respectively over a 10 year horizon, indicating their economic viability even in the medium run. Almost all IGAs return favorable BCR values with traditional/caste based IGAs such as carpentry and blacksmith returning the highest values, indicating that project support to buttress existing skills provide quicker returns.

Socially inclusive, institutionally and environmentally sustainable objectives

The project has laid great emphasis on adopting an inclusive and participatory approach that entails community involvement at all stages, that is, starting from project planning up to implementation. It has adopted a decentralized institutional setup with the Gram Panchayat as the main planning and implementing agency. Such an approach has helped to enhance levels of participation at various levels. Participation in Gram Sabha and Gram Panchayat

meetings show a sharp increase. For example, the attendance percentage in Gram Sabha meetings has doubled and the attendance percentage of women in Gram Sabha meetings has increased fivefold. The average number of GP meetings has increased from 5.28 in a year to 11.14 in a year.

The assessment also points towards a high degree of transparency in various project processes. An average of 78.96% of total households in a Gram Panchayat have been involved in the preparation of GPWDP. An average of 48.7% of the community members were aware of GP budget and expenditure and 91% of households were aware of project objectives, activities and methodologies.

Formation and successful functioning of a large number of SHGs under the project with a majority of women members is an indication of awareness generation among the women. The Income Generating Activities for Vulnerable Groups have led to significant livelihood enhancement for weaker sections and led to high economic returns in the short run. The emphasis placed on activities for non-landed households in parallel with land-based interventions have had an equity-enhancing impact.

The credit for strong involvement of women and weaker sections of society in the project activities goes in large measure to the FNGOs. The involvement of PNGOs in two Divisions could be seen as an important innovation and a progressive feature of the project. This experiment of handing over the roles and responsibilities of the government machinery to civil society organisations in a multi-disciplinary project of this scale has been quite successful and it has been observed that while the teams fielded by the PNGOs had relatively fewer years of experience, their levels of motivation and openness to new ideas were high.

Farmers' Interest Groups (FIGs) have been formed at the Revenue Village (RV) level in project villages that include all those farmers who are adopting new technologies and improved seeds from the project to increase their production. Though the initial response to the process of FIG formation was low, as the produce of off-season vegetables and cash crops increased and farmers started selling the surplus, the response picked up and helped establish the necessary market linkages. For the purpose of post-project maintenance of structures created under the project, 1943 user groups (UGs) have been formed. The collection of a small monthly sum from the members for the maintenance of the structures would not only help in sustainable operations of the structures in a physical sense, but also would help foster group cohesion. Since most of these structures benefit a well-defined group of individuals, the interest in maintaining them was found to be very high.

The level of transparency in the project has been quite high largely on account of different levels of auditing (CA, internal and AG) and regular Participatory Monitoring and Evaluation (PME),

Most of the interventions undertaken under the agriculture and horticulture component have strong potential of sustainability. For instance, minikits have been effectively utilized by almost all the farmers and wherever the productivity has substantially increased, the farmers have retained the seeds to be used for the next agriculture season. The soil conservation structures that withstood the heavy rainfall in 2010 and 2011 have served their purpose to a large extent, and the formation of UGs for maintenance of these structures is a step towards ensuring post-project sustainability. In case of plantations, most of the activities have been taken up in van panchayat areas, managed by van panchayat committees with strict codes of conduct and usufruct sharing. It could be expected that these institutions would ensure adequate upkeep of the plantations.

In a word, while the project has performed well in terms of achieving enhanced potential of natural resources and enhanced incomes, the standout feature would be its effective social mobilization strategy, leading to broad-based participation in various project processes, and significantly, the inclusion of Vulnerable Groups.

Results Framework

PDO	Outcome indicators
To improve the productive potential of natural resources and increase income of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches.	• 10% increase in household net income (in real terms) in targeted villages. (Rs/HH) (Achievement: 17%) • 10% increase in vegetation increase in vegetation and biomass index of treated watersheds (Achievement: 9.37%) • 10% increase in percentage of households accessing water for domestic use. (Achievement: 12% increase in households accessing tap water, attributable to RWH structures) • 15% increase in irrigated area in treated areas. (Ha) (Achievement: 24.7%) • 20% improvement in administrative capacity of GPs as measured by performance indicators. a. Overall attendance in Gram Sabha meetings increased by 102.5% b. Attendance of women in Gram Sabha meetings increased by 482.33% c. Attendance of VG members in Gram Sabha meetings increased by 200.56% d. Number of Gram Panchayat meetings increased by 110.98% e. Attendance in Gram Panchayat meetings increased by 52.05%
Intermediate Results One per Component	**Results Indicators for Each Component**
Component One: a) Communities are mobilized and prioritize their own mix of watershed and village development technologies by actively involving all households b) GPs directly implement the mix of watershed treatments and village development investment using appropriate User Groups / sub – committees at revenue village levels (if necessary)	**Component One:** • 80% of households are included in preparation of GPWDP (Achievement: 78.96%) • 60% of financial allocation in GPWDP to address soil conservation measures, water resource management, forest fuelwood and fodder management indentified during PRA exercise (Achievement: 65.43%) • More than 50% of GPs have treated 80% of area proposed for treatment in the approved GPWDPs (Achievement: 52%)

PDO	Outcome indicators
Component Two: a) New high value crops, horticulture and livestock technologies have been adopted by farmers and/or herders.	**Component Two:** • 10% increase in area over baseline of improved varieties, high value crops (Ha) (Achievement: 21%) • 10% increase in fodder production over baseline (Achievement: 9.6%) • 1% increase over baseline in number of improved breed (No. Cows in sample households) (Achievement: 19% (cow), 191% (buffalo)) • 15% in net value of produce realized by farmers in treated area (Achievement: 27%)
b) Appropriate technologies for grading, storage and processing, and market linkages have been adopted by farmers to increase the value of their produce. c) Vulnerable groups (including women and landless) establish income generating activities through VGs o SHGs	• 30% increase in number of functioning SHG (Achievement: >30%) • Number of Income Generating Activities funded under the project (Achievement: 4060) • 15% increase in average net income generated by Income Generating Activities for Vulnerable Groups Households (Rs/HH) (Achievement: 29.6% in real terms) • 50% of IGAs still active after two years from the start of activity (Achievement: 90%)
Component Three: a) GPs and other relevant local institutions have developed sufficient capacity to design, prioritize, implement watershed treatment and operate and maintain assets created b) All stakeholders are informed and educated about key design and participation features of the project using targeted messages evolved through a comprehensive communication strategy.	**Component Three:** • At least 50% attendance in statutory Gram Sabha meetings (% of households) (Achievement: 46.8 %) • 50% of GP constituents aware of annual budget and expenditures (Achievement: 48.7%) • 80% of GPs targeted under project having satisfactory annual audit report (Achievement: 100%) • 50% of target households aware of project objectives, activities and methodologies (Achievement: 91%)
c) Effective and efficient project coordination, management, monitoring and evaluation system are established and operational	• PME regularly (at least 3 times) carried out in 400 GPs and reports received by WMD (Achievement: PME carried out regularly (at least thrice) in all sampled GPs) • 90% staff deployment as per agreed schedule (Achievement: 100%)

1. Project background

Introduction

The Government of Uttarakhand through the Watershed Management Directorate (WMD) received a credit from International Development Association (IDA) for implementation of Uttarakhand Decentralized Watershed Development Project (UDWDP). The project development objective (PDO) was "*to improve the productive potential of natural resources and increase incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches*".

The project had three main components that encompass eight sub components:

a) Participatory Watershed Development and Management
   - Promotion of social mobilization and community driven decision making
   - Watershed treatments and village development

b) Enhancing Livelihood Opportunities
   - Farming systems improvement
   - Value addition and marketing support
   - Income generating activities for vulnerable groups

c) Institutional Strengthening
   - Capacity building of all tiers of PRIs and local community institutions
   - Information, Education and Communication
   - Project coordination, monitoring and management

Project area, project period, implementing agency

The project was operational within the state of Uttarakhand. The project covered about 2.34 lakh hectares of 76 micro-watersheds identified for treatment, which were spread across 11 districts and 18 Development Blocks. The project focussed on the areas lying between 700 m and 2000 m above sea level within the state of Uttarakhand that were degraded, poverty ridden with poor connectivity and infrastructure. An estimated 2,58,000 population within the project area were likely to be benefited from the project outcomes.

The project became operational in September 2004. The project was implemented over a period of seven years (Sept.2004 to Sept.2011). The project period in each GP was 5 years. The first year was the preparatory phase, the next 3 years, the implementation phase and the last year was the withdrawal phase.

The project was implemented in phases across the GPs. In the year 2004-05, project activities commenced in 43 GPs. In 2005-06, project activities were initiated in 208 GPs. In 2006-07, project activities were undertaken in 126 GPs and in 2007-08 project activities were undertaken in 89 GPs. In remaining 2 GPs project activities were under taken 2008-09. Thus, in all 468 GPs were involved.

A decentralized institutional setup using Gram Panchayat as the planning, implementation and monitoring agency was used.

Key features of the project

UDWDP was built on the experiences of earlier projects implemented in Uttarakhand hills. Some of the key value additions of UDWDP were coordination among different line departments, role of the GP as the main implementing agency, important role of NGOs in project planning and implementation, financial autonomy to local communities and the special emphasis on the involvement of marginalized sections of the community, specially through activities targeted at the Vulnerable Groups (VGs). Some of the important features are discussed below:

GP's role

Gram Panchayat has been envisaged as the main implementing agency of the project. This institutional arrangement has several positives. Firstly, it prevents creating conflicting power centres. Unlike many other watershed projects where a separate Watershed Development Committee (WDC) is constituted, in UDWDP, Water and Watershed Committee (WWC) of the GP acts as the main implementing agency. It creates organic linkages of the project with the GP and avoids any possible conflict between the two institutions.

Secondly, UDWDP not only views GP as the implementing agency for the project but it also moved towards strengthening the local government by building its capacity. One of the expected project outcomes is the increased administrative capacity of GP by at least 20%. The project has led to building the capacity of GPs through regular trainings and skill building programmes on financial management, record keeping, livestock management, and other activities. As a result, the GP has become more effective as an administrative unit, thus improving the governance at local level in more general terms.

Finally, the adoption of GPs as implementing agencies could ensure the continuity and sustainability of project interventions. Once the project is over, maintenance and management of assets would be supervised by the GP.

NGO role

NGOs have been given significant responsibilities for planning and implementation of project activities. A Field NGO (FNGO) was selected for each district to facilitate the participation of village communities in the project. Responsibilities of a FNGO included facilitating PRAs for the preparation of GPWDP, ensuring participation of weaker sections and marginalized communities and assisting WMD in implementation of the project. A Partner NGO (PNGO) was given responsibility to implement the project independently in one district each of Kumaon and Garhwal. They have been given full operational and financial responsibilities for successful implementation of the project. Their responsibilities included mobilisation of village communities, facilitation of PRAs at village and GP levels, preparation of GPWDPs and implementation of the project activities. So, in these two districts, PNGOs had roles and responsibilities just like government run project offices in other districts.

Involvement of NGOs to this level in project level is a progressive feature of UDWDP. It also provides a means of comparison between government and NGO implementation and learnings for future activities.

Nature of integration

Watershed implementation requires a multidisciplinary approach and coordination among various line departments like Forest, Agriculture, Animal Husbandry etc for specialised inputs and synergistic efforts. However, watershed programmes not only in Uttarakhand hills but across the country have been sometimes lacking on this front. Often, a watershed programme is implemented by one line department like Soil and Water Conservation, without adequate synergy or specialised inputs from other departments. Uttarakhand is a unique state where expertise from different line departments has been pooled and a watershed project has been implemented through the Watershed Management Directorate (WMD) under a unified command. WMD was responsible for the overall operation of UDWDP. As a result there were experts from various sectors such as agriculture, forestry, horticulture, geographical information systems, and soil and water conservation working at various levels. This approach assured the inflow of multidisciplinary inputs to the project.

Social and institutional aspects

A decentralized institutional setup using Gram Panchayat as the main planning and implementing agency was a key feature of the Project. The village community was involved from planning to implementation, handling of funds and procurement to maintenance of assets.

The Project placed special emphasis on Vulnerable Groups. Women's participation in project interventions was sought to be enhanced by way of ensuring upto 50% representation of women in village level committees and inclusion of their concerns, needs and issues emerging in Women Aam Sabhas into the Gram Panchayat Watershed Development Plans. The broader purpose of the Women Aam Sabha was to review those activities that target women beneficiaries.

Participatory Monitoring and Evaluation (PME)

Participatory Monitoring & Evaluation (PME) is the process of social audit, which involves project beneficiaries and other stake holders in the monitoring and evaluation of the project. The process aimed to assess whether the planned interventions are being executed as per the intended objectives. The PME indicators were finalized after a series of consultative village level workshops. These were used for assessment by the community on the level of awareness about the project, participation, inclusiveness and equity, transparency, creation of assets and financial management.

Agri business and post-harvest techniques

Under this sub-component, the main thrust was given to (i) dissemination of technologies and provision of advisory services; (ii) production and distribution of quality seeds and seedlings; and (iii) establishment of linkages between Farmer Interest Groups (FIGs) and suppliers for processing and marketing of off-season vegetables and high value crops. Formation of Farmer Interest Groups (FIGs) was meant to facilitate the production, processing and marketing of high value crops.

To improve private sector involvement and public/private partnerships in agribusiness development, initiatives for consultancies and studies were: (i) identifying potential niche market opportunities; (ii) establishing links with private sector entrepreneurs who could help in exploiting the market potential; (iii) disseminating appropriate information and

technology to farmers to help them to enter into production; (iv) co-financing with farmers (on a one-time subsidy basis) for establishment costs; (v) co-financing with private sector entrepreneurs (on a one-time subsidy basis) for storage, processing and marketing infrastructure needed to exploit the market potential.

Six specialized agencies (Divisional Support Agencies for Agribusiness) were hired under the Project to provide support for value addition, marketing and to develop forward and backward linkages, in addition to two Partner NGOs who are working in the Project area.

Final impact evaluation

The final impact evaluation has been undertaken in the seventh year of the project. The objective of the present consultancy is to determine whether the project objectives set in terms of expected outcomes and outputs have been met, using various criteria and indicators as defined in the Project Appraisal Document (PAD). The assignment entailed the measurement of changes in socio-economic and environmental parameters while assessing physical and financial achievements. The Results Framework as in the PAD (and modified post-MTR) was used as the guiding document for measuring outcomes for each of the components.

2. Methodology

The study involved developing a evaluation framework based on verifiable indicators, conducting of a baseline survey, and conducting the Final Impact Assessment to determine whether the project objectives, set in terms of expected results as defined in the Project Appraisal Document have been achieved. In the interim (November 2008), a mid term impact assessment report was prepared by TERI that tracked the project progress at the midterm stage.

The final impact evaluation was undertaken in the seventh (final) year of the project. The objective of the present consultancy is to determine whether the project objectives, set in terms of expected outcomes and outputs are met, using various criteria and indicators as defined in the Project Appraisal Document (PAD). The assignment entails the measurement of changes in socio-economic and environmental parameters while assessing physical and financial achievements.

Sampling

For the baseline survey undertaken by TERI, 100 GPs were selected out of the total set of project GPs, as per the ToR for the assignment. Since implementation of the project was planned in phases, the sample selected provided due representation to GPs belonging to each implementation year. The GPs where implementation started early were given progressively higher weights – on the assumption that impacts were proportional to the time elapsed between year of implementation year (start year) and the year of impact evaluation. This was meant to ensure that the mid-term impact assessment adequately captured project impacts for early phase GPs (since a proportionately higher number of these GPs were included in the sample for baseline survey). Among the GPs allocated to each implementation year, sampling was done using topography as a stratification variable (ridge/middle/valley).

For the midterm impact assessment undertaken by TERI, 40 GPs were selected from among GPs with implementation years 2004-05 and 2005-06. Since the assessment was done in 2008, GPs where implementation was taken up in later years were not included in the sample.

15 GPs were selected as control (from non-project micro-watersheds) for the baseline survey and midterm impact assessment. In the control GPs, no interventions under UDWDP or any other watershed programme have been carried out. While selecting control GPs, care was taken to ensure that overall socio-economic characteristics were similar to the selected project GPs as far as practicable. The same control group has been used for the final assessment.

The final impact evaluation has been carried out in 50 GPs among the 100 sampled GPs in the baseline survey. The list of GPs selected for the final impact assessment is provided in Table 1 below. Of the 50 selected GPs, the mid term assessment has been carried out in 23 GPs (about 50% of the total). This list has been finalized in consultation with the Watershed Management Directorate. A map locating the sampled GPs has been placed as at Annexure 5 to this report. List of control GPs is placed at Annexure 3.

Table 2.1 List of GPs selected for Final Impact Assessment

Sl. No.	Name of GP	Micro Watershed	Division	No. of RVs	Year of initiation of Project activities	Whether included in MTR
1	Kamla	Saronka Khala	Vikasnagar	3	2004-05	Yes
2	Thaina	Saronka Khala	Vikasnagar	2	2004-05	Yes
3	Jaidwar	Jaidwar	Vikasnagar	3	2004-05	Yes
4	Marod	Jaidwar	Vikasnagar	2	2004-05	Yes
5	Khatar	Sunindagad	Vikasnagar	3	2004-05	Yes
6	Koti	Dhawalgad	Vikasnagar	2	2005-06	No
7	Khaiskande	Saulagad	Champawat	2	2004-05	Yes
8	Pau	Saulagad	Champawat	1	2004-05	Yes
9	Kolidhek	Saulagad	Champawat	1	2004-05	Yes
10	Forti	Saulagad	Champawat	3	2004-05	Yes
11	Nashkhola	Lohaghat	Champawat	3	2004-05	Yes
12	Gurmangal	Lohaghat	Champawat	3	2004-05	No
13	Khaikot malla	Piligad	Champawat	2	2005-06	Yes
14	Balso	Amergad	Champawat	3	2005-06	Yes
15	Chami	Chariyagad	Champawat	1	2005-06	No
16	Rikangaon	Daski gad	Chinyalisaur	4	2005-06	Yes
17	Andhiyari	Kayari	Chinyalisaur	1	2005-06	Yes
18	Kandargaon	Gairgad	Chinyalisaur	2	2006-07	No
19	Kyarda	Gairgad	Chinyalisaur	2	2005-06	Yes
20	Kavangarhi	Dhanarigad	Chinyalisaur	1	2005-06	No
21	Kyunja	Kyunja gaad	Augustmuni	1	2005-06	Yes
22	Gimtoli	Surgad	Augustmuni	2	2005-06	Yes
23	Rumsi	Banyari gaad	Augustmuni	2	2005-06	Yes
24	Jagot	Banyari gaad	Augustmuni	2	2005-06	No
25	Bijrakot	Pogta gad	Augustmuni	4	2005-06	No
26	Kothgi	Chinka gad	Augustmuni	2	2006-07	No
27	Gairkhet	Jargad	Bageshwar	2	2005-06	Yes

Sl. No.	Name of GP	Micro Watershed	Division	No. of RVs	Year of initiation of Project activities	Whether included in MTR
28	Fhalyati	Gomti Nadi	Bageshwar	1	2005-06	Yes
29	Haweel kulwan	Gomti Nadi	Bageshwar	1	2005-06	No
30	Purkot	Tatani	Bageshwar	1	2005-06	No
31	Silalekh	Dolgad	Nainital	1	2005-06	Yes
32	Dini Talli	Dolgad	Nainital	1	2005-06	No
33	Nai	Dolgad	Nainital	1	2006-07	No
34	Simla Kanya	Dolgad	Nainital	3	2005-06	Yes
35	Hedakhan	Pasiyagad	Nainital	1	2005-06	Yes
36	Jajoli	Nargalnala	Pithoragarh	4	2006-07	No
37	Banela	Chhanigad	Pithoragarh	2	2006-07	No
38	Daselakhet	Ganai gedhra	Pithoragarh	2	2006-07	No
39	Pipli Nigalti	Lingagad	Pithoragarh	3	2007-08	No
40	Pan	Kuthlar gad	Dwarahat	2	2006-07	No
41	Naugaon Akheria	Kuthlar gad	Dwarahat	1	2006-07	No
42	Gadsiyari	Kuthlar gad	Dwarahat	3	2007-08	No
43	Bhent	Dusadgadhera	Dwarahat	1	2007-08	No
44	Vijaypur	Kuthlar gad	Dwarahat	1	2007-08	No
45	Ghindelu	Kaindul	Kotdwar	2	2007-08	No
46	Kharkoli	Bisgadi Khal	Kotdwar	1	2007-08	No
47	Nagdhar	Dudharkhal	Kotdwar	2	2007-08	No
48	Dungri	Dhurgaid	Gairisan	2	2007-08	No
49	Gaid	Mathugad	Gairisan	3	2007-08	No
50	Dhargad	Mathugad	Gairisan	2	2007-08	No

For each selected GP (both project and control), 1 to 4 Revenue Villages (RVs) are sampled – with a total sample of 100 RVs (2 RVs per GP on an average). Within each RV, at least 8 households were selected with proportional representation to each socio-economic group to

obtain a sample of 800 households. (A similar approach was used for selecting 10 sample households per RV in the baseline and midterm assessment). As far as practicable, efforts were taken to re-visit the same households (at least 8 of the 10) that were interviewed in the baseline survey. The control group consisted of 16 GPs, 30 RVs and 300 households with socio-economic features similar to the treatment group but without any watershed intervention in the recent past (about four years).

Instruments used

The basic survey tool is a set of structured questionnaires at four levels – Microwatershed, GP, RV and household. The questionnaires developed and used for the baseline and the midterm impact assessment have been used for the final assessment with necessary modifications. In addition to the questionnaire survey, Group Discussions are conducted. The survey is conducted by a group of trained enumerators and supervised by professionals from TERI. A training programme spread over 2-3 days has been conducted for the enumerators and the training manual developed for the baseline survey is suitably updated.

In addition, remote sensing and GIS techniques have been used to assess changes in micro watershed characteristics. This was coupled with ground trothing in accordance with standard methodology.

Household, RV and GP formats

For the final impact evaluation, the set of questionnaires used for the baseline survey and mid-term impact assessment have been used. In addition, a set of supplementary questionnaires have been developed at the GP, RV and household levels to address the additional components of the evaluation. The formats for eliciting information through Focus Group Discussions (FGDs) have also been modified to address the additional information needs. (See Annexure 2)

Economic analysis

The economic analysis is based on data sourced from household questionnaires and appropriate secondary data (input costs, rotation periods of species, wage rates etc). The approach is detailed in the relevant section of the report.

GIS/RS

In the present study, PAN sharpened IRS 1C and IRS 1D with Cartosat is being used. The data was procured by WMD from National Remote Sensing Centre (NRSC) and forwarded to TERI for further analysis. A few vector layers such as micro-watershed boundary were also provided by WMD to facilitate the study.

Vegetation data formats

During the field survey, several sample plots were laid for assessing vegetation cover and biomass. These plots were further used to validate the classified image as a means of ground-truthing. Along with image classification, vegetation indices were calculated for both time periods. Later these vegetation indices were used to calculated biomass for the entire study area.

Process adopted

Pilot survey and training

The survey team that had participated in the baseline and mid-term survey was re-mobilised for the final impact evaluation. The team was split into two groups – one covering the Garhwal region and the other covering the Kumaon region. About 30 field enumerators were enlisted to conduct the survey, led by two supervisors (Mr Kailash Khanduri for the Garhwal region and Mr Naveen Murari for the Kumaon) Both the supervisors had supervised the previous surveys under the project and are experienced in assignments of this nature.

A four day training programme was organized for the survey team at Wildlife Institute of India, Dehradun during 29.05.2011 to 01.06.2011. The training programme was conducted by key professionals of the TERI team. Mr Naresh Kumar, Joint Director, WMD also participated in the programme and gave an overview of the project being evaluated. During the training programme, broad field techniques were explained, and the various survey questionnaires were discussed in great detail. Hands-on training was provided on the use of GPS instruments, and 4 GPS instruments were handed over to the survey team. The training had the advantage of having both supervisors of and some of the enumerators involved in the previous survey.

Two days of classroom sessions were followed by a field visit (Thaina GP) where hands-on training in implementing the survey was provided. A group discussion was conducted in the village to get a broad understanding of the nature of perceptions that could be elicited through the survey process. This process also served as a means for field-testing and validation of the questionnaires.

Following the field visit and based on discussion with survey supervisors and enumerators, the formats were refined and modified. A comprehensive training manual was prepared, including all questionnaires and relevant details of the project and handed over to each member of the survey team ahead of the survey.

Field surveys and Group Discussion

The modified questionnaires were sent to the WMD for comments and after clearance from the WMD, these were finalised and the survey was initiated. The survey programme was developed by the TERI PMU at Dehradun and communicated to the supervisors and the New Delhi based TERI research team. On an average, two to three days were spent in each GP by the survey team. The survey was supervised by one or two members of the TERI team to ensure accuracy and consistency.

In several GPs, a specialized team comprising two to three members of the TERI team also conducted FGDs and collected information including data on the benefits and costs of project interventions. They also visited locations in the GP to see the various interventions that had been carried out.

FGDs were used to elicit qualitative data that would supplement the information captured through the survey questionnaires. In addition, information obtained through FGDs was (a) used for triangulation - to cross check the data collected from the primary survey (b)to have a first-hand understanding of the impacts of project (c) to cover the information gaps, and (d) to capture qualitative changes (the why and how of the interventions). FGDs were

administered at the G P level, with at least 15 participants and in most cases 25 to 30 participants. Participants included a cross-section of small, marginal and large farmers, women and direct beneficiaries of the project, members from SHGs, UGs, VGs, FIGs, individual and group members of income generation activities and agribusiness representatives. The participation of Gram Pradhan, elected Gram Panchayat members, village motivator, account assistant, facilitators and WMD field staff was ensured, as far as practicable. Care was taken to provide advance information about the scheduled meeting to ensure good representation. The professionals conducting the discussion reviewed the survey data for the respective GP before initiating the discussion so that the discussion could serve as a way of validating the survey data.

Analysis plan

The broad data analysis plan was developed, closely following the plan that was used for the mid-term assessment.

The data analysis plan comprised of statistical analysis of the quantitative data (as obtained from the questionnaire survey) and a descriptive reporting of the field perceptions elicited through the FGDs /individual interviews and observations of the research team. These have been organized sector-wise, following the pattern followed in the midterm report.

For quantitative data pre and post project data has been compared and reported in terms of percentage increases. Where percentage increases are very large, especially in cases where the base values are low, the changes are reported in terms of the increase factor purely for expositional convenience. For example, the percentage of households adopting improved seeds goes up from 5.4% to 57.2% during the project period, implying an increase of about 950%. For the sake of convenience, we instead report this as an increase factor of 9.5. The qualitative data sourced through FGDs have been analysed GP wise and wherever relevant they have been mentioned to support or supplement quantitative data.

Economic analysis of the project is presented in a separate section. This includes contains computations of benefits for key sectors. The estimation of biomass using remote sensing techniques is also presented separately. The economic analysis is presented at the Project/Division level and the biomass estimation at the MSW level. All other data relates to the sample of 50 GPs with changes reported in percentage or as an increase factor without any extrapolation in absolute terms to the project level.

3. Demography, incomes, land use and coverage

Demography

The 2011 India census puts the population of Uttarakhand at 1,01,16752, accounting for 0.84% of the country's population. Given that much of the state is hilly and mountainous, Uttarakhand is sparsely populated relative to the rest of the country. The population density of the State as per the recent 2011 census is 189 persons per sq. km, half of the national average of 382. Uttarakhand's sex ratio of 963 females per 1000 males is far better than the national average of 940 females. Both men and women also have literacy levels that are far higher than the national average. As many as 88.33% of men and 70.7% of women are literate as compared with 82.14% of men and 65.46% of women at the national level.

In this chapter, we provide information on the demography of sampled households as well as the impact of the UDWDP project on changes in incomes and assets as well as land use.

The demographic profile of the project and control GPs (details in Annexure 3) have not changed since the baseline survey. The profile of the households selected for intensive study are similar to the project GPs, suggesting that our samples are representative of the demography of the GPs. For example, the study Gram Panchayats have 72% of the households belonging to the general caste category, 20% belonging to the scheduled caste category, followed by scheduled tribes (6%) and 2% belonging to the other backward castes. This is similar to the composition of the sampled households (Fig. 3.1), although the number of households belonging to the general category is 10% lower than the sampled GPs. A majority of sampled households belong to the general caste category (64%) followed by scheduled caste (25%), scheduled tribe (7%) and the other backward castes (4%). The composition of the sampled households is very similar to the control group (Fig. 3.2).

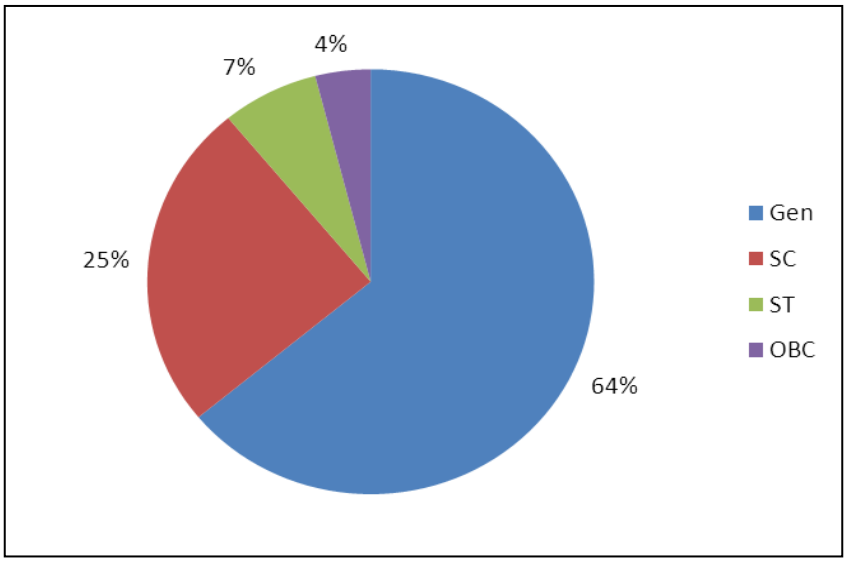


Figure 3.1 Caste composition of the sampled households

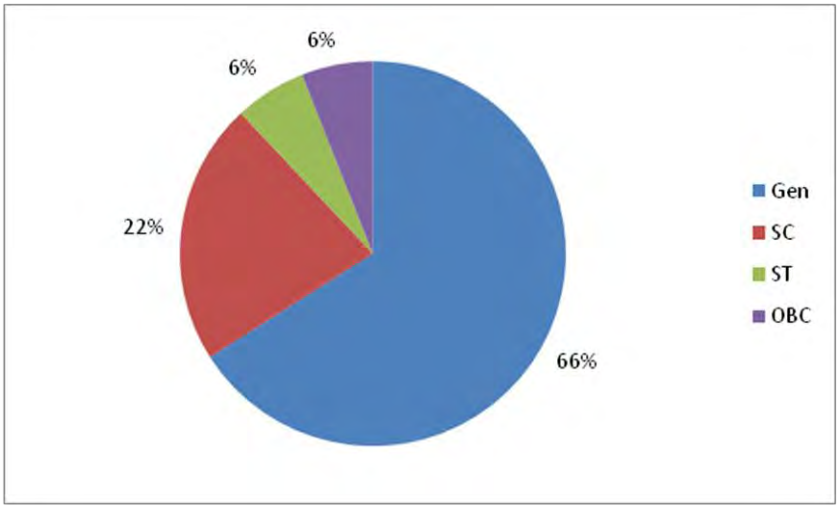


Figure 3.2 Caste composition of the control GPs

Slightly more than 50% of the sampled households belong to the vulnerable group.

In terms of landholding, there has been little change since the last assessment As before, the largest group of sampled households (30%) possess less than 0.2 ha of land whereas the percentage of landless households is the least (2%) (Fig. 3.3). For the control GPs, the largest group of sampled households (36%) also held less than 0.2 ha of land (Fig. 3.4).

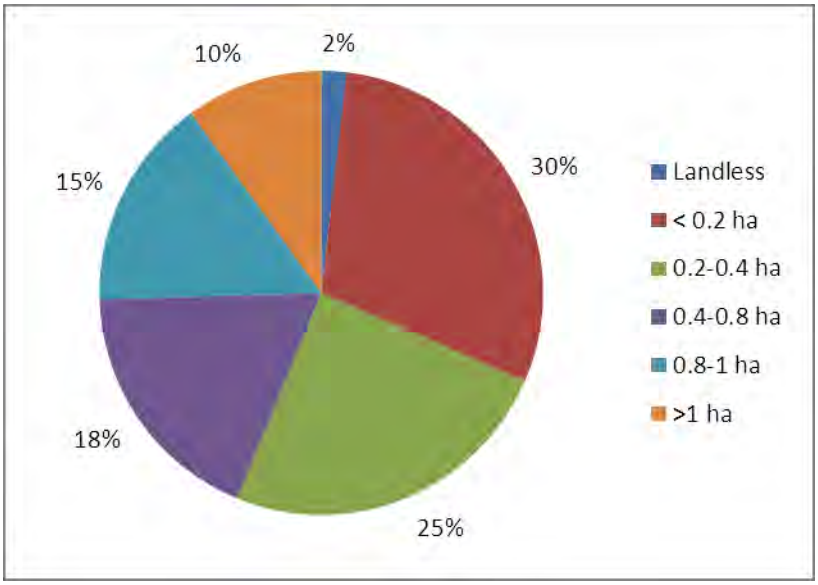


Figure 3.3 Distribution of households by landholding in the sampled project GPs.

(Data was originally reported in nali; 50 nali = I ha).

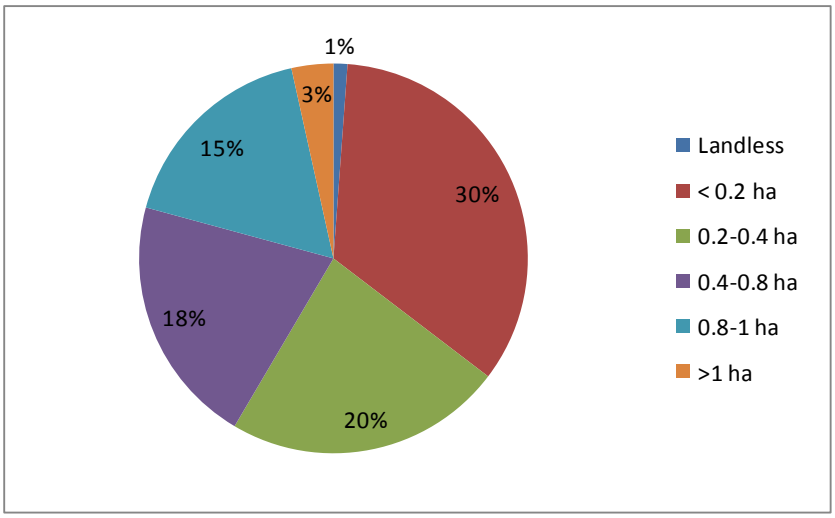


Figure 3.4 Distribution of households by landholding in the sampled control GPs

Occupational structure

The composition of sampled households in terms of key primary occupations is shown in figure 3.5.

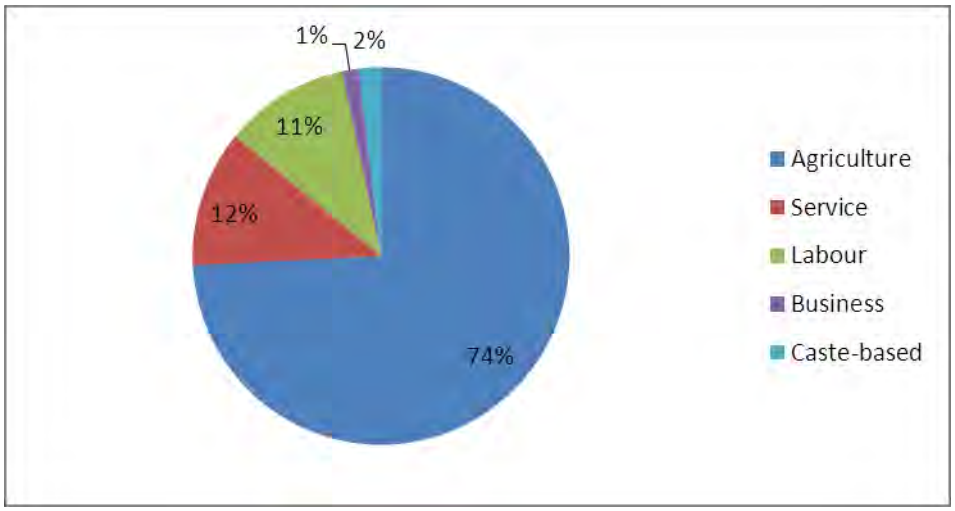


Figure 3.5 Occupational structure of households in sampled project RVs

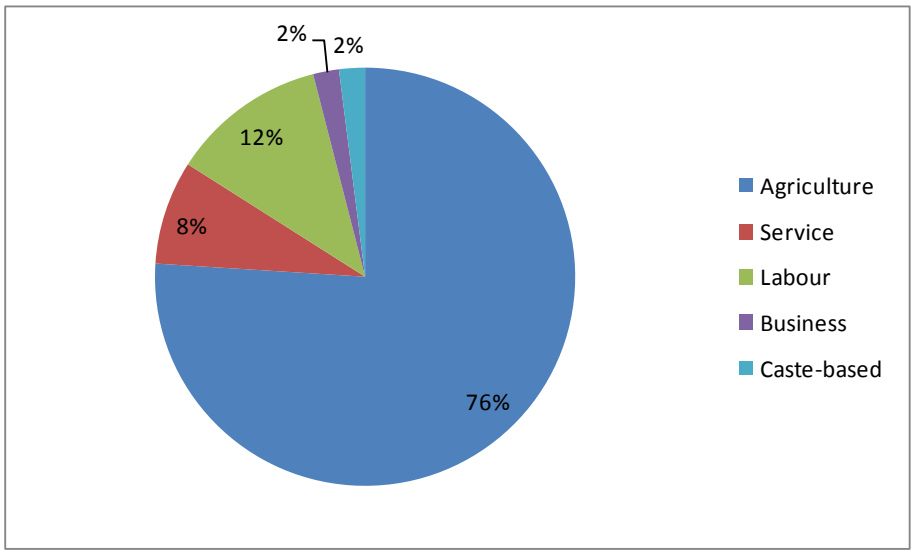


Figure 3.6 Occupational structure of Households in sampled control RVs

The figure shows that a majority (74%) of sampled households are involved in agriculture as their primary occupation[1], followed by service (12%) and labour (11%). Caste-based occupations refer to occupations (usually tertiary) that are peculiar to specific castes such as black smiths and carpenters. The study group have a similar occupational structure to the control group, with most of the households involved in agriculture.

Incomes and Assets

The PAD mentions that about 7800 households below the poverty line will be direct beneficiaries of the project and that the achievement in targetted villages must be at least a 10% increase in household incomes (over baseline). The results described below suggest that the project has greatly exceeded the target. The total percentage increase in incomes for vulnerable groups is 66% over the baseline (Tables 3.1 and 3.2). Moreover vulnerable groups encompassed more than 50% of the sampled households. The sampled GPs as mentioned earlier in this report are very similar in demographic composition to both the overall selected GPs and the control GPs. If we assume then, that our sample is largely representative of the entire project GP composition, then about 50% of the households of the entire project area fall within the vulnerable group category, or about 12700 households of the estimated 25400 project beneficiary households. Given that in the 50 selected GPs, more than 50% of the vulnerable group have shown significant income increases, it appears that more than the stated objective of 7800 households below the poverty line have shown an increase in income. Increases in income, however, are not limited to the VG but also include non-VG groups indicating the large scale impacts of this project. (By Vulnerable Group, we mean the category defined in the PAD i.e., the sub-set of Cateogry C identified and given in the GPWDP, based on certain criteria).

Fig. 3.7 shows income increases by caste categories – SC/ ST, OBC, General as well as by (VG/ non-VG). Incomes are also split into farm (agriculture, forests, livestock) and nonfarm.

[1] Primary occupation of a household is that occupation which contributes the largest share of the household income.

Increases in farm income are observed for all categories. Changes in income for each category are shown in Figure 3.8, 3.9 and 3.10). Increases in farm income are higher than non- farm incomes for the general population and for vulnerable as well as non-vulnerable groups. Non-farm income increases are higher for SCs/STs as well as OBCs. Overall, farm incomes increases are higher than the other categories. The total increase in income across all categories is 57%, but increase in farm income is overall higher (61%) than non-farm incomes (56.6%). Interestingly, amongst all social groups, the highest increase in total income has occurred amongst OBC and vulnerable groups followed by SC/STs. The highest increases in non-farm incomes have occurred amongst OBCs and SC/STs. Table 3.1 shows details of the % increase in incomes for all categories of people and across all income sources. Statistical tests run on the data indicate that for all four castes there are significant increases ($p<0.5$) in income for farm, non-farm and total incomes in the post project scenario except for the changes in farm income for the ST/SC and OBC category ($p>0.5$). For VG and non VG, there were significant changes in income between all three categories of income ($p<0.5$).

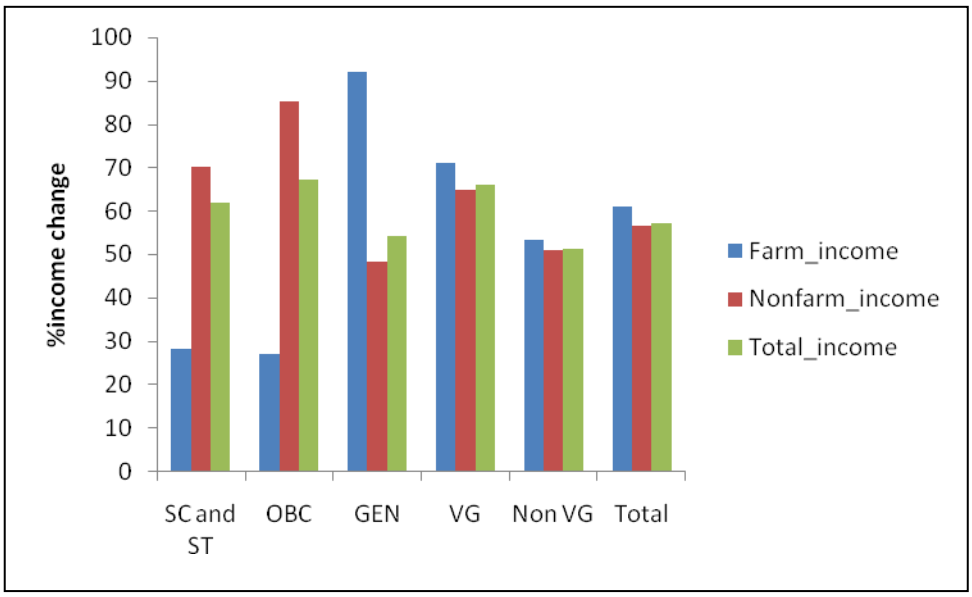


Figure 3.7 Percentage income changes

These large increases in income both farm and non-farm can be attributed to the interventions introduced under the UDWDP project. These positive interventions have been described in detail in the chapters on Agriculture (Chapter 4) and in Chapter 9 on income generating activities. Under the Vulnerable Group Fund (VGF), funds have been set aside for income generating activities. A wide spectrum of activities have been supported including handicrafts, livestock production (backyard poultry, goat/sheep units), dairy processing plants, stitching and tailoring, shops or stalls, tools for artisanal activities and bakeries. A total of 720 IGA groups have been supported under the project benefitting 4797 members. A total of 8137 VG members were funded Rs 7.75 crores for IGAs (WMD, 2011-2012). These income generating activities along with agricultural interventions (described in brief in the land use section of this chapter and in detail in Chapter 4) have directly contributed to these income increases.

Table 3.1Change in annual household income before and after the project by caste composition

Category	Farm income (Rs)			Non- farm income (Rs)			Total income (Rs.)		
	Before project	After project	% change	Before project	After project	% change	Before project	After project	% change
SC/ST	8550.86	10976.46	28.36	33947.68	57799.21	70.25	42498.55	68775.67	61.83
OBC	20670.00	26304.41	27.26	46244.12	85696.47	85.31	66914.12	112000.88	67.38
General	5906.60	11336.16	91.92	38045.74	56427.52	48.31	43952.34	67763.69	54.18
Total	**7373.92**	**11876.56**	**61.06**	**37126.40**	**58130.68**	**56.58**	**44500.32**	**70007.25**	**57.32**

Note: As many as 236 Households belonging to the general category are also included within the VG category. Hence baseline incomes of the Gen category are low as they include almost 50% of households that fall with the VG category.

Table 3.2 Change in annual household income before and after the project for vulnerable and non-vulnerable groups

Category	Farm income (Rs)			Non- farm income (Rs)			Total income (Rs.)		
	Before project	After project	% change	Before project	After project	% change	Before project	After project	% change
VG	6194.57	10589.98	70.96	28391	46813.59	64.89	34585.57	57403.56	65.98
NON VG	8660.78	13280.43	53.34	46658.06	70479.36	51.06	55318.84	83759.79	51.41
Total	**7373.92**	**11876.56**	**61.06**	**37126.40**	**58130.68**	**56.58**	**44500.32**	**70007.25**	**57.32**

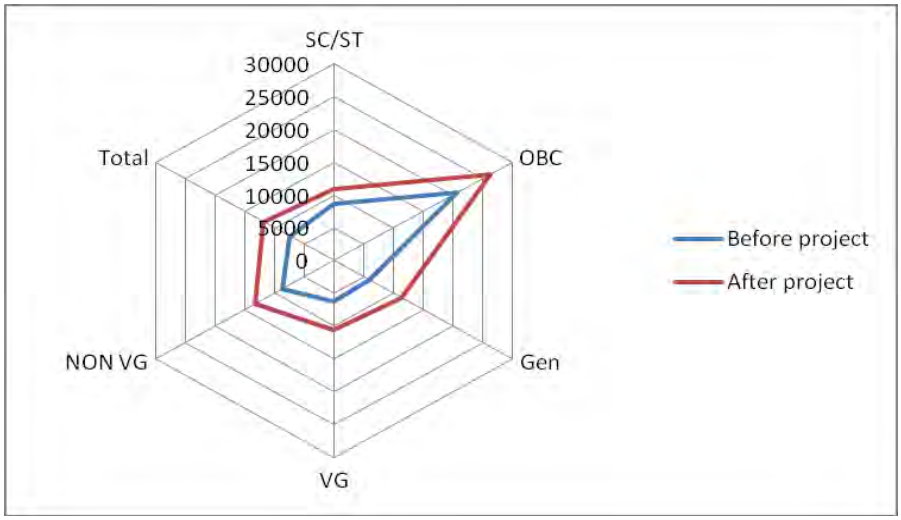


Figure 3.8 Change in farm income

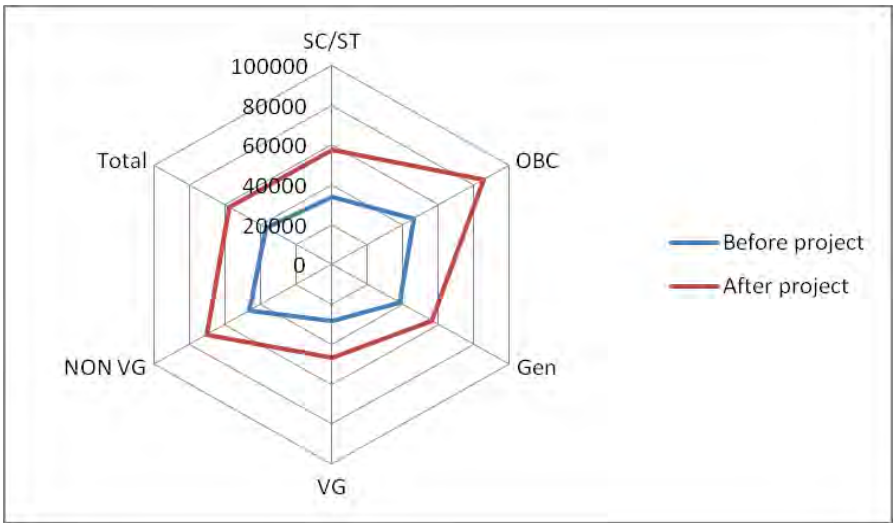


Figure 3.9 Change in Non-farm income

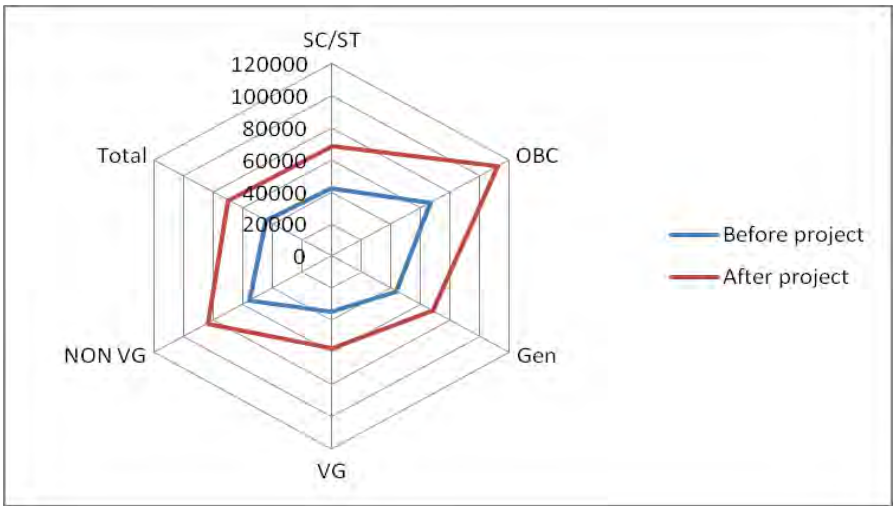


Figure 3.10 Change in total income

In real terms, the income increase of 57% as shown above translates to 26% over the project period. In other words, if the impact of inflation is fully considered over the project period, then the project beneficiaries would enjoy benefits of additional income of 26% over the baseline . This adjustment for inflation is based on the Consumer Price Index (CPI) for rural labourers, using agricultural year average values. With an increase of control group income by 9% in real terms, the income increase attributable to project interventions is 17% in real terms. It is seen that the VG population enjoy a relatively high increase in income (both farm and nonfarm) and in this sense, the project could be said to have an equity enhancing impact. The significant support given to VG households in the form of income generating activities is a key project feature.

The increase in income is corroborated by increase in assets, as shown in Table 3.3.

Table 3.3 Assets (in numbers)

	Non-farm income generating equipment	Consumer durables	Bicycle	2 wheeler
Before (number)	220	1036	9	20
After (number)	251	2265	10	40
% increase	14	119	11	100
% increase (control)	12	9	60	0

There is a large increase in the ownership of consumer durables, which indicates a general improvement in living standards. In the control group, the change in the numbers of non-farm income generating equipment was only 12%, while the percentage increase in ownership of consumer durables is only 9%.

Land use

Table 3.4 shows the aggregate change in land use pattern in sampled RVs (All categories are in ha; land use data has been sourced from RV level questionnaires). GP level data on changes in land use patterns are presented in Annexure 6. The biggest change is seen in the area under horticulture (almost a 56% increase). Irrigated agricultural land has gone up by about 25%, while unirrigated agricultural land has gone down by 4.7%. There has also been a decrease in culturable and non-culturable wastelands. As expected, areas under RF, civil soyam and van panchayats have remained the same. Significant changes in landuse were observed for irrigated and unirrigated land, horticultural land and culturable wasteland ($p<0.5$) but not for the other land use categories ($p>0.5$) (Table 3.6).

These positive increases in irrigated agricultural land as well as horticulture are directly attributable to the project interventions. Given that agriculture and farm-related activities are the main source of livelihood in the project area, the project placed significant emphasis on landbased activities so as to achieve the project objectives. Important activities that were targeted under the programme include improvement of farming systems, compact area demonstration, dissemination of information and technologies to farmers, promotion of high value crops, post - harvest value addition and market linkages. Detailed information on project interventions that have led to these positive outcomes are elucidated at length in the chapter on agriculture (Chapter 4). Some of the salient features, however that have caused these changes are highlighted here

1. Fallow land and un- irrigated land has been brought under cultivation particularly of improved varieties and high value crops wherever irrigation was available. Due to increased crop intensity the overall gross area under cultivation has increased.
2. Agriculture terraces in hills are prone to damage by heavy rains during rainy season. Marginal and small farmers find it difficult to repair them in time resulting in loss of production. The support provided under Gramya for this activity proved to be of great help in maintaining the soil cover and productivity. On individual holdings repair of agriculture terraces have led to inclusion of abandoned cultivation in the cultivated area.

3. In the project area most of the land was un-irrigated resulting in poor crop production. Even the available irrigation sources largely remained untapped. Under Gramya there was great stress on provision of irrigation by way of renovation of old *guls*, construction of new irrigation channels, construction of irrigation tanks and water harvesting tanks which resulted in bringing more area under irrigation.

For the control group, the increase in irrigated agricultural land was 7.6% while the decline in unirrigated agricultural land was 8.1%. For the control group, there were no significant changes in land under horticulture or any of the other categories. This difference between control and sample groups, strongly suggests that the project has been particularly successful in the agricultural interventions that have been provided.

Table 3.4 Aggregate changes in land use in the sampled GPs (all values are in ha)

	Agri (irr)	Agri (unirr)	Horti	Cult waste	Non-cult waste	Civ Soy	VP	RF	Others	Total
Before	611.20	3195.34	106.21	2598.20	626.99	1230.34	3888.77	476.76	241.42	13007.52
After	762.39	3045.18	165.51	2538.65	625.58	1230.34	3888.77	476.76	274.34	13007.52
% change	24.74	-4.70	55.83	-2.29	-0.22	0.00	0.00	0.00	13.64	0.00
Before (control)	106.20	1138.39	8.24	649.31	355.75	300.83	832.19	339.68	117.90	3817.28
After (control)	114.25	1045.83	8.24	649.31	354.04	300.83	832.19	339.68	172.89	3817.27
% Change (control)	7.58	-8.13	0.00	0.00	-0.48	0.00	0.00	0.00	46.60	0.00

Note: GP wise disaggregated data on change in land use are provided in Annexure 6. Agricultural area is in gross terms.

Coverage and achievement

Coverage (in this context) is indicated by 60% of financial allocation in GPWDP used to address soil conservation measures, water resource management, forest fuelwood and fodder management identified during PRA exercise. These activities include repair of risers/farm bunds/ grass plantation on bunds, Fodder production programme, Fodder crop demonstration, grassland development, Napier/ other fodder grass plantation, Nursery demonstration, Fodder/ nursery grass demonstration, advance soil work, plantation, silvi-pature, fuelwood plantation, bamboo/agave plantation, construction of vegetative check-dam, construction of drystone check dam, construction of crate-wire check dam, landslide treatment, vegetative treatment, construction of spurs, river bank protection, construction of cross-barriers, 1:6 CC mortar work, gul/chanel construction for irrigation, irrigation tank, roof harvesting tank,village pond, repair/ construction of wells, potable water supply pipeline and rejuvenation of pond/naula/khala .

It is seen that 65.43% of the financial allocation is used to address soil conservation measures, water resource management, forestry, fuelwood and fodder management identified during PRA exercise.

The physical achievement cannot be reported as a single figure since the measurement units of all interventions is not same. Following the norm used in the mid term impact assessment report, we club activities based on reporting units. It is seen that the target result is achieved in three out of four activity groups where more than 50% of the GPs have treated more than 80% of the proposed area. The average achievement (in terms of percentage of GPs reaching the target) is 52%.

Table 3.5 Achievements against targets

Sr No	Activity group(assumed to define treatment area)	Unit	% of GPs that have treated 80% of proposed area
1	Repair of risers/farm bunds/grass plantation on bunds, Construction of dry stone check dam, Construction of crate-wire check dam, Construction of spurs, River bank protection, Construction of cross-barriers, 1:6 CC mortar work	m^3	64
2	Orchard development, Demonstration of fruit plantation on community land, Grassland development, Plantation, Silvi-pasture, Advance soil work, Fuelwood plantation, Bamboo/agave plantation , Construction of vegetative check dam, Land slide treatment, Vegetative Treatment	Hectare	42
3	Napier/other fodder grass plantation, Gul/channel construction for irrigation	Kms/1000 running meters	50
4	Irrigation Tank	Number	52

Note: The targets have been taken from the GPWDPs prepared at the beginning of the project.

Conclusion

In general, the project has had very high positive impacts on incomes and the buying potential of participant households. In particular, the highest increase in total income has occurred amongst OBC and vulnerable groups. The percentage of agricultural land under irrigation has increased substantially due to the project, as has the area under horticulture. In most of the GPs, the additional agricultural land that has come under irrigation is used for cultivation of cash crops.

4. Agriculture and farm activities

Background

Agriculture is the mainstay of Uttarakhand's economy and the main source of household income for over 70% of the population[2]. Despite this, out of 53.48 lakh hectare of the geographical area of the State only 7.81 lakh hectares are under cultivation which is 14.6% of the total area. Most of the agriculture in the state is rainfed. Only 12% of the area in the hills has irrigation facilities. The cropping intensity of Uttarakhand is 158.7% which is much higher than that of India which is 137%[3]. The contribution of agriculture to the state GDP is around 22%.

Agriculture is largely subsistence-based and primarily managed by women. It is characterised by low incomes because of several factors including: (a) small and scattered land holdings with little or no irrigation facilities ; (b) subsistence farming and lack of modern pre and post-harvest practices (c) low productivity of subsistence cereals (12-14 q/ha in the hills as against 32-35 q/ha in the plains); (d) fragile soils with steep slopes highly-prone to soil erosion during the monsoon; (e) widely dispersed villages in the hills often with several separate caste-based hamlets, that are poorly accessible; and, (f) inadequate basic rural infrastructure which leads to migration of the local farming families either to foothill townships or townships close to roads . As a result, farming families frequently abandon agriculture lands in their native villages which are then not cultivated by other farming communities. Cash incomes from farming are low and most communities depend on outside subsidies and remittances from migrant family members. Over 24% of the population out-migrate to supplement family income.

In this context, UDWDP was conceived for a period of 7 years (from 2004 to 2011) with the overall objectives of improving agricultural productivity and augmenting income levels leading to improvements in living standards of rural communities. This programme also focussed on reducing out migration of farming communities.

Agricultural/horticultural interventions

Since agriculture and farm-related activities are the main source of livelihood in the project area, emphasis was given to land based activities so as to achieve the project objectives. Important activities that were targeted under the programme include improvement of farming systems, compact area demonstration, dissemination of information and technologies to farmers, promotion of high value crops, post - harvest value addition and agribusiness promotion.

Under the project, for the low-lying valleys up to 1,000m with a hot and humid climate during summer and rainy season, crops like paddy, wheat and pulses were promoted. For the sub-tropical zone which lies between the altitudes of 1,000m to 1,500m a diverse range of crops including horticulture crops were introduced. For the area lying in the altitudinal range of 1,500m to 2,000m classified as the temperate region, a large number of temperate fruit species, floriculture as well as medicinal plants are promoted. Vegetables and cash crops as found to be suitable for each zone where given special emphasis to obtain quick

2 http://www.pppinindia.com/economic-development-uttaranchal.php. Accessed on Jan 6, 2012.
3 http://www.fao.org/docs/eims/upload/277050/India,_Agriculture_and_ARD300310.pdf

results. Further, appropriate post-harvest technologies including market linkages were introduced to increase the value of the produce.

The specific activities undertaken under this component besides other activities are as under:

Agriculture

1. Providing quality seeds and seedlings
2. Area demonstration
    a. Compact area demonstration
3. Terrace repair/vegetative boundaries
4. Dissemination of information and technologies to farmers
5. Introduction of off- season vegetables and high value crops
6. Provision of inputs (bio-agents and bio-fertilizers with the condition that the land, labour, irrigation and Farm Yard Manure (FYM) will be provided by farmers)
7. Agribusiness development
8. Post-harvest value addition

Horticulture

1. Orchard development
2. Orchard rejuvenation
3. Community fruit plantation demonstration
4. Homestead plantation
5. Mehal top working
6. Poly house/poly tunnel demonstration
7. Introduction of medicinal plants/floriculture

The details of physical interventions in the sampled GPs are provided in the Annexure. These figures indicate that maximum importance in the sampled GPs was accorded to bio-compost demonstration covering an area of 1111 hectares. Although composting was practiced in the hill areas before Gramya it was not done methodically, hence the main thrust was promotion of quality compost/FYM including vermicomposting through imparting of technical knowledge to improve its efficacy. Agribusiness also received considerable importance and was introduced in 797 hectares. It was mainly introduced to facilitate the production, processing and marketing of high value crops. Development of fruit orchards is another important intervention under the project covering an area of 373 hectares.

In the next section, the activities undertaken under agriculture and horticulture are elaborated and their impacts are discussed in detail.

Assessment of impacts - Agriculture

Increase in area and productivity (Outcome indicator)

Table 4.1 provides information on productivity changes of the major agricultural crops and vegetables in the sampled GPs.

Table 4.1 Increase in productivity of improved varieties

Crop	Productivity (q/ha)				% increase in productivity	
	Irrigated (before)	Un-irrigated (before)	Irrigated (after)	Un-irrigated (after)	Irrigated	Un-irrigated
Agriculture						
Paddy	19.6	15.4	23.1	15.6	18.1	1
Wheat	19.8	13.2	22.5	13.5	13.7	2.6
Finger millet	0.0	14.1	0.0	14.8	0	5.3
Maize	0.0	15.1	0.0	15.2	0	0.9
Toria (*Brassica campestris)*	0.0	8.2	0.0	7.7	0	-6
Soya bean	0.0	11.3	0.0	14.5	0	28.33
Rajma (*Phaseolus* spp)	13.5	10.2	15.1	12.4	12.1	21.3
Other (Mixed) *	12.1	11.4	12.1	11.6	0	2.1
Other (Pure) **	11.8	11.6	11.8	11.2	0	-3.2
Vegetable						
Potato	102.0	93.0	118.4	100.7	16.1	8.3
Pea	17.0	21.0	27.2	24.5	60	16.7
Tomato	154.0	121.0	200.2	145.2	30	20
Cauliflower	104.0	78.0	162.2	156.9	56	101.2
Cabbage	157.0	107.0	204.1	133.8	30	25
Capsicum	32.0	26.0	41.6	31.2	30	20
French beans	81.0	128.0	149.2	208.6	84.2	63
Ginger	149.0	125.0	179.5	146.0	20.5	16.8

Crop	Productivity (q/ha)				% increase in productivity	
	Irrigated (before)	Un-irrigated (before)	Irrigated (after)	Un-irrigated (after)	Irrigated	Un-irrigated
Other (vegetables)	54.0	26.0	57.6	29.2	6.61	12.4

* Includes crops not mentioned above that are grown mixed along with the main crops (such as urad *(Phaseolus mungo)*, mustard and lobia *(Phaseolus lunatus)*)

** Includes crops not mentioned above that are grown as pure crops such as barley *(Hordeum vulgare)* and chaulai *(Amaranthus tricolor*)

It can be seen from Table 4.1 that there has been an increase in productivity of all major agricultural crops on irrigated lands in the sampled GPs. Among the main agricultural crops, new improved varieties of soya bean recorded a significant increase in productivity on un-irrigated lands (from 11.3q/ha to 14.5q/ha) as compared to the earlier traditional/improved varieties. The other agricultural crops that recorded a substantial increase in productivity include paddy (from 19.6q/ha to 23.1q/ha on irrigated land) and wheat (19.8q/ha to 22.5q/ha on irrigated land). All the vegetable and cash crops marked a considerable increase in productivity on irrigated and un-irrigated lands. Cauliflower recorded a 100% increase in productivity (78q/ha to 157q/ha) on un-irrigated land followed by french beans (63%).

Toria (*Brassica campestris*) and other pure crops (such as barley (*Hordeum vulgare*) and chaulai (*Amaranthus tricolor*) showed a decline in productivity on un-irrigated lands which could be mainly attributed to erratic rainfall. Toria (*Brassica campestris*) and some of the other pure crops being moisture sensitive, the timing of sowing did not match with post monsoon rains.

Important reasons attributed to increased productivity include:

- Increased availability of water due to soil and moisture conservation activities
- Provision of irrigation facilities
- Distribution of improved variety of seeds
- Adequate dissemination of packages of practices by way of demonstration and wider adoption of such practice by the farming community

Table 4.2 provides information on increase in area of improved varieties of the major agricultural crops and vegetables in the sampled GPs.

Table 4.2 Increase in area under improved varieties

Crop	Area (ha)				% increase in area	
	Irrigated (before)	Un-irrigated (before)	Irrigated (after)	Un-irrigated (after)	Irrigated	Un-irrigated
Agriculture						
Paddy	253.5	674.0	306.0	659.8	20.7	-2.1

Crop	Area (ha)				% increase in area	
	Irrigated (before)	Un-irrigated (before)	Irrigated (after)	Un-irrigated (after)	Irrigated	Un-irrigated
Wheat	179.5	996.8	192.6	979.8	7.3	-1.7
Finger millet	0.0	544.8	0.0	565.0	0	3.7
Maize	0.0	205.4	0.0	207.0	0	0.76
Toria (*Brassica campestris*)	0.0	146.5	0.0	155.3	0	6
Soya bean	0.0	282.5	0.0	272.6	0	-3.5
Rajma (*Phaseolus* spp)	16.0	151.5	17.7	182.2	10.5	20.3
Other (Mixed)	24.5	69.0	24.5	73.9	0	7.1
Other (Pure)	0.0	1.0	0.0	1.1	0	10
Vegetable						
Potato	18.5	5.5	19.7	6.0	6.3	8.5
Pea	17.4	4.7	29.6	6.4	70.1	37.1
Tomato	13.6	9.1	81.8	11.3	501.3	24
Cauliflower	13.4	7.2	44.4	8.0	231	11.6
Cabbage	13.7	6.2	58.4	22.7	326	266
Capsicum	18.5	7.8	34.8	12.7	88	63
French beans	6.3	2.1	68.0	13.2	980	530
Ginger	21.2	3.4	22.8	3.7	7.6	8.5
Other (vegetables)	21.0	8.4	22.7	9.3	8	10.5

It can be noted from Table 4.2 that the highest increase in area has occurred for vegetable crops especially on irrigated lands. French beans recorded the highest increase in area (from 6.3 to 68 ha) followed by tomato (13.6 to 81.8 ha). Introduction of poly houses and poly tunnels has facilitated off-season high value crops in the sampled GPs. Moreover, vegetable crops are financially more attractive since they yield quicker returns as compared with cereal crops. Cereal crops like paddy, wheat and soya bean marked a decrease in cropped area on un- irrigated lands. This decrease is due to un-irrigated area being brought under irrigation and also due to some area brought under vegetables and cash crops due to availability of improved seeds and better marketing facilities provided by Gramya.

Increase in value of major crops (Outcome indicator)

The overall increase in area and productivity is the weighted average of the increases for individual crops. The weights used are the average of pre and post project areas for each crop, expressed as a proportion of the combined area under all improved variety crops. The increase in value has been calculated by magnifying the increase in area by the corresponding increase in productivity and applying weights, as mentioned. This, therefore, captures the combined impact of area and productivity increases.

In symbols,

$$\Delta V = \sum_i \Delta a_i (1 + \frac{\Delta p_i}{100}) w_i$$

Where, ΔV = % change in value (weighted)

Δ ai = % change in area of crop i

Δ pi = % change in productivity of crop i

wi = $\frac{ai}{\sum ai}$ (so that $\sum wi = 1$)

In simple terms, this provides a way to assess the combined impact of area and productivity increases collapsing these into a single value.

The results of the agriculture outcome indicators are summarised in table 4.3.

Table 4.3 Agriculture Outcome Indicators

Outcome Indicator	Final Impact result
10% increase in area (ha) over baseline of improved varieties, high value crops	Area (ha) over baseline of improved varieties, high value crops increased by 21%
15% increase in net value of produce realized by farmers in treated areas	Net value of produce realised by farmers in treated areas increased by 27%

On the whole, the following reasons can be attributed to an increase in area and productivity of improved varieties:

- Traditional crops have been replaced by improved varieties particularly where irrigation facilities have been created
- Fallow land has been brought under cultivation particularly of improved varieties and high value crops wherever irrigation was available
- Un- irrigated land has been brought under irrigation and thereby under cultivation of improved varieties and high value crops
- Due to increased crop intensity the overall gross area under cultivation has increased
- On a few individual holdings repair of agriculture terraces have led to inclusion of abandoned cultivation in the cultivated area
- Availability of seed through the project as well as good market linkages have motivated farmers to grow cash crops

Impact of specific interventions

Table 4.4 below shows the increase factor of the households in the sampled villages who have adopted scientific agriculture interventions. The increase factor of compost pits has been 30 fold making it the most popular input to improve the quality of manure among the households. Adoption of improved seeds for agriculture and use of bio-fertilizer has also increased 10 fold. It was observed during field visits and group discussions that awareness generation among farmers has been undertaken through village level workshops, trainings and exposure visits regarding improved agricultural and horticulture practices and off-season vegetable cultivation.

The control villages did not report any significant adoption of inputs like bio fertilisers, improved seeds for vegetables and cash crops, improved variety of medicinal plants etc.

Table 4.4 Adoption of inputs

Adoption of inputs	% of hhs adopting (baseline)	% of hhs adopting (final)	Increase factor
Agriculture			
Improved agricultural seeds	5.42	57.24	9.56
Bio-fertilizer	1.64	17.31	9.54
FYM	97.69	99.62	0.02
Vermi-compost	0.77	2.56	2.33
Bio-pesticide	5.77	18.85	2.27
Compost pit	0.32	9.86	29.59
Vegetable and cash crops			
Improved seeds for vegetables and cash crops	8.03	59.56	6.42
Polyhouse*	0.46	1.78	2.87
Poly tunnel *	0.00	1.01	
Horticulture			
Improved variety plants for horticultural crops	7.12	39.90	4.60
Homestead programme	0.00	5.27	
Irrigation tank	1.14	7.33	5.45
Medicinal plants			
Improved variety of medicinal plants	0.00	0.05	

* These are provided both at individual and community levels, and also for demonstration purposes. As such, an estimation of individuals adopting these could not be obtained

Farming system improvement

Under farming system improvement activities, various demonstration activities of improved technologies and package of practices along with access to quality inputs like seeds (HYV and hybrids), planting material, bio-fertilizers and bio-pesticides were imparted to farmers of the project area. The activities include:

- Terrace repair/vegetative field boundaries
- Area demonstration
    - Compact area demonstration
- Agriculture minikits distribution
- Line sowing/ Planting of vegetable and cash crops
- Vermi compost/Bio compost pits
- Integrated crop management
- Organic farming

Terrace repair / vegetative field boundaries

Amongst the activities supporting crop production, the repair of agriculture terraces was found to be highly effective in protecting cultivated land holdings with a rise in net cultivated area on a few individual holdings. Since farmers are aware of the consequences of soil erosion that is happening in the hilly terrain, they are making thoughtful efforts in not only maintaining their agricultural terraces, but have also started to repair their terraces by themselves. It is customary with the hill farmers to repair their damaged terraces after every rainy season. Group discussions in sampled GPs revealed that the maintenance of terraces have helped to check water runoff and soil loss. Hence, the sustainability of this intervention appears to be high. Hybrid napier grass is being planted on field boundaries hence there were no conflicts among the neighbouring farmers due to the shade caste from vegetative boundaries. Farmers are also using napier as fodder for their animals.

In control GPs no special scientific efforts for terrace repair were noticed. Also none of the farmers have undertaken Napier grass plantation on field boundaries though all the farmers in general repair terraces of their field after damage by rains as and when required.

Compact area demonstration

The objective of compact area demonstration was to demonstrate the superiority of hybrid or HYV crops. The main crops that were considered for compact area demonstration include Gahat (*Dolichos biflorus*) - VL Gahat -1, Maize Him-128, Soya bean - VL-47, Mandua *(Eleusine coracana*) - VL-148, Wheat - VL-616, 732, 373, 738; Pea - VL-704, Toria (*Brassica campestris*) - PT-303 and Masur dal (*Lens culinaris*). The cumulative achievement of compact area demonstration up to Dec 2011 was 2910 ha[4]. Major demonstration activities were carried out with the help of technical support from VPKAS, Almora and KVK of respective districts.

In addition, demonstration of improved varieties of agriculture and horticulture crops through FIGs has been taken up under the project. Till date around 690 FIGs at GP level have been formed in which progressive/ interested farmers who were keen on taking up

[4] UDWPD Status Report, December 2011.

innovative activities were selected[5]. The FIGs were then imparted training on improved agricultural inputs such as line sowing, and use of improved package of practices through the organic way.

Demonstrations pertaining to the introduction and promotion of hybrid and HYVs of vegetable crops were aimed at diversifying crop production and creating avenues for augmenting farmers' income. However, in some cases, in addition to introduction of improved varieties, other objectives like crop protection were also included in the demonstrations. All the agriculture activities of the project were carried out by following integrated crop management strategy like integrated plant nutrient management and integrated pest and disease management.

The intention was to promote this activity through demonstration plots (of size 0.04 ha (2 *nali*) for agricultural crops and .01 ha to 0.4 ha (5 to 20 *nali*) for horticulture crops) in each village. Due to small and fragmented holdings, it was difficult to get the required land at one place belonging to one or two farmers. To overcome this difficulty, a practice of giving demonstration at one place on 0.04 ha of land belonging to a small group of farmers was followed. However, small and scattered agricultural holdings made compact are demonstration a difficult proposition. For instance, wherever farmers with adjoining holdings were not willing to pool their land to form a 0.04 ha compact land parcel, seeds have been distributed in smaller quantities to a larger group. However, it was noted from field visits to various GPs and through discussions with the farmers that, on the whole, the farmers were readily adopting new varieties and farmers' participation was quite encouraging. Off-season vegetable demonstration was taken up by the FIGs as per the technical recommendations. Field demonstrations has given the farmers an opportunity to learn first-hand the methodology of planting new and better varieties of vegetables, fruits, medicinal plants and fodder crops. Farmers have provided inputs like land, labour, FYM etc. which has not required cash contribution. This intervention has benefited progressive and forthcoming farmers in most sampled GPs.

Performance of the new varieties was constantly monitored by the WMD staff and whenever the new varieties performed below expectations, changes were made in the next crop season in consultation with the experts.

Minikits

Many HYV of agriculture crops have been introduced in the project GPs. Seeds of these HYVs have been given to the farmers through agricultural minikits. The objective of giving minikits was to gradually replace the low yielding local varieties with HYVs thereby enhancing the yields, overall production and farm income. As per the Status Report of Gramya (December 2011) agriculture minikits has been distributed to cover an area of 1526 hectares. Some of the major agricultural crop varieties distributed to the sampled GPs are given below.

Kharif

- Paddy - Pant 4, Pant 10, Pant 11, Pant 12, Narendra 359
- Maize - Surya, Kanchan, HIM 128
- Urad (*Phaseolus mungo*) - PU 35, PU 30, PU 34

[5] www.gramya.in. Accessed on 30th Dec 2011.

- Soyabean - PK 1042, VL 21, VL 18
- Finger millet - VL 149, VL 146

Rabi

- Wheat - HS 240, HS 295, HS 284, VL 738, VL 616, UP 2338, PBW 343, PBW 154, PBW 373, VL829, VL 804, VL738, VL614, VL 2329
- Lentil - PL 4
- Toria/Masur (*Brassica campestris/Lens culinaris*) - PT 303, T9, PL 4, PL 406

Group discussions reveal that in most of the GPs, minikits were distributed for demonstration to farmers and have been successfully utilized by almost all the farmers. Farmers in all the GPs where the productivity substantially increased have retained the seeds to be used for the next agriculture season. The irrigation facilities along with improved techniques provided by the project helped farmers to get substantial production benefits from these HYVs. . An important spin-off benefit of adopting the new varieties was the increased availability of fodder due to increased amount of agro-waste. The GPs which benefited due to higher productivity of wheat among other GPs include – Kyunja, Thaina, Gaid, Falyati, Haweel Kulwan and Gairkhet. These GPs on an average recorded a 15% increase in productivity on irrigated lands. Higher productivity of paddy on irrigated land was also reported by Gairkhet, Purkot, Simalkanya and Pan where the productivity showed an increase of nearly 20% over the baseline. Further, higher productivity of maize was also reported by most of the GPs. Some of the GPs which benefited significantly are Kheskande, Pipli Nigalti, Gadsyari and Daslikhet. However the village community in Simalkanya and Pau reported that the number of minikits should be increased to cover more farmers. In Valson GP poor productivity of toria (*Brassica campestris*) and urad (*Phaseolus mungo*) varieties were reported by farmers. They also opined that wheat introduced was not successful and the local varieties fared better.

In the control GPs farmers were mostly using traditional varieties. Yet, some of the new varieties adopted include paddy (Pant 11, Pant 12), wheat (VL 738), maize (Kanchan) and urad (*Phaseolus mungo*) (PU 35). These varieties were not provided through any government scheme or department; they were procured directly by the farmers. Farmers also reported an increased availability of fodder from the new varieties of agricultural crops.

Vegetable Minikits

Distribution of vegetable minikits has also been a very important step adopted by the project to bring prosperity to farmers by quickening the pace of agriculture development. Vegetable crops like Pea (Arkil, Azad, VL-7), Cauliflower (Varun, Mrinalini, Krishna), Lady Finger (Perbhani Kranti), Cabbage (Varun, Nobel -1), Ginger, (Rio de Janeiro), Tomato (Manisha, Naveen, Naveen Plus, Naveen 2000, Tolstoy), Potato (Kufri Giriraj, Kufri Joyti), Capsicum (Tanvi, California wonder) Chili (Pusa Jawala, Pant C-1) French Beans (Contender,VL-1, Pant Anupama, Ratna), Brinjal (Pant Samrat, Vijay), Radish (Japanese long white), Summer squash (Pusa Alankar) etc. were also demonstrated in several villages. As per Gramya records (Progress report, December 2011) off-season vegetables and demonstration of high value crops were undertaken on 2881ha of land. Positive results of vegetable minikits could easily be seen during village visits in all sampled GPs.

A general shift towards vegetables is observed in most of the GPs mainly due to improved availability of irrigation, promotion of high-yielding varieties (good quality seeds) and other interventions such as poly houses and poly tunnels. As a result farmers have mostly

replaced traditional varieties of cereals especially mandua (*Eleusine coracana*) with vegetables, fruits and cash crops. HYVs of vegetables and cash crops particularly tomato, ginger, turmeric, pea and other vegetable crops have performed well in most of the GPs mainly due to availability of irrigation facilities. In Valson GP traditional coarse grains are being replaced by vegetables. In some of the GPs farmers have earmarked certain portion of their lands only for vegetables cultivation in all the three seasons. Small farmers who have benefited due to irrigation have largely switched over to vegetables cultivation due to the commercial value of the crops. Highest productivity of tomato (around 38% increases from the baseline value) was reported in Jaidwar, Maror, Koti, Rikhangaon, Ghandalu and Nagdhar GPs. The productivity of peas depicted an overall increase of 70% on irrigated lands after the project initiation in the sampled GPs like Nai, Jaidwar, Gairkhet and Dini talli. Ginger also recorded around 26% increase over the baseline value in GPs like Khaikot Malla, Naskhola and Kamla. However in Valson GP, new varieties of ginger and garlic did not perform well due to erratic rainfall and also crop damage by wild boar, pigs, monkeys and birds. Moreover, tomato and capsicum generated low yields in the last few years due to heavy rains.

Some of the seeds of cereal crops, vegetables, cash crops etc. did not perform well in certain blocks. In such cases, suitable feedback was sought by the WMD field staff from both the famers and the experts and such low performing varieties was replaced in the next crop season.

New varieties of vegetables were found to be popular in control GPs. Some of the varieties adopted include tomato (Sneha Latha), chilly (Pant c-1); capsicum (California), french bean (Contender), ginger (Rio De Janeiro), bottle guard (hybrid) and lady finger (Perbhani Kranti).

Box 4.1 Case Study of Reverse Migration from Kyunja Village of Augustmuni Division

UDWDP was launched in Kyunja village of Augustmuni Division in 2004-05. The farming community practiced irrigated agriculture even before project initiation but were mostly doing traditional farming, cultivating wheat and paddy with little bit of vegetables and pulses for self-consumption. The farmers with larger holdings were in a better position as the production was enough to meet the household requirements. However, the farmers with small holdings often found it difficult to meet the food requirements of the households. Birendra Singh and Rajendra Singh were subsistence farmers with 8 to 10 *nalis* of land which were under traditional crops. The produce from the farm lands was meagre and the situation compelled the youths to migrate to Delhi in search of livelihood opportunities to support their families. However, with low skill levels they were able to find only odd jobs which were less remunerative. Back home their young wives had to supplement the family income by working as agriculture labourers. When Gramya was launched in the village, the women got involved in the awareness programmes and trainings and stated actively taking part in project activities. Hence, Rajendra Sing's wife Kiran Devi was engaged as motivator in the project which gave her an additional income of Rs 1000/- per month. With the availability of good quality seeds and the technical know-how she along with Saraswati Devi W/o Birendra Singh started cultivating vegetables and other cash crops on their meagre holdings. Further, Income Generation Activities for VGs came as a boon to these two families when they formed women VGs and were financed to cultivate cash crops and Vegetables on the fallow land. An additional 8 *nalis* were brought under cultivation due to availability of irrigation under the project. Cash crops such as ginger, turmeric, onion, garlic, coriander and off season vegetables such as cauliflower, cabbage, tomato were grown. Ever banana was grown on farm boundary. They informed their husbands about the potential of vegetable cultivation and motivated them to return back to farming. Both the gentleman came home and got engaged with their wives in cultivation and sale of the vegetables and cash crops grown on their land and on the common wasteland. Meanwhile their earning from vegetables and cash crops had gone up to about Rs.10000 to 15000 per annum. With formation of FIGs, Kiran Devi became the first Chairman of one of the FIGs in which there are 16 members.

Both Rajendra Singh and Bijendra Singh not only stayed at home but got fully involved with what their wives had started. Rajendra Singh now has a shop in the village in which the vegetables etc. grown on their own land is being sold along with other things. This can prove to be a good example for other educated youth to stay in the village and engage in farm based activities rather than migrating to big cities in search of petty employment.

Line sowing

Instead of customary broadcast sowing, an attempt was made by Gramya to introduce line sowing so as to enhance crop productivity and reduce seed wastage.

GD analysis indicated that line sowing was introduced in most of the project GPs. The farmers have adopted line sowing mainly to grow improved varieties of wheat and maize. The GPs that benefitted the most from this technique are Valson, Forti, Chami, Silalekh, Nai, Pan, Bhent, Pipli Nigalti, Naugaon Akheria and Kolitek. In Jajoli, more than 60% of the farmers have adopted line sowing techniques and in Simalkanya training on line sowing was given to farmers. Farmers opined that the line sowing has resulted in minimum wastage of seeds and also has resulted in good seed germination. However, some of the concerns voiced by farmers in Naskhola and Valson was that line sowing is time consuming and labour intensive. Moreover, this method was found to be suitable only for mono-cropping; for mixed cropping the farmers still preferred to adopt the broadcasting method.

In none of the control GPs have the farmers adopted line sowing technique for cereal crops; broadcasting method is still followed by the farmers.

Vermi compost/Bio-compost pits

As part of farming systems improvement, bio-compost pits were introduced to improve the quality of the manure. This was with the caveat that the land and labour would be provided by the farmers. Traditionally composting was undertaken by farmers, but was not done systematically. The compost constituted a mix of dung and agriculture waste and was stored in open. Project intervention did not solely focus on promotion of vermi compost/ bio compost but also created awareness regarding organic practices among the village community. These techniques were introduced in most of the GPs, where 4652 bio demonstration units were undertaken till December 2011 (Gramya status report, 2011). These techniques were well received by most of the GPs, and the group discussions indicated that it was found to be effective in most of the sampled GPs surveyed for final assessment. Some of the GPs in which the cultivable area has come under vermi compost and irrigated organic farming after project initiation include - Khatar (around 14 ha), Silalekh (2.5 ha), Jagot (around 15 ha) and Rikhangaon (3 ha). Adoption of vermi compost was also mostly taken up in PNGO, Almora and Nainital Division.

Winnowing fan/Spraying machine

Winnowing fan which is used to separate the grain from the chaff was given to some FIGs in sampled GPs. In Chami, 2 winnowing fans were given which was effectively used by 20 households. Use of Winnowing fan reduces the time of women folk while separating the grain and husk.

Mini thresher

Mini thresher was also provided through FIGs in some of the sampled GPs. One thresher is normally enough for one village of 50 households. For e.g. Chami in Champawat division and Rikhangaon in Chinayalisaur the village communities are effectively using mini thresher.

Table 4.5 indicates the use of improved farm equipment before and after project initiation.

Table 4.5 Use of improved farm equipment

Improved farm equipment	% of hhs adopting (baseline)	% of hhs adopting (final)	% change
Implements used through draught power	88.33	96.03	8.7
Improved agri. /horti. Implements	0.38	0.64	66.5
Small tractor	0.00	0.39	
Thresher	0.26	0.39	50

Table 4.5 suggests that the use of improved implements through draught power has not changed much in the post-project scenario. In the hilly areas, the farmers relied on draught power rather than any other mechanised source mainly due to availability and suitability of draught power and difficulty in carrying the mechanized means from one terrace to other.

Small tractors and threshers are the other new additions for the rural hill community, although their utility is yet to be fully realised.

Assessment of impacts - Horticulture

The horticulture sector is more suitable for the hill areas. The climate of these regions makes it an ideal location for growing temperate, subtropical fruits and vegetables that fetch a high value in the domestic urban markets. Hence, to enhance livelihood opportunities among rural hill communities, various interventions related to horticulture development were undertaken under the project.

Table 4.6 Number of major fruit trees in sampled households

Fruit trees	Baseline	Final	Increase Factor
Apple	2176	3460	0.59
Citrus	1680	5672	2.38
Pears/apricot	1705	6024	2.53
Others	3752	8151	1.18

Table 4.6 shows the adoption of the major fruit trees by the sampled households in various GPs. Pears/apricot recorded the highest adoption, where the increase was almost three fold followed by citrus which showed a two-fold increase.

The impacts of specific interventions for horticultural crops are summarised below:

Orchard development

Community fruit plantations and homestead plantations have been identified as one of the factors for progress in fruit cultivation in the project area, and major emphasis has been given for success on these fronts. Demonstrations of orchard development for the following fruit plants have been initiated:

Mango (Dashhari, Langra, Chausa), Litchi, Guava (L-49), Kathal, Citrus species, Pear (Jargnal, Thampier, Victoria); Walnut (Kagzi); Peach (Alexander, Red June); Plum(New Plum, first plum, Santarosa); Apple (Red Delicious, Royal Delicious, Polynizer red gold, Delicious spur); Almond (Kagazi, California, paper seal, IXL); etc. Most of them have been found suitable for Uttarakhand's agro climatic conditions.

These fruit trees can adapt themselves very well in marginal lands and hill slopes that are not suitable for agriculture crops. Moreover, fruit trees are economical to grow and give good returns, apart from their nutritional value. Fruit trees also preserve and improve the ecology of the region. Communities were encouraged to establish orchards on fallow lands or/and on the lands which are not suitable for agriculture. Orchards were also established on less productive and slopy agriculture lands. In such areas, intercropping is being carried out till the fruit plants reach a stage that would not allow agriculture.

Group discussions have shown that fallow lands in certain GPs have come under orchard cultivation. Some of the GPs where considerable land has come under cultivation include – Kamla (100 *nali*), Thaina (23 *nali*), Jaidwar (350 *nali*), Koti (40 *nali*), Jogot (105 *nali* under

orchards and 7 *nali* under cash crops), Kyunja (15 *nali* under orchard and 37 *nali* under cash crops), Andhiyari (18 *nali*) Kawagadhi (15 *nali*), Rickengoan (15 *nali*), Dhargaid (20 *nali*), and Gaid (20 *nali*). Orchard development and demonstration were carried out with the help of technical support from VPKAS, Almora and Pant Nagar University. The survival rate of community orchards was between 65 to 70%, whereas the individual orchards recorded a higher survival rate of 75 to 80%. Mango, malta *(Citrus sinensis)* and guava showed high survival rates.

Orchard rejuvenation

In most of the GPs, old orchards exist consisting of over-mature trees with declining fruit yields. Often negligence in maintenance, inadequate nutrition, incidence of insects, pests and diseases, lack of technical know-how and resources, lead to these orchards becoming unproductive and are abandoned. These orchards, however, could be rejuvenated by adoption of suitable measures such as pruning of old and diseased branches, application of *chaubatia* paste and other fungicides, preparation of *thawalas* around the plants, removal of dead, dry and diseased plants and planting of new fruit plants of suitable species in the gaps. This enables the orchard to become productive and profitable. An area of 631 ha was undertaken for orchard rejuvenation under the project. The GPs were identified for intervention based on the presence of old and diseased trees. The successful examples were found in Dhargaid GP of Gairsain, Kharkoli GP of Gharwal, Dinitalli & Silalekh GP of Nainital.

Homestead plantations

One of the components of the project was to grow fruit plants in the kitchen garden or in the vicinity of the houses to enhance the village communities nutritional status through the availability of fresh fruits. Moreover, in the hills, homestead plantations are more popular due to their proximity to habitation where they can be protected better.

In general, each household has been given 5 saplings of fruit plants to be grown in the homestead. The beneficiaries of this intervention have largely been the landless and marginalised farmers. The GPs which have benefitted by the intervention include Chidiyadunga, Valson, Silalekh and Dini talli. During the survey it appeared that the survival of homestead plantations was better than the orchard plantations.

Community fruit plantation demonstration

Amongst high value crops in the community fruit plantations mainly tejpatha (*Cinnamomum tamla*), bari elaichi (*Amomum aromaticum*) and almond (IXL, California paper seal) demonstrations were carried out. Fruit tree species including exotic ones were grown on lands owned by individual farmers situated in one block. In most cases fallow lands have been diverted for this purpose which were either unfavourably located for the group of farmers or was not otherwise fit to cultivate agricultural crops. This has been a successful intervention in the project. The activity has helped in bringing uncultivated land or marginal land to productive use. The results of such plantations during the survey were found to be satisfactory.

New variety horticulture crops adopted in the control GPs include mango (dussera), orange and lemon.

Mehal top working

Mehal top working was targeted in few of the sampled villages out of which this activity was carried out in some of the RVs like Andhiyari Chapra (1 ha), Seemapani (1 ha), Gadsyari (0.46 ha), Pan (2.52 ha), Gaid (1 ha) and Koliyana (2.77 ha). Top working of improved pear cultivars onto wild plants of Mehal (Pyrus pashia) was targeted in the above mentioned RVs covering a total area of 8.75 ha.

The past experience with varieties like Gola has not been very encouraging because of poor market response. The results of grafting were found successful during the field survey. However the fruiting is yet to take place in most of the RVs.

In the control villages no such activity was noticed despite the fact that wild Mehal trees were locally available. Lack of technical know-how has prevented farmers from undertaking this activity.

Poly house/poly tunnels

For early propagation of vegetable seedlings /fruit plants and to protect the crops from adverse climatic conditions poly house/poly tunnel were demonstrated in the project area for growing off seasonal crops, nursery, etc.

GD analysis indicated that poly house/poly tunnel was introduced in most of the GPs and it was mostly used to grow off-season vegetables. This intervention is contingent on the farmers providing land and labour and in this sense; the intervention usually targeted relatively progressive farmers within the project area. The survey results showed that this intervention has been successful in ensuring good seed germination even in high altitude.

The crops that have been typically grown are tomato, capsicum, cauliflower and other new varieties of cash crops which typically showed high increases in productivity over the baseline. Several GPs which showed successful adoption of poly house are also those that showed high increases in irrigated area. In Valson, for example, the land was entirely un-irrigated at the baseline and currently 8.5 ha of land are under irrigated agriculture. Among other GPs Valson, Silalekh, Simalkanya, Jagoli, Andhyari, Pau, Kolitek, Ghimtoli, Rumsi, Koti, Rikhangaon etc. poly house/poly tunnel is mainly used to grow tomato, capsicum, cauliflower and other new varieties of cash crops. Adoption of Poly houses /Poly tunnels were not noticed in any of the control villages.

Post-harvest value addition

Post-harvest technology is applied to agricultural produce after harvest for its protection, conservation, processing, packaging, distribution, marketing, and utilization. This is used to meet the food and nutritional requirements of the people. It aims to stimulate agricultural production; prevents post-harvest losses, improves nutrition and adds value to the products. In this process, it helps to generate good returns for the primary producers.

Improved technology for drying, grading, processing, packaging, storage, etc. has been introduced in the project. Table 4.7evaluates the adoption of improved post-harvest technology in the sampled GPs.

Table 4.7 Adoption of improved post-harvest technology

Improved Technology	No. of hhs adopting (baseline)	No. of hhs adopting (final)	Increase Factor
Improved drying	4	133	32.2
Improved grading	4	6	0.5
Improved packaging	2	5	1.50
Improved storage	2	2	0.00
Others	7	13	0.85

Efforts were made to improve post- harvest technology and value addition. Though the post-harvest technology for cereal crops has largely remained traditional, the project interventions have had a good impact on grading and packing of vegetables and fruits. Value of tomato, capsicum and other fresh vegetables have gone up as a result of good grading and packing practices adopted under agribusiness. Value addition of spices, pulses, fruits like malta (*Citrus sinensis*) and pahari nimbu (*Citrus limon*) , and traditional crops like mandua (*Eleusine coracana*), gahat (*Dolichos biflorus*) and chaulai (*Amaranthus tricolor*) was done by adopting different methodologies of gridding, packing, drying, preservation etc. Although training in fruit preservation, juice making, jam/jelly making, and pickle making was given to farmers, commercial production on comparatively larger scale was noticed only in some of the valleys where good irrigation facility could be provided under the project. It has primarily picked up in Gairsain, Gangolihaat, Augustmuni, Almora (PNGO), Chinaylisaur and Nainital. However, as a consequence of better market linkages, even local coarse grains like mandua (*Eleusine coracana*), gehat (*Dolichos biflorus*) etc. has gained better market prices at the local level. Also fruits like malta (*Citrus sinensis*) and rhododendron juice gained popularity as a result of market linkages.

Tomato products, juices, pickles, squash, spices, graded pulses etc. were prepared and packed at different value addition centres under the project in different divisions. 18 such centres are operative in the project area in which marketing of such products was reported to the tune of 85.91 ton valued at Rs. 1.37 lakhs. Market linkages for these products were provided by the DSAs engaged by the project. This was possible only due to improved post-harvest technologies like drying, grading, storage and processing. These products were given different trade names for marketing and some of the products became popular not only in the local market but also in national markets, *haats (*market*)*, fairs etc.

Agriculture being largely subsistence, improved technology for grading, storage and processing etc. has not been introduced in any of the control villages/ GPs in the past 4-5 years.

Cropping intensity & Cropping Pattern

Cropping intensity

As per figures of Uttarakhand Agriculture department the cropping intensity for the hills of Uttarakhand is 151.93 %. Their figures also show that the area irrigated by *guls* and channels

in the Uttrakhand hills is more than the area irrigated by canals constructed by irrigation department. More often the water from natural springs and perennial *nullas* is being tapped by the farmers by constructing *kuchha guls*. Seepage loss from these *kuchha guls* has been high and farmers were able to utilise only a part of its capacity. One of the most important interventions in UDWDP has been the lining with cement concrete and repair of these *guls* and constructing new channels wherever possible. The net area under irrigation has increased by almost 25% out of which over 80% has increased from these channels. The increase in irrigated net area has increased the cropping intensity over this area which is now approximately 180% in the increased irrigated area. Due to increase in quantity and duration of water available the irrigated area in many places is being used to grow vegetables and cash crops.

Cropping pattern

The main cereal crops are rice (as Kharif crop) and wheat (as Rabi crop). The other crops are maize and mandua *(Eleusine coracana)* in food grains, urad (*Phaseolus mungo*), gram, pea, masur (*Lens culinaris*), rajma (*Phaseolus* spp) and gahat (*Dolichos biflorus*) in pulses and mustard, soya bean, groundnut in oil seeds. The influence of the monsoon on the cropping pattern is pivotal; of the total cropped area about 70 to 75 per cent is under 'Kharif' or rainy season crops[6].Over a period of two years farmers usually take three crops leaving land fallow in one crop season.

On un-irrigated land, kakun (*Setaria italica*) and til (*Sesamum indicum* - oilseed) are grown mixed with paddy, whereas all pulses except masur *(Lens culinaris)*, pea, and rajma *(Phaseolus* spp*)* are grown mixed with finger millet. Masur (*Lens culinaris*) and toria (*Brassica campestris*) are mixed with wheat, barley (*Hordeum vulgare*) or may also be grown as pure crop. On irrigated land Urad (*Phaseolus mungo*) and finger millet is also grown on field bunds with paddy. The distinctive feature of cropping patterns in scattered holdings in the hills is the '*sar'* pattern (growing of the same type of crop on a portion of village agricultural land by all farmers). On irrigated land the cropping pattern is different as the land is not left fallow and wheat and rice are grown alternately.

GD analysis reveals that there have been significant changes in cropping patterns across most of the GPs. A general shift towards wheat, rice and vegetables is observed. This shift could be attributed mainly to improved availability of irrigation, promotion of high-yielding varieties of crops and other interventions such as compact area demonstration, poly- houses and poly-tunnels.

In GPs like Pipli Nigalti, Akhodia Naugaon, Kheskande and Kawagadhi, the cropping pattern in some parts of the land has changed from paddy – wheat to paddy – vegetables or wheat – vegetables. In some other GPs like Kamla, Koti, Kandargaon, traditional varieties have been replaced by improved varieties of wheat and rice. In GPs like Pau, Simalkanya, Banelagoan, Thaina, and Khaikot Malla, farmers were earlier taking one/two crops a year (wheat –paddy/maize – fallow); presently they are taking 3 crops a year (paddy/wheat/maize – vegetables – vegetables). This shift towards vegetables has taken place wherever irrigation facilities have been made available. Tomato and pea are the two major vegetables which have a high adoption in all of the sampled GPs. Local varieties of turmeric which have a long gestation period of 22 months were replaced by new varieties which had a gestation of only 10 months. Growing of vegetables for domestic consumption

6 Planningcommission.nic.in/reports/sereport/ser/imi_aibp.pdf accessed on 25th Jan.

was observed in majority of the RVs due to availability of improved and suitable seeds. A switch over to cash crops like ginger, potato, garlic, pea etc. was also observed not only on the irrigated but also in the un-irrigated agricultural land.

The introduction of new crops, such as peas, ginger, flowers, potatoes and other vegetables also showed a very positive impact in small localised areas. There are also opportunities for further expansion of these off-season vegetables and cash crops since the higher cash returns are encouraging their wider cultivation.

There have been no major changes in cropping pattern in any of the control GPs. The main crops have maintained their relative shares in gross cultivated area. Nevertheless, farmers have shifted to HYV/improved varieties of paddy, maize and urad (*Phaseolus mungo*).

Sustainability

Most of the interventions undertaken under the agriculture and horticulture component have strong potential of sustainability. For instance, minikits has been effectively utilised by almost all the farmers and wherever the productivity has substantially increased the farmers have retained the seeds to be used for the next agriculture season. High yielding varieties of paddy and wheat has performed significantly well in most of the sampled GPs as compared to other high yielding varieties. Similarly, high yielding varieties of vegetables and cash crops particularly tomato, potato, garlic, ginger, turmeric, pea and other vegetable crops have performed well in most of the GPs and in some of the GPs farmers have earmarked certain portion of their lands only for vegetables cultivation in all the three seasons. A switch over to cash crops was observed not only on the irrigated but also in the un-irrigated agricultural land. Hence, the high level of adoption of vegetables and retaining the improved varieties of seeds for the next agriculture season is an indicator of sustainability of intervention like distribution of minikits.

Another effective intervention has been the introduction of compost pit where the increase factor has been 30 fold as compared to the baseline scenario. Since the project intervention did not solely focus on promotion of vermin compost/ bio compost but also created awareness regarding organic practices among the village community, the sustainability factor of this intervention seemed to be quite high.

Poly house/poly tunnel was found to be effective in facilitating good seed germination and protecting the plants from adverse climatic conditions even in high altitudes GPs. Farmers also earned additional income by selling vegetable seedling to other farmers. The popularity of poly house/ poly tunnel has been reflected in more farmers demanding for this intervention in their farm lands.

Recommendations

Some of the recommendations identified for the agriculture and horticulture component based on the impact assessment are as follows:

- Small and scattered agricultural holdings made compact area demonstration a difficult proposition. Hence, considering the small and scattered land holdings in the hilly areas the ceiling of the mandatory 0.04 ha of compact land parcel needs to be relaxed.

- Preservation of vegetables and cash crops for longer duration is a limitation in the remote areas. Some of the valleys have started commercial production on larger scale and will need some kind of support from the govt. for construction of cold storages of small sizes. With continuous supply of electricity this should now be possible. And can be considered under the component of post-harvest technology.
- Winnowing fans have been very helpful in separating chaff from the grain which otherwise takes long time as the women have to depend on the flow of natural wind. The federations formed under the project can be encouraged to supply winnowing fans to more farmers. Similarly other activities which can be provided by the federation include supply of spray machines, small tractors, pump sets for water lifting etc. which can benefit the farmers to a great extent.

Conclusion

1. The overall increase in area (ha) over baseline of improved varieties and high value crops is about 21% as against the outcome indicator of 10% increase in area. Similarly the net value of produce realised by farmers in treated areas increased by 27% as against the outcome indicator of 15% increase in net value. There has been an increase in productivity of all major crops on irrigated lands. New improved varieties of soya bean, cauliflower and french beans also recorded high productivity on un-irrigated lands. Traditional crops have been replaced by improved varieties particularly where irrigation facilities have been created. Further, fallow land and un-irrigated land has been brought under cultivation particularly of improved varieties and high value crops wherever irrigation was available. Hence the project has been able to meet the larger objective of improving agricultural productivity leading to improvements in living standards of rural communities.
2. An effective agriculture intervention has been the introduction of compost pit, where the increase factor has been 30 fold as compared to the baseline scenario making it the most popular input to improve the quality of manure. Adoption of improved seeds for agriculture and use of bio-fertilizer has also increased 10 fold in the sampled GPs.
3. Agriculture terraces in hills are prone to damage by heavy rains during rainy season. Marginal and small farmers find it difficult to repair them in time resulting in loss of production. The support provided under the project for this activity proved to be of great help in maintaining the soil cover and productivity. On a few individual holdings repair of agriculture terraces have led to inclusion of abandoned land in the cultivated area.
4. In the project area most of the land is un-irrigated resulting in poor crop production. Even the available irrigation sources largely remained untapped. Under the project, there was great stress on provision of irrigation by way of renovation of old *guls*, construction of new irrigation channels, construction of irrigation tanks and water harvesting tanks which resulted in bringing more area under irrigation. This encouraged the farmer to introduce high yielding varieties of agriculture and vegetable crops. This also resulted in switching over from cultivation of traditional agricultural crops to cash crops.
5. Minikits have been utilized by almost all the farmers. Farmers in all the GPs where the productivity substantially increased have retained the seeds to be used for the

next agriculture season. An important spin-off benefit of adopting the new varieties was the increased availability of fodder due to increased amount of agro-waste.

6. High yielding varieties of vegetables and cash crops particularly tomato, ginger, turmeric, pea and other vegetable crops have performed well in most of the GPs mainly due to availability of irrigation facilities and other interventions such as poly-houses and poly-tunnels. A switch over to cash crops was also observed not only on the irrigated but also in the un-irrigated agricultural land. In some of the GPs farmers have earmarked certain portion of their lands only for vegetables cultivation in all the three seasons. Small farmers who have benefited due to irrigation have largely switched over to vegetables cultivation due to the commercial value of the crops. Although line sowing resulted in minimum wastage of seeds and good seed germination, the farmers found this method to be suitable only for mono-cropping and for mixed cropping the farmers still preferred to adopt broadcasting method. Moreover, they opined that line sowing is time consuming and labour intensive.
7. The use of improved implements through draught power has not changed much in the post-project scenario. In the hilly areas, the farmers relied on draught power rather than any other mechanised source mainly due to availability and suitability of draught power and difficulty in carrying the mechanized means from one terrace to other. However, some of the improved agricultural implements such as hand hoe, sickles, nap sack sprayers etc. also need to be promoted for better farming practices.
8. Communities were encouraged to establish orchards on fallow lands or/and on the lands which were not suitable for agriculture. Orchards were also established on less productive and slopy agriculture lands. The survival rate in community orchards were between 65-70%.
9. Homestead plantation recorded a survival rate of 75 to 80% and was found to be better as compared to orchard plantation due to their proximity to the house where the plants were better protected
10. Poly house/poly tunnel was found to be effective in facilitating good seed germination and protecting the plants from adverse climatic conditions even in high altitudes. The crops that have been typically grown are tomato, capsicum, cauliflower and other new varieties of cash crops which typically showed high increases in productivity over the baseline. Several GPs which showed successful adoption of poly house are also those that showed high increases in irrigated area. Farmers also earned additional income by selling vegetable seedling to other farmers.
11. Post- harvest technologies like grading and packing have had considerable impact on the increase in prices of vegetables. The processing centres established under the project to promote agribusiness are a welcome change as the neighbouring farmers can also sell their surplus and get good prices close to their home. Processing centres are not only engaging the local human power but are also upgrading the skill of women folk in grinding, packing, grading, preservation etc. Some of the centres are performing very well their products under different trade names and are becoming popular in local and outside markets.

5. Agribusiness

Introduction

Agribusiness interventions in UDWDP have been undertaken with the aims of farming system improvement, value addition and marketing support, and income generation. The component focuses on farm based livelihood activities in selected villages of the project area.

The activities undertaken in this component include the following:

1. Dissemination of technology and provision of advisory services
    a. Promotion of improved variety technologies and techniques
2. Production and distribution of quality seeds and seedlings
    a. Improved variety seeds
    b. Support for traditional crops
3. Establishment of linkages between FIGs (Farmers Interest Groups) and suppliers, for processing and marketing of off-season vegetables and high value crops
    a. Promotion of FIGs
    b. Formation of Farmer Federations
    c. Market linkages

Assessment of Impacts

Strategy and approach for promotion of agribusiness

Divisional Support Agencies (DSAs)

Six specialized agencies, Divisional Support Agencies (DSAs), have been hired under the project to provide support for value addition and marketing, and to develop forward and backward linkages. The DSAs are working in six of ten DPD Divisions. In the two P-NGO (Partner-NGO) Divisions the work is being carried out by the P-NGOs themselves; P-NGOs ASEED (Asian Society for Entrepreneurship Education and Development) and INHERE (Institute of Himalayan Environmental Research and Education) have their own agribusiness experts. While in Vikasnagar and Lohaghat Divisions, agribusiness consultants have been hired. The position of sale of different products under agribusiness and the value realized is given in table 5.1.

Table 5.1 DSAs hired for agribusiness promotion

S.No.	Name of Divisions	Quantity marketed (Tonnes)	Value (in lakh Rs.)	Remarks
1	Chinyalisaur	800.38	80.94	Under DSA – Himalayan Action Research Center (HARC)
2	Gairsain	63.41	4.27	Under DSA – HARC

S.No.	Name of Divisions	Quantity marketed (Tonnes)	Value (in lakh Rs.)	Remarks
3	Augustmuni	227.60	35.20	Under DSA – Center for Business and Entrepreneurial Development (CBED)
4	Gangolihat	241.00	52.22	Under DSA – Society for Uttaranchal Development and Himalayan Action (SUDHA)
5	Bageshwar	44.36	72.17	Under DSA - Gramin Evam Krishi Vikas Samiti (GKVS)
6	Nainital	61.52	10.64	Under DSA – Central Himalayan Environment Association (CHEA)
7	PNGO (Almora)	52.35	6.34	-
8	PNGO (Garhwal)	3.00	2.75	-
9	Vikasnagar	287.21	22.50	-
10	Lohaghat	29.00	5.02	-

Source: Watershed Management Directorate and TERI Primary Survey, 2011

Most DSAs started their activities in their respective Divisions in 2008. The DSAs were assigned the following tasks:

1. Identify potential niche market opportunities
2. Establish links with private sector entrepreneurs who could help in exploiting the market potential
3. Disseminate appropriate information and technology to farmers to help them to enter into production
4. Co- finance with farmers (on a one time subsidy basis) for establishment costs.
5. Co- finance with private sector entrepreneurs (on one time subsidy basis) for storage, processing and marketing infrastructure needed to exploit the market potential.

The performance of DSA was better where project activities were started in the early phase of UDWDP (2004-05, 05-06). Due to networking and forward and backward linkages established by DSAs, their performance has been good. They have detailed village wise status of agribusiness and have made production plans for *Rabi* and *Kharif* crops, which helped in forward and backward linkages.

Dissemination of technology and provision of advisory services

Promotion of improved technologies and techniques

The improved technologies and techniques used to promote agribusiness are: organic farming, water lifting, water harvesting, mulching, light trap, mehal grafting, line sowing, IPM, agri-clinic, HDP (High density polythene) pipe, LDP tank, poly house, poly tunnel, drip/sprinkler irrigation, agri-clinic, agriculture and horticulture mini kit. The pre harvesting techniques promoted are: nursery raising, line sowing, seed treatment, seed selection, plant protection, staking. The post harvesting techniques promoted are: grading, packing, transportation, preservation, drying, cleaning, and vacuum packaging. Modern farming equipment was also used. These are: power tiller, high sped spray machine, mandua *(Eleusine coracana*), thresher, paddy thresher, double line seed drill, hand hoe, fork, line maker, rack, plastic packing crates.

Production and distribution of quality seeds and seedlings

Improved variety seeds

High value crops and improved variety seeds have been introduced under the project. During survey beneficiaries reported that certain varieties performed well. Hybrid seeds were used for vegetables like cabbage, capsicum, brinjal, *chappankaddu* (long gourd). The performance of vegetables like tomato, French bean, capsicum, and pumpkin was rated to be high by the beneficiaries. The improved variety/seeds that have performed well are given in table 5.2 below.

Table 5.2 List of seed varieties that have performed well

Crop	Improved variety/ Variety that has performed well
Potato	KufriJyoti
Ginger	Manjula
Garlic	Yamuna Safed
Onion	Green Found, and local varieties
Capsicum	Tanwi, Green Diamond
French bean	Phalguni, Anupama
Rajma (*Phaseolus* spp)	Chakrata
Pea	Arkil
Turmeric	Swarna
Chilli	Jwala
Coriander	Panipat Special

Crop	Improved variety/ Variety that has performed well
Gehat (*Dolichos biflorus)* and Urad (*Phaseolus mungo*)	Local Variety

Source. TERI Primary Survey, 2011

Support for traditional crops

DSAs surveyed the traditional crops (both cash crops and vegetables) that were being cultivated in the area before the project. Support for cultivation of these was also enhanced by the following means:

1. Technical guidance for prevention and cure of common diseases
2. Finding better market
3. Selecting more suitable seed varieties

Appropriate seed varieties of turmeric, ginger, potato, garlic, rajma (*Phaseolus spp*) etc. were introduced for the purpose of better production and prevention of diseases. Local turmeric, which earlier could be harvested after two years was replaced with a variety, which could now be harvested after ten months. Traditional varieties of potato which were prone to diseases were replaced with more resistant varieties. The know-how for prevention and control of diseases was also provided alongside. Ginger, garlic and rajma (*Phaseolus spp*) were replaced by varieties that had more per hectare production. Products like rhododendron juice, malta (*Citrus sinensis*) juice, mandua *(Eleusine coracana*), chaulai (*Amaranthus tricolor*), and gahat (*Dolichos biflorus*) are also being sold in markets for their curative and nutritive value. Mandua *(Eleusine coracana*), gahat (*Dolichos biflorus*), chaulai (*Amaranthus tricolor*) which are purely organic in nature and were earlier bought by middlemen at throw away prices from the farmers in the villages and then sold at a much higher price outside, are now marketed with better sale price at the village level, that is, the farmer can now sell at a higher price at the village level itself.

Establishment of linkages

Promotion of FIGs

Farmer Interest Groups (FIGs) have been formed at Revenue Village (RV) level in project villages that include all those farmers who are adopting new technologies and improved seeds from the project to increase their production. The FIGs help farmers to promote their access to production and marketing services. The DSAs were instrumental in the formation of FIGs, and were supported by WMD field functionaries. FIG membership may vary from 5 to 20. The members contribute a token money per month that is saved as revolving fund. From interactions during the primary survey, it was gauged that the initial response to the formation of FIGs was slow. However, as the produce of off-season vegetables and cash crops increased and farmers started selling the surplus, formation of FIGs stepped up.

The DSAs prepared production plans for different crops and vegetables for both *Rabi* and *Kharif* crops. This was done in advance (as a forecast) upon assessing the production through FIGs. The production plan also helped in assessing the seed requirement of farmers which could be procured and distributed before time. The expected production of various crops helped DSAs to establish forward and backward linkages for sale. Technical knowhow

was also provided to farmers, which helped in deciding the variety of seeds and crops to be given for a particular area. The experience gathered in the earlier years also helped in selection of seed varieties and crops. Seeds that did not succeed in a particular area were eliminated. Irrigation facilities created under the project also encouraged farmers to take up suitable new varieties of vegetables and cash crops.

A total 95 FIGs have been formed in the sampled GPs with a total membership of 1382 (See Annexure 7). About 40% of the membership is constituted of women. Out of the total 95 FIGs, 12 FIGs remained to be federated (at the time of the survey) with any of the Farmer Federations and 3 were yet to be functional.

Formation of Farmer Federations

FIGs joined together at the cluster level to form a Farmer Federation (FF) that is registered under the Uttarakhand Self Reliant Cooperative Act, 2003. The number of FFs in a Division depended upon production, the number of FIGs and the geographical location of the area. The number of FFs in different Divisions is given in table 5.3 below. The FFs establish market linkages, and also help in processing, grading, and packaging for value addition. The profit earned is used to run the FF and also to help farmers in procuring seeds, equipment, fertilizers, insecticides, technology etc. Under the project many of the services are being provided free to the farmers. For instance, the cost for machinery, or the use of building space for the processing centre is not charged to the farmer. However, post project these services will be on payment basis and farmers will have to pay a rent. Thus, this will have a bearing on the price at which the produce is bought by the FF from the farmer. The price will change from the present price, as some of the service charges will be included.

Table 5.3 List of Farmer Federations (FFs) in the project

Division	Number of Farmer Federations
Gairsain	2
Augustmuni	4
Chinyalisaur	5
Vikasnagar	3
Kotdwar	1
Nainital	1
Dwarahat	3
Bageshwar	2
Champawat	3
Pitthoragarh	3
Total	**27**

Source: Watershed Management Directorate, August 2011. UDWDP: Agribusiness Interventions

Market linkages

Through the FFs, farmers have been linked to *mandis* (markets) and buyers to which their produce is directly sold. A list of *mandis* and buyers where the produce is being directly sold is given in table 5.4 below. The products being sold marketed from the sample villages are: off- season vegetables, cash crops such as ginger, potato, garlic, onion, and other products such as mandua *(Eleusine coracana*), cholai (*Amaranthus tricolor*), rajma *(Phaseolus* spp*)*, urad *(Phaseolus mungo)*, gahat (*Dolichos biflorus*), turmeric, chilli powder, coriander powder, ginger powder, tulsi *(Ocimum sanctum)*, malta *(Citrus sinensis)* squash, rhododendron juice, hill lemon, soyabean (*Glycine max*), jhingora (*Echinochloa crusgalli*)), *kaalabhat* (black soyabean).

Table 5.4 List of *mandis* and buyers for direct sale of produce/products

Name of mandi / buyer	Location
Keshavpur, Okhla and Azadpur*Mandis*	New Delhi
Mother Dairy	New Delhi
Green Fresh	New Delhi
Geo Fresh	New Delhi
Himalayan Trading Company	Almora
Navdanya Foods	Dehradun
SOS Organics	Almora
Ferocon Pvt. Ltd.	Dehradun
Garhwal Mandal Vikas Nigam	Uttarakhand
Local *Mandis*	Dehradun, Vikasnagar, Roorkee, Rishikesh, Haldwani, Nainital
Dilli Haat	New Delhi
India International Trade Fair	New Delhi
Saras Fair	Dehradun

Source: TERI Primary Survey, 2011

Table 5.5 below gives brand names of the products being sold under agri-business in the project area.

Table 5.5 Brand names of products being sold under agri-business in the project area

Division	Brand name
P-NGO –Pauri	Gramya Fresh
Gangolihat	Hill Fresh
Vikasnagar	Jaunsar Fresh
Chinyalisaur	Garh Kalau
Augustmuni	Mandakini Valley Fresh
Gairsain	Gairsain Fresh
Nainital	ParvatiyaShudh
Bageshwar	Sarmool Fresh
P-NGO Almora	Himalayan Fresh
Champawat	Gramya Masala

Source: Watershed Management Directorate, August 2011. UDWDP: Agribusiness Interventions

In the sampled GPs 1809.83 tonnes of various agricultural products of the total value of app. Rs 292.05 lakhs have been marketed. The products marketed were largely vegetables and cash crops. Traditional crops grown in hills like finger millets, potato, rajma (*Phaseolus* spp), burnyard millets, soyabean (*Glycine max*), gahat (*Dolichos biflorus*), urd (*Phaseolus mungo*), arbi (*Colocasia* spp), Chaulai (*Amaranthus tricolor)* were also marketed with linkages formed under the project. Products like wheat, rice and milk were reported as being marketed from only 3 of the sampled GPs. Off season vegetables got higher rates with agribusiness support. Rhododendron juice extracted from wild flowers has also found a market with good returns. The marketing of fruits such as malta *(Citrus sinensis)*, *pahadinimbu* (hill lemon) that has good potential to fetch higher sale value can be also be explored.

Certification

Certification of quality has been acquired for products being marketed under the agribusiness component. In Kotdwar and Dwarahat, where P-NGOs are operating, FPO (Food Product Order) numbers have been procured for the products that are being marketed under the brand names. In Garsain Division, Agmark certification has been received. While in 4 other Divisions FPO certification has been applied for and in 3 other Divisions, Agmark certification is under process.

Convergence

Convergence with state government departments for agribusiness promotion has been helpful in few cases. The organic certification by Uttarakhand Organic Commodity Board in

Dehradun for the benefit of 122 farmers in Augustmuni Division covering 74 hecatres within the project area has set an example for other GPs.

The setting up of the processing centre at Ghandalu, Kotdwar Division is also a unique example of convergence activity. The building for the centre was constructed under the District administration budget, the costs for interior design, equipment and packaging material were provided under UDWDP and the approach road to the centre was constructed under the local MLA fund.

Benefits

The promotion of agribusiness has led to the following benefits:

1. There has been an increase in yield of produce due to provision of inputs like improved seeds, improved irrigation, IPM etc.
2. Input costs have decreased due to improved technologies like line sowing, selection of appropriate seed varieties, timely sowing etc.
3. Integrated Pest Management (IPM) has been practiced in many of the project areas, resulting in decrease in crop diseases, and thereby increasing the yield of the produce.
4. Irrigated and un-irrigated lands where traditional farming was being practiced have been converted to cultivation of vegetables and cash crops, resulting in increased income for farmers.
5. Preparation of production plans by farmers has helped in establishment of backward and forward linkages for sale of the agricultural products.
6. Agribusiness interventions have improved the understanding of farmers about sale procedures in *mandis.* The farmers were earlier unaware about sale in local and outside *mandis.*
7. Market demand was assessed in advance in local and outside markets and the products were grown accordingly, which helped in quick returns.
8. Farmers who were dependent on single buyers such as middlemen of local *mandis* had access to other buyers, thereby having access to competent prices for their produce.
9. Local markets where produce used to come from outside, are now able to receive production from the farmers which has facilitated increased supply to local buyers.
10. Some produce became popular due to better quality such as Daski tomato in Delhi *mandis*.
11. FFs were instrumental in sale of different village products in local and outside markets.
12. Processing Centres established in different Divisions for different products offered opportunities of employment to women and also fetched better prices as a result of value addition.
13. Seed certification in 12 villages of Gangolihat Division by the efforts of DSA SUDHA for paddy, mandua, wheat, *gahat*, has led to better sale price for these crops in those villages.

Case Studies

Ghandalu, Kotdwar Division

Ghandalu is a Revenue Village and GP located in Kotdwar Division. The farmers of Ghandalu and seven neighbouring villages, namely, Bargadi, Seeladanda, Pulyansu, Barsuri, Bakhrodi, GuinBada and Utinda were grouped in eight different FIGs, which were federated into the "Gramya Kissan Bahudeshiya Sawayat Sahakari Samiti". The members of the FIGs were provided with 10 – 15 hybrid citrus fruit plants and high yielding varieties of vegetables like chilli, onion, potato, tomato, tamarind and ginger were also introduced. At the same time improved technology like polyhouse, vermicomposting were also introduced. The members of the FIGs were also trained on timely harvesting and storage, and marketing with better prices.

The GP has a processing centre run by the Federation. The setting up of the processing centre is a unique example of integration of different State Government departments. The building was constructed under the District administration budget (6.8 lakh rupees), the costs for interior design, equipment and packaging material were provided under UDWDP (app. 20 lakh rupees), and the approach road to the centre was constructed under the local MLA fund. A multi utility centre has also been made in close vicinity of the processing centre with UDWDP funds. The processing centre was set up in the financial year 2009-10 and production started in January 2011. The Farmers Federation is registered under the Uttaranchal Cooperatives Societies Act, 2003 and the centre has got FPO (Food Product Order) no. A1315. It is a home scale processing centre (category B) with processing unit of 10 metric tonne yearly capacity.

The centre produces juices, squash and pickles and other products from local produce under the trade name of "Gramya Fresh". It is also processing spices such as Dhaniya, Haldi & Mirch. The centre also purchases local pulses and grains, and sells them after cleaning and grading under the brand name of "Gramya Fresh". Some of the typical local products that have medicinal & nutritive values, being processed are: *Kanali* (nettle plant) soup, pickles of Timala (*Ficus roxburghii*) and Genthi (*Dioscorea* spp), soup of Vasinga (*Adhatoda vasica*), Ghritkumari (*Aloe vera*) juice, Patharchata (*Sexifraga* spp) juice and *Chyawanprash*.

The centre is buying local produce from farmers at higher rates (compared to market rate) and sells the products at its own risk. The profit is utilized in strengthening the centre and paying better wages. Pine needle briquettes are also made here for which the equipment has been provided by UDWDP. At the time of survey, 20 kg briquettes were in storage.

"Gramya fresh" products are sold in the local market and outside markets like Lansdowne, Pauri, and Saras Fair in Dehradun, Dilli Haat and India International Trade Fair in Delhi.

Mr.Surman Singh Rawat of village Ghandalu is the Chairman of this Federation, and is assisted in daily operations by Dharmendra Singh Rawat, who works as a Food Technologist, a trained and experienced local youth. Between 10 to 20 local women, are engaged as labourers and are paid Rs 100/- to 120/- per day as wages. Up to November 2011, the centre made a sale of Rs 3 lakhs and spent Rs 1 lakh on raw material and labour.

Gairsain, Gairsain Division

Agribusiness programme in Gairsain, Chamoli, was initiated in 2007 through the Gairsain Fruit and Spices Production Autonomous Cooperative (Gairsain Phal Avam Masala

Utpadak Swayat Sahkarita). The project has provided beneficiaries with high value crops such as turmeric, ginger, garlic, coriander, chilli, etc., and locally available citrus fruits like malta (*Citrus sinensis*), hill lemon. The aim of the established co-operative is not only provide market to these crops but also to add value by developing the various products under a brand name for marketing. Raw materials in the form of dried spices, fresh fruits are procured from the farmers at market prices, and these undergo value addition, either pounded and ground (in case of spices), or processed into marmalades, jam, pickles in case of fruits and vegetables.

The members of the Cooperative are spread over more than 25 villages involving 895 farmers and 48 FIGs (till March 2011). The value added products are marketed under the brand name *'Gairsain Fresh'* and then made available in the local market as well as in nearby areas of Karnprayag, Gopeshwar, Devprayag, Dehradun, and even Delhi. The main products which are marketed are turmeric powder, ginger powder, garlic powder, coriander powder and chilli powder.

The important feature of the Cooperative is the substantial incentive that people receive in the form of reverse benefit. This system works by providing farmers generally a locally prevalent market rate for the raw materials. The profit generated after selling the value added product developed by the Cooperative is shared with the members. The Cooperative retains 30% of the profit for operation and maintenance and the remaining 70% is shared among the farmers. For example, 530 kg of dried turmeric were procured from 86 farmers at Rs. 60/kg, the prevailing market rate offered by the buyers in the open market in 2010. After value addition and sale, the Cooperative earned a profit of Rs. 69,014 on the produce, of which 70% of the amount, Rs. 48,309.80, was shared as reverse profit among the 86 farmers in February 2011. The total amount accounted to Rs.98/kg per farmer. The programme is, hence, envisaged to sustain itself working on the principle of reverse profit which benefits all the farmers. The table 5.6 below shows the flow of profits from selling the value added products.

Table 5.6 Benefit flow from sale of value added product (Gairsain case study)

Year	Raw material (Rs. Lakh)	Value added product (Rs. Lakh)	Profit (Rs. Lakh)
2008-09	0.86	2.26	1.4
2009-10	2.68	7.04	4.36
2010-11	2.09	5.5	3.41
2011-12 (till Oct. '11)	0.8	2.4	1.6

Source: TERI Primary Survey 2011

In addition to the cost of the raw materials for value addition, capital costs, labor charges, etc. are also incurred, the details of which are given below in table 5.7.

Table 5.7 Capital and O&M Cost of Agribusiness (Gairsain case study)

Input	Cost (One-time) (Rs.)	Annual Cost (Rs.)	Life-span (years)
Pulverizer	45,000	2,250	5
Motor	10,000	NA	9
Sealing machine			
Band-tight	25,000	NA	5
Vacuum	70,000	NA	5
Storage bins	25,000	NA	20
Cross air-flow dryer	70,000	NA	10
Packaging		1,80,000	NA
Shed	40,000	NA	20
Labor	NA	36,000	NA
Misc.	NA	12,000	NA
Conveyance			
Raw materials	NA	10,000	NA
Finished products	NA	10,000	NA

Source: TERI Primary Survey 2011

The success of this programme has also induced other farmers from adjoining areas (non-members of the co-operative) to sell their crops to the co-operative. Efforts are also being made to expand the co-operative and undertake grading and 'vacuum packing' of surplus crops like *tor*, soyabean, *gahat (Dolichos biflorus)* , lal chawal (*Oryza* spp), etc., which will substantially benefit the farmers and serve as an incentive for the stakeholders to sustain the programme.

Sustainability

Though the result of agribusiness is encouraging, it is still in initial stages and will need support of the state government for improved seed, biopesticides, biofertilizers, improved implements and technologies etc. It would be important to dovetail these activities with the concerning State Government Departments, Krishi Vikas Kendras (KVK) and institutions like Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Bharsar Universitys and Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora to sustain and enhance productivity. The formation of FIGs and FFs is also a significant step towards sustainability of improved farming practices.

Recommendations

FIGs and FFs formed under agribusiness have taken off well in all the areas where surplus for marketing is available. Vegetables and cash crops have given it a good start. FFs have been registered under the Uttarakhand Self Reliant Cooperative Act, 2003. The FFs can be effective and transparent only if FIGs remain active, as they are at the producer end. While the FIGs can remain active as long as the farmers get competitive prices and hence, good profit. It would be important for the state government to continuously monitor the FFs and provide support and incentives to FIGs so that the activities of FFs can be enlarged to cover other products like milk and milk products, fruits and other local products that are popular with migrants of Uttarakhand in Delhi as well as in the cities of the state.

Conclusion

The input support of agribusiness under the project is to the tune of Rs. 13000/- per hectare (to a FF). The inputs provided include quality seeds, biopesticides, biofertilizers, biocompost, polyhouse, polytunnel, plant protection equipment, packaging material, plastic crates for packaging and transportation, weight machines etc. Primary survey results show that the best performance of agribusiness has been in those Divisions where DSAs have been hired. P-NGOs had their qualified agribusiness experts to perform agribusiness activities in their areas. In the two Divisions of Vikasnagar and Champawat where agribusiness experts were engaged by the WMD under the supervision of DPDs, the forward and backward linkages have not yet been developed as strongly as those by DSAs.

Formation of FIGs and FFs in areas where surplus produce is available or is likely to be available in the near future for sale will go a long way towards sustainability of improved farming practices. The motivation of financial profit, however, will remain as a guiding factor for agribusiness activities in future. Benefit computation of agribusiness is given in Chapter 10 (Table 10.8).

6. Livestock

Introduction

In Uttarakhand, next to agriculture, livestock is the largest employment sector. Traditionally, animal husbandry is complementary to agriculture and supplements household incomes in rural areas. Over 70% of the work force is involved with livestock either as owners or as hired labourers. Approximately 80% of rural households in the state earn over a third of their income from livestock. Livestock provide draught power and organic manure for agriculture, fuel (in the form of dung cakes) for cooking, and nutrition (in the form of protein-rich milk, eggs and meat).

The weaker sections of rural society are greatly dependent on livestock for their varied domestic needs. To these deprived sections, livestock provides a safeguard against unforeseen financial hardships as well as means to supplement domestic requirements. Livestock rearing is generally a woman-centric economic activity in the state.

In Uttarakhand, the number of cattle almost equals the members of a household. But each family's small landholdings do not support the inordinate number of animals. Hence, most of the livestock is left to graze in the open on community pasturelands, other common lands and in nearby forests. The grazing of livestock on fragile land causes serious damage to the ecosystem and leads to soil erosion. Most of the cattle in the hills are scrub cattle, surviving on low levels of nutrition. Although disease resistant, they produce small quantities of milk. The low milk yield is also attributed to the lack of availability of good quality and sufficient fodder in the area.

The objectives of the Livestock component as envisaged under Gramya were to:

- reduce the livestock pressure on fragile lands by reducing the extent of open grazing and encouraging stall feeding of cattle
- improve the productivity of livestock by upgrading local animals and providing better feed management practices including health care
- improve the contribution of the livestock sector to natural resource management

The benefits envisaged under the Livestock component aligns to the second component of the overall Project Development Objective viz. 'enhancing livelihood opportunities', the sub-components of which are:

- farming systems improvement
- value addition and marketing support
- income generating activities for vulnerable group

The outcome indicators to measure the second component of the PDO relevant to the livestock component of the project as given in the PAD are:

- 10% increase in fodder production over baseline
- 1% increase over baseline in number of improved breed (number of cows in sample households)

Interventions

To attain the objectives of the livestock component the following activities have being undertaken in the project area:

1. Breed Improvement Programme:
    a. Establishment of Natural Breeding Centres (NBCs)
    b. Para Veterinary Centres (with four month training)
2. Health Care Programme:
    a. Livestock camps/shows
    b. Vaccination campaign
    c. Castration of scrub bulls
3. Stall Feeding Programme:
    a. Construction/demonstration of animal shelter/shed
    b. Construction/demonstration of livestock mangers
    c. Distribution/demonstration of chaff cutters
4. Fodder Production Programme
    a. On- farm fodder production
    b. Forage/pasture development programme
    c. Napier/fodder grass plantation or Napier crop border plantation
    d. Distribution of fodder minikits
5. Others-Livestock income generation activities

The overall achievement in the livestock sector (in the sampled GPs) is given in the Annexure 1.

The following section elaborates the various interventions undertaken under the livestock component of the project.

Breed Improvement Programme

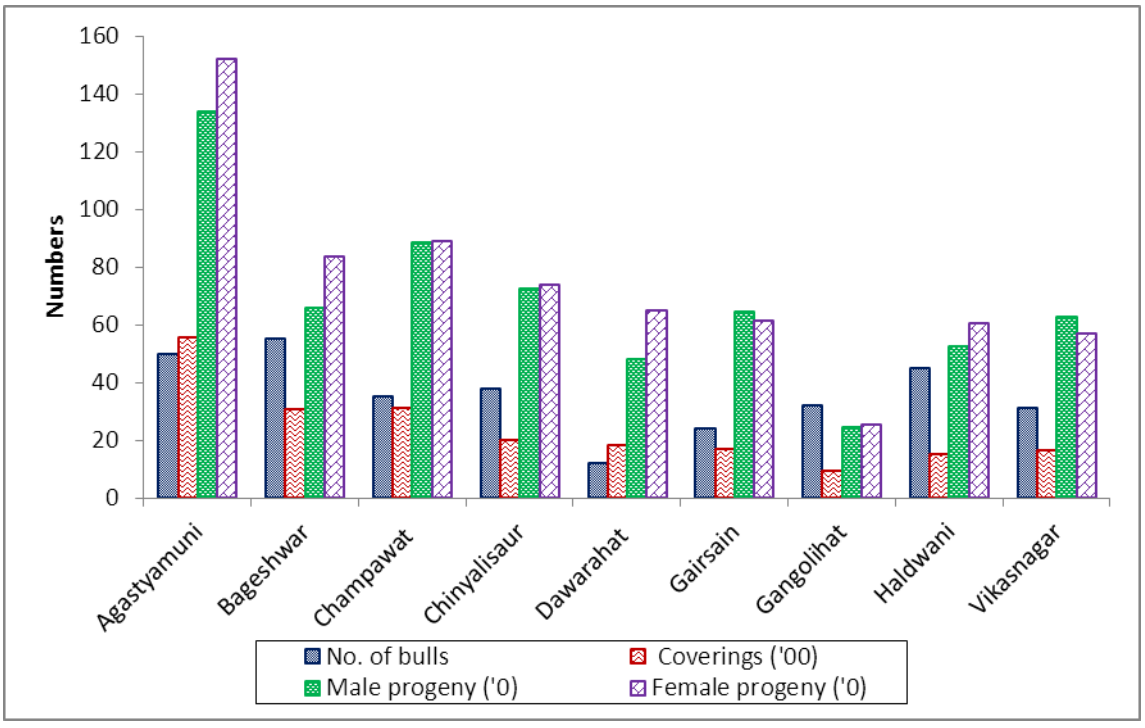
In the project area most of the livestock are indigenous, scrub cattle with low productivity. Hence, livestock breeding programme was one of the major thrust areas of the project, mainly to increase the productivity of livestock. However, some of the GPs like Jaidwar & Maror (Vikasnagar division), Kolidhek, Pau, Naskhola and Gudmangal (Champawat division), Gaid and Dhargaid (Gairsain division), Purkot (Bageshwar division), Silalekh (Nainital division), Bhent (Dwarahat division), Jagot (Augustmuni division), Andhiyari (Chinyalisaur division), and Nagdhar (Kotdwar division) already had a few improved breeds of livestock at the start of the project as was found during the household survey.

The breed improvement component of the project was taken up by establishment of Natural Breeding Centres (NBC) and to a small extent by Artificial Insemination (AI) through paravets.

Natural Breeding Centres

About 262 NBCs for breed improvement were established under the project, out of which 34 NBC units were established in the sampled GPs (see Annexure 1). By and large, one cow bull and one buffalo bull were provided in each GP, but in some GPs either a buffalo bull or a cow bull was provided.

The NBCs of male buffaloes established at most GPs (sampled) were operational and people were bringing their local cattle breeds for insemination in these centres at the time of the field survey. In some centres like Valson (Champawat division), people from the neighbouring villages were also making use of these facilities. From the group discussions during the field visits, NBCs established under the project for bulls were successful in GPs like Jagoth (Augustmuni division), Kawagadhi, (Chinyalisaur Division), Jajoli and PipliNigalti (Gangolihat division), Dungri (Gairsain division), Valson (Champawat division) and Falyati (Bageshwar division). The average number of inseminations in these centres ranged from 10 to 50. For example, the *Murra* buffalo bull at the Valson NBC was crossed with 22 local buffaloes, the *Jersey X* cow bull at Kheskande (Champawat division) produced 10 off-springs. A total of 322 buffalo bulls were introduced in NBC centres set up across the total project area and total of 21360 coverings were done. The number of offspring (improved breed) produced was 12794 (6123 male and 6671 female). See Figure 6.1 for division wise details on number of bulls introduced, coverings and progeny details for the buffalo bulls in the project area.

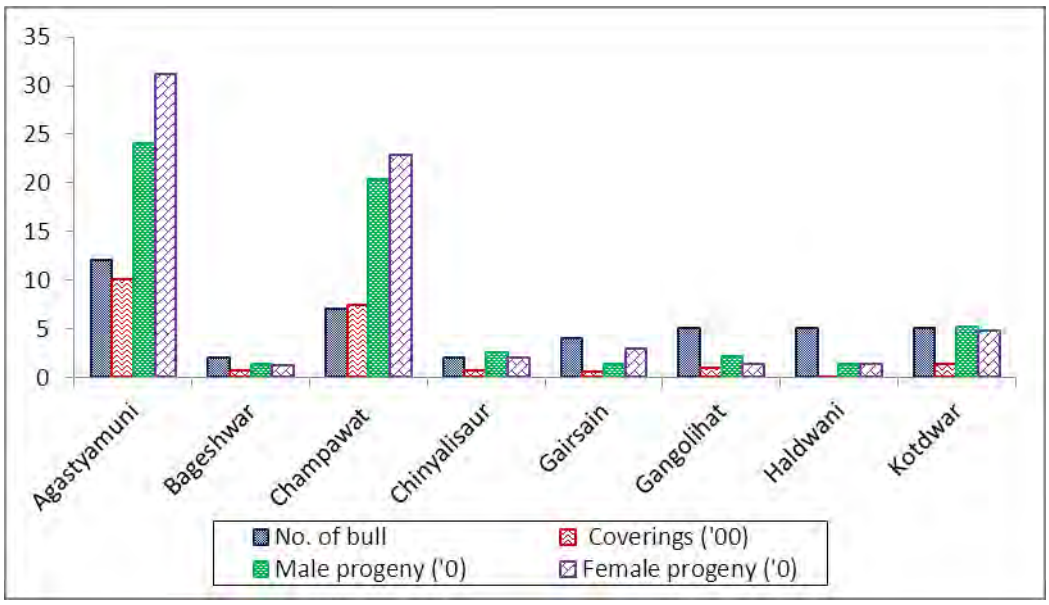


Source: Watershed Mangement Directorate Report , February 2012

Figure 6.1 Status of NBC centres for buffalo bulls

A total of 42 cow bulls were introduced in NBC centres set up across the total project area and total of 2202 coverings were done. The number of offsprings (improved breed)

produced was 1261 (584 male and 667 female). See Figure 6.2 for division wise details on number of coverings and progeny details for the cow bulls in the project area.



Source: Livestock Report, Watershed Mangement Directorate, February 2012

Figure 6.2 Status of NBC centres for cow bulls

Bucks (goats) were provided in Kamla, Thaina, and Koti (Vikasnagar division), Ghimtoli and Jagot (Augustmuni division), Gairkhet (Bageshwar division), and Dini Talli (Nainital division). A total of 123 bucks were introduced in buck NBC centres set up across the total project area and a total of 6595 coverings were done. The number of offsprings (improved breed) produced was 4542 (2249 male and 2293 female).

Few casualties were reported by the communities for bulls, buffaloes and bucks during the group discussions, which occurred due to natural causes. The Uttarakhand Livestock Development Board had made provision for replacement of bulls and bucks on the event of their death; however this was only availed in Gairsain Division. There was no separate provision for upkeep (buying of feed, healthcare etc.) of these bulls in the project. The beneficiary household was supposed to use part of the payments received against coverings done by the bull for its upkeep. However, due to less number of coverings, and payments being made after the birth of offspring, it was difficult to maintain the bull, especially if the beneficiary household happened to be economically poor. Hence, it is suggested that upkeep of bulls be made part of the NBC programme.

Paraveterinary centres and AI through Paravets

To support the breed improvement programme, 71 paraveterinary centres have also been established in the project area (14 in the sampled GPs) (see Annexure 1). Paravets were trained to treat minor veterinary cases and assist in AI. The frozen semen of *Jersey X* and *Murra* Bull were used for AI. AI through paravets was done in coordination with the Uttarakhand Livestock Development Board who rendered free services in the initial year. The main emphasis was to improve the local livestock by cross breeding with improved

breeds. Some of the important activities undertaken were provision of *Murra* breed of buffalo bull to be crossed with the local breeds, provision of *Jersey X* and *Sindhi Jersey X* cow bulls for improved milk yields, and introduction of *Barbari* goats for better milk/meat production. Buffalo bull (*Murra spp.)* and cow bull (*Jersey X* and *Jersey X Sindhi*) were procured through Uttarakhand Livestock Development Board and bucks were procured through ICAR farms, and supplied to the villagers.

Difficult geographical terrain and a large coverage area for each paravet were the limitations for this programme. It was also observed that in some situatiions, the paravets were inclined to move on to permanent employment options. Paravets also informed the survey team that there was not much demand for their services. For example, a paravet (Mr. Surender Singh) from Nai village informed that he had undergone four months training on AI, vaccination, primary health care, etc. at Kalsi and Rishikesh in 2005. Although he had saved the life of a bull that had fallen off a cliff, however there was not much demand for his services in the village.

Health Care Programme

There have been incidences of cattle suffering from foot and mouth disease (FMD) in different villages in the project area. FMD adversely affects the health and productivity of livestock. Decrease in milk production in milch animals, leads to economic losses for livestock owners. Also, the project aims to upgrade local cattle and since, genetically improved cattle are more susceptible to diseases in comparison to local animals hence a health care programme was started in the project area. Health care facilities like prophylactic treatment (vaccination and mass drencing) against major contagious diseases, livestock health camps / cattle shows and castration of scrub bulls to stop proliferation of local and low yielding males were introduced under the project.

Approximately 718 livestock health camps / shows have been organized in the project area. Vaccination against animal diseases is not common in the project area, due to lack of awareness and financial constraints. So the farmers were motivated by the technical staff of the project to vaccinate their livestock, as a preventive measure of disease control. Approximately 2,23,979 animals have been vaccinated and 6,740 castrations of scrub bulls has been achieved in the project area.

Stall Feeding Programme

In order to encourage farmers to stall feed their livestock and thereby check soil erosion caused by overgrazing on community / forest land, the programme assisted in construction of livestock mangers. To supplement the stall feeding efforts, the programme also distributed chaff cutters. It is estimated that use of chaff cutters for chopping fodder reduced wastage by about 20%. The beneficiaries had contributed about 20% of the cost of managers in terms of labour under the project. Assistance was also provided to the economically weak households in construction of animal shelters. Details of the three major interventions under the stall feeding programme are discussed in details in the following sections. See Table 6.1 for the number of mangers, chaff cutters and animal shelters constructed in the total project area, and the sampled GPs.

Table 6.1 Details of interventions under stall feeding programme

	Mangers (Nos.)	Chaff cutters (Nos.)	Animal shelters (Nos.)
Total Project Area	8783	2030	14281
Sampled GP	1221	250	1529

Source: Livestock Report, Watershed Mangement Directorate, 2012

Construction/demonstration of livestock mangers

In order to increase / encourage stall feeding and thereby reduce grazing pressure in forests and community grazing lands, use of mangers were demonstrated through selected households in the project area. Approximately 8783 and 1221 mangers were constructed/demonstrated in the total project area and sampled GPs respectively (see Table 6.1). During the group discussions in the sampled GPs the beneficiary households informed that mangers helped in saving fodder by avoiding wastage and it also improved animal health as they were hygienic.

Distribution/demonstration of chaff cutters

About 2030 and 250 chaff cutters were distributed /demonstrated in the total project area, and sampled GPs respectively. During the field surveys and group discussions in the sampled GPs it was found that due to the technical limitations in the operation of the chaff cutters, they could not be optimally utilized. The practical difficulty in segregation of branches / twigs collected along with leaves of fodder trees grown on farm bunds and forests areas made cutting of fodder in the chaff cutters difficult.

Construction/demonstration of animal shelter/shed

At the time of the baseline survey, all sampled households had some form of indoor arrangement for housing cattle. However, about 50% of the households didn't have adequately spaced and appropriate arrangements for keeping their cattle. Traditionally people and cattle share the same dwellings in many parts (especially in the Kumaon region) of Uttarakhand. Cattle are usually kept on the ground floor while people use the first floor. Heat radiating from the cattle keeps people warm during the cold winter season.

The project financed a large number of cattle shelters, approximately 14281 in the total project area and 1529 in the sampled GPs respectively. From the field survey and group discussions it was observed that the animal shelters / sheds were popular with the people. They felt that the shelters reduced stress on the animals by providing protection against extreme weather conditions and cattle-lifting by wild animals. These shelters facilitate good health and hygiene for the cattle. Due to the many benefits provided by these cattle shelters, there was a huge demand for their construction in the sample villages.

Fodder Production Programme

Due to the fragmented and small to marginal land holdings, and poor irrigation facilities, the practice of growing fodder crops on agriculture land is almost absent in the hilly region of the state. Most of the fodder needs are met from natural grasses growing on individual or community-owned fallow lands. The other sources of fodder / feed for the domestic cattle are agriculture wastes like hay, husks, grasses and lopped branches of fodder trees grown

on homestead, bunds uncultivable agricultural land, Van Panchayat (VP), Reserve Forests (RV) and Civil Soyam Forests.

Under the fodder production scheme of the project, demonstration of HYV (High Yielding Varieties) of fodder crops such as Jai (*Avena sativa*, Kent)[7], Berseem (*Trifolium alexandrinum*, Muskavi), hybrid Napier (*Pennisetum purpureum)*, hybrid Maize (*Zea mays*, African tall Jawahar) were done. Fodder minikits of MP *Cherry Lobia* (*Vigna unguiculata)* and Berseem (*Trifolium alexandrinum*) were distributed in the Kharif and Rabi season respectively. In the hilly areas, farmers were encouraged to plant fodder species like Bhimal (*Grewia elastic)*, Kachnar (*Bauhinia purpurea)*, Khadik (*Celtis australis*) etc. on the bunds and risers of their field. Farmers also planted slips and tufts of Napier (*Pennisetum purpureum)* grass at the edge and risers of the terraces and on other uncultivated patches near their fields.

Livestock based Income Generation Activities

Various livestock-based income generation activities (IGA) were introduced for VG households, and a VG fund was created to aid this. The objective of the VG fund was to enhance social equity in villages and to assist those people who were either left out or received very little benefit from watershed development activities, which seemed to favour the households having land. Through the VG fund, assistance was provided to VG households to initiate income generation activities such as dairy, goatery (goat rearing) and poultry rearing.

Poultry

There were two major interventions to promote poultry rearing under the project. One component was on establishment of brooder units to supply chicks to facilitate backyard poultry rearing and the other component was on assisting VG households to establish backyard poultry units to supplement their household incomes. As many as 1280 VG members (624 beneficiaries under individual activity and 656 beneficiaries under the group activity) received grants under the VG funds to establish poultry units in the total project area (Status report December 2012). Group discussion in the sampled GPs showed that overall poultry rearing was not successful to the extent desired. Most of the beneficiary households had limited the activity to cater to their household needs. The reasons, for this was mainly due to introduction of improved breeds, for which veterinary care was necessary but was unavailable in the villages. Also the new breeds were prone to disease as they are not able to withstand harsh weather conditions. They were also preyed upon by domestic and jungle cats, and by raptors. Another reason for failure of poultry interventions in the project area was that poultry rearing was not a traditional activity; hence there was hardly any local knowhow to treat out-break of diseases. However, few successful cases on successful poutry rearing were observed during the field visit. See Box 6.1 on a successful case study on poultry rearing.

[7] The first is the botanical name followed by the variety. This style is followed where ever variety is mentioned.

Box 6.1 Case study on poultry rearing

Kamal Singh is a native of Jaikandi Gram Panchayat. He used to earn his living by operating a small tea shop in Kyunja Gram Panchayat. In 2006-07, under the VG fund of the project, he received an amount of Rs. 17,500 to start backyard poultry rearing. Kamal Singh purchased 100 chicks using this money and the rest he spent on building a coop for the hen and also purchased feed and medicines. In the first year, he made a net profit of just Rs. 4,500 by selling the hens and the eggs. In the subsequent two years he reared around 9 lots (200 birds / lot) of birds. By selling each lot he earned a net profit of approx. Rs. 7,500-8,000. Thus the total profit earned was around Rs. 70,000. Motivated by his own success Kamal Singh contacted the project authorities for expanding his business in 2011-12. He was assisted with an amount of Rs. 60,000 for the establishment of a brooder unit. Initially he started with 350 chicks, and later expanded to 400 chicks and made a net profit of Rs. 50000 in a year. Thus from the time he received benefit from the project, first as a VG member and then by establishing a brooder he has made a net profit of Rs. 1,24,500.

Goat rearing

As many as 1561 VG members (457 beneficiaries under individual activity and 1104 beneficiaries under the group activity) received funds under the VG funds for Goatery in the project area (UDWDP progress report December 2011). The upkeep of goat was relatively easy as compared to other livestock, and it was of great economic value to the farmers. Hence this intervention was widely appreciated by the project beneficiaries.

Dairy

Under the dairy component of the IGA, 922 VG members (535 beneficiaries under individual activity and 387 beneficiaries under the group activity) received funds.

Assessment of impacts

The impact of the project interventions under the livestock component is discussed in the following section. The two outcome indicators which is relevant to the livestock component of the project and which confirms to the second component of the PDO viz. 10% increase in fodder production over baseline and 1% increase over baseline in number of improved breed (number of cows in sample households) has also been discussed in detail.

Breed Improvement Programme

The total number of *Murra* buffalo bulls, *Jersey X* cow bulls and *Sirohi & Barbari* bucks introduced in the NBCs were 322, 42 and 123 respectively. The success rate of production of improved breed offspring was 70%, 67% and 77% for buffalo bull, cow bull and bucks respectively in the project area. The success rate was calculated using the equation below.

Success rate = [Total progency/(Total coverings-Animals not calved)] x 100

See Table 6.2 for details on coverings and success rate of production of improved breed cattle in the NBCs established under the project.

Table 6.2 Performance of the NBCs

	Numbers introduced	Total Coverings	Animals not calved*	Progeny			Success rate (%)
				Male	Female	Total	
Buffalo bull, *Murra*	322	21360	3204	6123	6671	12794	70.47
Cow Bull, *Jersey X*	42	2202	330	584	677	1261	67.37
Buck, *Sirohi & Barbari*	123	6595	660	2249	2293	4542	76.52

* For buffalo bull and cow bull 15% of the animals each wee assumed not calved and for bucks, 10% are assumed not calved.

Source: Livestock report, Watershed Management Directorate, Februrary 2012

About 3533 AI were assisted by the paravets in the project area and 1930 offsprings were produced as a result of the AI. The success rate for AI for cows and buffaloes were 66% and 63% respectively. See Table 6.3 for the details of AI assisted by the paravets in the project area. A total of 7024 veterinary cases were treated by paravets in the project area.

Table 6.3 Details of AI assisted by paravets in the project area

Cattle	Number of AI assisted	Animals not calved	Progeny			Success rate (%)
			Male	Female	Total	
Cow	1817	273	522	494	1016	65.78
Buffalo	1716	257	467	447	914	62.66

Source: Watershed Management Directorate, February 2012

Health Care Programme

Group discussions show that people appreciated and had benefited from the livestock health camps / shows. During the field survey no major cattle diseases (communicable) were observed in any of the GPs surveyed during the project period.

Changes in the number of cattle

The following section presents the changes in the number of cattle for both local and improved breeds due to various livestock related interventions in the project area. There has been an effort to increase the number of improved breed cattle especially through the breed improvement programme. Other interventions like the stall feeding, fodder production and health improvement programmes target both improved and local breeds of cattle. The

following section discusses the changes in the number of local and improved breed cattle due to the programme interventions.

Changes in the number of local cattle breed

The percentage changes in the number of local breeds of cow, buffaloes, bullocks and young stock (livestock below 1 year old) has decreased over the baseline period, for the total sampled households and the VG households (see Table 6.4). Some of the probable reasons for this were, an increase in economic condition of the project beneficiaries, and the phasing out of scrub cattle. Also, economically well off families had started rearing improved breed cattle. Also, improvement in the road network had facilitated buyers of scrub cattle from the plain areas to reach even interior villages; consequently unproductive cattle were often sold.

Table 6.4 Percentage changes in the number of local breed livestock (sampled households)

		Local breed (total sampled HH)	Local breed (sampled VG HH)
Cow	Before	626	320
	After	511	265
	% Change	-18	-17
Buffalo	Before	545	257
	After	519	242
	% Change	-5	-6
Bullock	Before	859	468
	After	535	301
	% Change	-38	-36
Goat / sheep	Before	1653	765
	After	1841	974
	% Change	11	27
Young stock	Before	376	189
	After	356	184
	% Change	-5	-3

Source: TERI primary survey 2011

Changes in the number of improved breed cattle (outcome indicator)

The percentage increase in number of improved breed livestock across all households sampled was highest for buffaloes (191%) followed by goat / sheep (106%), cows (19%) and finally bullocks (4%) (see Table 6.5). Since, the VG households were provided financial assistance under the dairy component of IGA mainly for establishing goatery and poultry

units, hence the percentage change in the number of improved breed goats for VG households in the sampled households was high (2723%). Their multiplication in some villages like Banyari (Daslikhet GP), Chamlekh (Banelagaon GP), Gadsyari (Gadsyari GP), Khaikot Talla (Khaikot Malla GP), Gudmangal (Gudmangal GP), Jajoli, Nag and Talli Basai of Jjoli GP, Ling, Nani and Pipli Nigalti of Pipli Nigalti GP was found to be good. From the household survey it found that the average increase in number of improved breed of goats for the VG households in the above mentioned villages was 3-6 per household.

Table 6.5 Percentage changes in the number of improved breed livestock (sampled households)

		Improved breed (total sampled HH)	Improved breed (sampled VG HH)
Cow	Before	104	48
	After	124	54
	% Change	19	13
Buffalo	Before	22	15
	After	64	115
	% Change	191	667*
Bullock	Before	23	17
	After	24	17
	% Change	4	0
Goat / sheep	Before	49	13
	After	101	367
	% Change	106	2723
Young stock	Before	67	25
	After	316	152
	% Change	372	508*

Source: TERI primary survey 2011

Changes in fodder availability

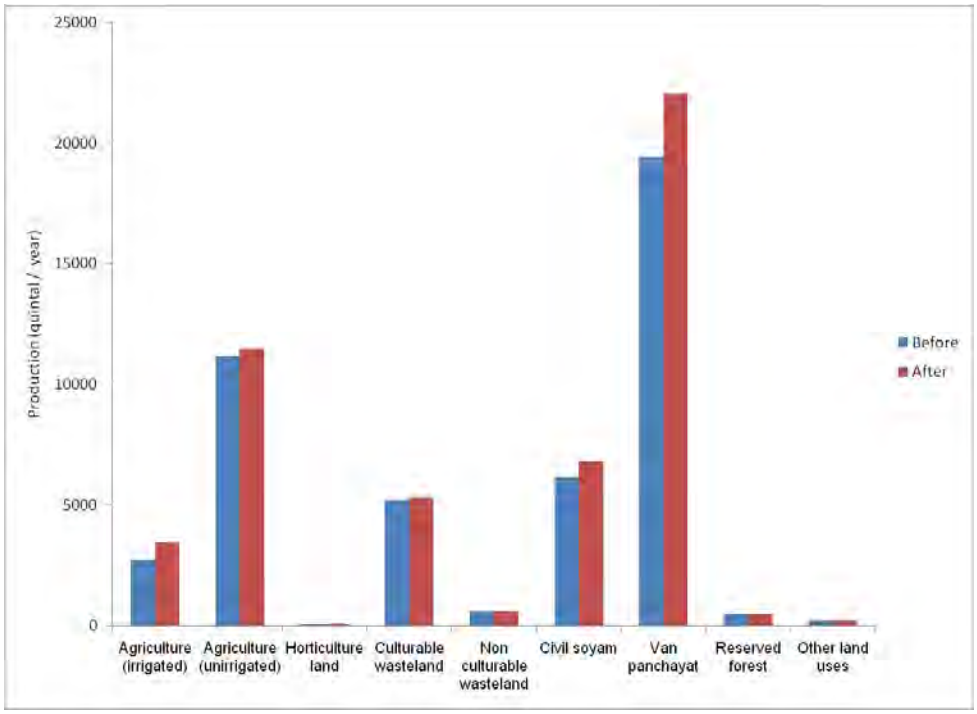
The primary survey shows that the average fodder production ranged between 0.5 -5.67 q/ha/year across different land uses. For calculating the average, RV data for a land category was aggregated for the sampled GPs. The highest percentage changes (24.18%) in availability of fodder was recorded for irrigated agriculture land suggesting increased

availability of fodder / feed produced from these lands. This was as a result of many farmers adopting agriculture crops, the agro - waste from which had good fodder value and also due to growing of fodder grasses and trees on the bunds / risers of agriculture field by the farmers. Fodder production from different land categories is presented in Table 6.6, while the percentage change in fodder available across different land categories across the sampled GPs is shown in Figure 6.3. Plantation of tree species having fodder value and growing of grasses like Napier (*Pennisetum purpureum)* in Van Panchayats and Civil Soyam lands has also resulted in increase in fodder availability in these lands by 13% and 11% respectively. The average increase in fodder availability across all land categories over the baseline was around 9.61%.

Table 6.6 Fodder production from different land categories in sampled GPs (quintal / year)

	Agriculture (irrigated)	Agriculture (unirrigated)	Horticulture land	Culturable wasteland	Non culturable wasteland	Civil soyam	Van panchayat	Reserved forest	Other land uses
Before	2756.51	11183.68	79.66	5196.39	626.99	6151.70	19443.83	476.76	241.42
After	3453.64	11510.79	82.75	5305.78	638.10	6852.99	22049.32	481.53	246.90
% Change	24.18	2.92	3.88	2.11	1.77	11.40	13.40	1.00	2.27

Source: TERI primary survey 2011



Source: TERI primary survey 2011

Figure 6.3 Change in fodder availability for different land categories in the sample GPs

The household survey for the total sampled households show that the percentage changes in household dependency for fodder and grasses from private agricultural/barren land/other land was the highest (13%), while dependency on fodder from Reserve Forests and feed purchased from market have declined by 8% and 3% respectively (see Table 6.7). The reasons cited for this by the respondents was, due to increased availability of fodder from private agriculture and other lands like the Van Panchayats and the Civil Soyam land where plantation activities were being carried out under the project, the need to go to Reserve Forests to collect fodder have decreased. Also this has helped to reduce dependency on buying of feed from the market. The percentage changes in household fodder dependency in the Van Panchayat and Civil Soyam lands were about 9% and 6% respectively. See Table 6.7 for the quantity (qt. / year) of livestock feed and fodder obtained by a household from different sources as derived from the household survey.

Table 6.7 Quantity of livestock feed and fodder from different sources

	Agricultural/ barren land/other land	Agriculture residue	Feed purchased from market	Civil Soyam	Van Panchayat	Reserved Forest
Before (qt. / year / HH)	12.01	18.05	2.09	10.39	39.24	4.50
After (qt. / year / HH)	13.57	20.22	2.03	10.98	42.60	4.16
% Change	12.99	12.03	-2.80	5.73	8.57	-7.66

Source: TERI primary survey 2011

Three main reasons cited for increase in fodder availability during the GD and household survey were as follows:

- Increase in agro-waste
- Fodder grass plantations
- Protection of common lands (from grazing)

Increase in agro-waste

Increase in agriculture land under irrigation, production of more vegetable crops and also increase in productivity of crops has in all likelihood resulted in an increase in availability of agro and vegetable waste, like hay, husk and straw which were useful as fodder.

Fodder grass plantations

Due to the small land holdings in the region, farmers under the project have been encouraged to grow fodder grasses / crops like Napier (*Pennisetum purpureum)*, Berseem (*Trifolium alexandrinum)*, Maize (*Zea mays),* Jai (*Avena sativa)* on field bunds / risers and fallow lands. GDs reveal that promotion of Napier (*Pennisetum purpureum*) grass on field bunds has succeeded in some villages like Thalin (Vikasnagar division), Dhargaid (Gairsain division), Jajoli (Gangolihat division), Gairkhet (Bageshwar division), Gairkhet and Haweel Kulwan (Bageshwar division). During the field survey it was found that amongst all fodder grass / crops introduced in the project villages, Napier (*Pennisetum purpureum)* grass was preferred the most by farmers as it could grow both on farm boundaries and fallow lands.

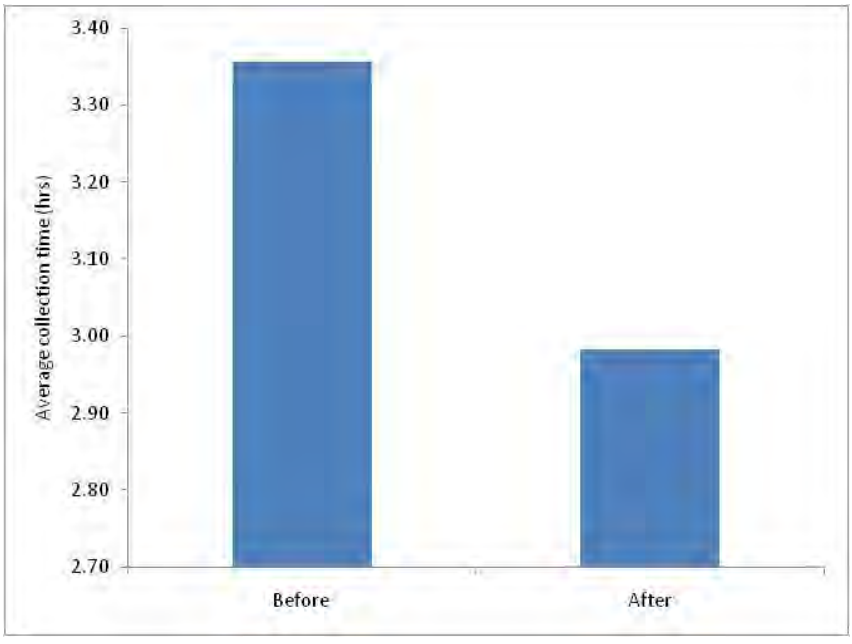
The yield of Napier (*Pennisetum purpureum*) was highest as compared to other crops and it could be harvested three to four times in a year.

Protection of common lands (from grazing)

In all GPs where afforestation have been carried out, the area was fenced and protected against grazing which has resulted in good growth of natural grasses. In most villages, the fodder was harvested once or twice a year and distributed equitably amongst all the households in the village. In some cases, patches of forest land in the Van Panchayat forests were allocated to the families of a village, who in turn protected, managed, tended and harvested grass for themselves. This was the case in villages like Thalin, Thaina, Jaidwar, and Koti in Vikasnagar division, Singangaon (Chinyalisaur division), Dhargaidand Gaid in Gairsain division, Ghandalu (Pauri division) and Pan (Almora division). A few examples where women SHGs were protecting plantations was observed during the field visit. In Thalin and Jaidwar of Vikasnagar division, women SHG were paid the *chowkidar's* (watchman) wages for protecting the forests. The benefits from these women-centric efforts were subsequently reaped by the whole village. This clearly exemplifies the role that a women can play in protecting their natural surroundings if they were motivated and included in village development activities.

Time taken for fetching fodder once

Due to the different initiatives undertaken under the fodder production programme in the project, it was found from the household survey that the average time taken for collecting fodder once had reduced. On an average, there has been 11% reduction in time spent on collecting fodder by a household (Figure 6.4).

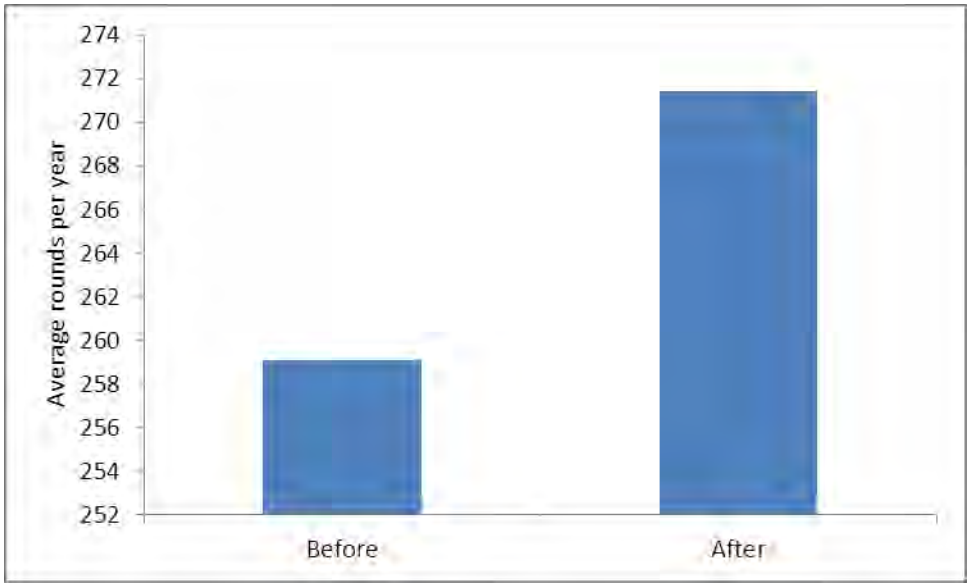


Source: TERI primary survey 2011

Figure 6.4 Average time taken for fetching fodder once (household sample)

Fodder collection pattern (No. of rounds of fodder collected per annum)

Primary survey shows that fodder availability has increased; hence the number of rounds of fodder available in a year accessible for a household has also increased. Earlier during the fodder scarce season more feed had to be brought from the market. There has been decrease in quantity of feed purchased from the market by 3% (see Table 6.7) by a household at the time of the final impact study. The household survey shows that the availability of fodder (number of rounds of fodder available annually) has increased by about 5% on average for a household (see Figure 6.5).



Source: TERI primary survey 2011

Figure 6.5 Change in fodder collection pattern (No. of rounds of fodder collected per annum)

Sustainability of the interventions

The sustainability of the interventions introduced under the livestock component of the project is discussed below:

- The success rate of production of improved breed offspring in the NBCs was 70%, 67% and 77% for buffalo bull, cow bull and bucks respectively in the project area respectively. Also the number of productive cattle (female offspring) produced as a result of insemination by the cow bulls, buffalo bulls and bucks were 677, 6671 and 2293 respectively. This shows the likelihood of the sustainability of the NBCs. However, the productivity of the bulls in the NBCs would also depend on whether nutritious diet and proper veterinary care is being provided to them continuously.
- The increase in the number of improved breed cattle and reduction in the number of local breed cattle shows local scrub cattle has been phased out in favour of improved breed livestock. Improved breed cattle has more productivity hence; this would ensure more income to the beneficiary households. However, since improved breed are more susceptible to diseases and are not able to withstand harsh weather

conditions, hence there is a need to ensure continuous veterinary support and provide timely vaccination and health care.

- The fodder production programme has promoted increased availability of fodder in the project villages and it has also facilitated reduction in average time taken for fetching fodder by a household due to more availability of fodder in the local surroundings (agri waste and fodder trees growing on farm land). It is anticipated that more fodder would be produced from plantations undertaken under the project after they attain maturity as many fodder tree species has been included in the plantation programmes.
- The livestock component of the project was implemented in close coordination with the Uttarakhand Livestock Development Board and the State Animal Husbandary Department. This initiative is expected to continue beyond the project period.

Recommendations

The broad recommendations to strengthen the livestock sector are given below:

- More NBCs are suggested to be set up to cater to more number of villages especially in the remote corners of the state.
- A component on upkeep of the cattle under the NBCs should be included in the future programmes, so that beneficiary households are supported through this to buy nutritious feed for the upkeep and sustenance of the bulls.
- Incentives to retain paravets and constantly update their skills need to be introduced as this would ensure greater outreach of veterinary services to remote locations in the state.
- Due to the lack of time to segregate the twigs and branches from fodder collected from tree species and the technical difficulty of getting the right mix of fodder to be used in the chaff cutters, their use has been limited in the sampled GPs. Hence, it is recommended that introduction of chaff cutters be reviewed and the resources used to promote it be diverted to upscale other successful initiatives like construction of animal sheds / shelters.
- Mechanism to incentivize SHGs to protect forest plantations for better forest growth and fodder production could be worked similar to that of Revenue Villages, Thalin and Jaidwar.
- Livestock camps/shows, vaccination campaigns and castration of scrub bulls should frequently be organised. Awareness on importance of vaccination should also be organized so that more households participate in the health improvement programme which would help to ensure good cattle health.
- Growing of fodder grasses on the bunds offer protection against soil erosion and also ensures optimization of land use besides providing fodder for the cattle. Hence, this should be widely promoted to encourage wider adaptation.

Conclusion

Various interventions have been introduced under the livestock component of the project to improve the productivity, health, and wellbeing of livestock and thereby improve the livelihood of the people in the project area. The various interventions envisaged under this

component were the breed improvement programme, health care programme, stall feeding programme and fodder production programme.

The breed improvement programme under the project had mainly two components, one was on the establishment of the NBCs and the second was on establishment of paraveterinary centres and training of paravets to treat minor veterinary cases and assist in AI. The number of improved breed progeny produced as the result of the breed improvement programme was satisfactory. The success rate of production of improved breed offspring in the NBCs was 70%, 67% and 77% for buffalo bulls, cow bulls and bucks respectively in the project area. The success rate of AI by paravets for cow bulls and buffalo bulls were 66% and 63% respectively. This indicates the overall success of the breed improvement programme in the project area.

To promote scientific animal husbandry practices, forage saving devices like mangers and chaff cutters were demonstrated. Livestock shelters / sheds were also demonstrated as a safe, clean and hygienic place to keep cattle. Fodder production schemes like on – farm fodder production, forage / pasture development programme, napier/fodder grass plantation or napier crop border plantation and distribution of fodder minikits were introduced in the project area.

The livestock sheds / shelters were in great demand as they provided hygienic space to keep cattle, protected them from harsh weather conditions and prevented them from getting attacked by predators and also being stolen. Mangers ensured hygienic feeding space for the cattle. During the group discussions and household survey it was found that due to lack of time to segregate twigs and branches collected along with fodder leaves the chaff cutters were being used to a limited extent in the sampled GPs.

Due to the introduction of improved fodder grasses and crops on farm boundaries and uncultivated land, increased availability of agriculture waste residues (as more agriculture land has been brought under irrigation) and protection of common land from grazing, forage and pasture development programme in Van Panchayats and Civil Soyam lands, there has been an overall 9.6 % increase in fodder availability across different land categories over the baseline. Social fencing was also encouraged which has helped in fodder availability. Due to the various initiatives undertaken under the fodder production scheme, the household survey revealed that the average time taken for collecting fodder by a household has reduced by 11% while the average number of rounds of fodder available per annum has increased by 5%.

The number of most local breeds of livestock has decreased as compared to the baseline level mainly due to removal of scrub cattle and their upgradation throughout the breed improvement programme. The number of improved breeds of cows and buffaloes has increased by 19% and 191% respectively, indicating the positive impact of the overall livestock breed improvement, health care, and fodder production programme.

The numbers of both local and improved breeds of goats in the sampled GPs has increased. Improved breed of goats has been introduced under the project mainly to support VG households and help them to supplement their income, and provide alternative livelihoods to them. Goatery interventions were appreciated by the project beneficiaries. As many as 1561 VG members (457 beneficiaries under individual activity and 1104 beneficiaries under the group activity) received funds for Goatery in the project area. Other than goatery, poultry was also promoted under the project. As many as 1280 VG members (624 beneficiaries under individual activity and 656 beneficiaries under the group activity)

received grants under the VG funds to establish poultry units in the total project area. Livestock-based income generation activities was introduced under the project to enhance social equity in project villages.

Overall the project interventions under the livestock component has led to the creation of improved breed of livestock herds by ugrading local animals and reduction in the number of unproductive local breed cattle. The improvement of forage production under the forage production scheme of the project would help to ensure sustainable feed production for the cattle in the project area. This conforms to the PDO relevant to the livestock component of the project as given in the PAD.

7. Soil and Water Conservation

Introduction

Soil and water conservation in Uttarakhand is imperative for overall development of the region as about 90% of the state is made up of hills with fragile soils and steep slopes that are highly prone to soil erosion during the monsoon season. The total cultivated area in the state is 7,84,117 ha. The productivity of agriculture in the hills is low (12-14 qtls/ha vs. 32-35 qtls/ha in the plains) contributed by about 0.55 million ha of un-irrigated land and is likely to decline further unless erosion is abated[8].

The annual rainfall in Uttarakhand is 1700 mm spread over 100 rainy days and most (95%) of the precipitation that falls in the catchments area as surface water, is lost due to steep slopes and mountainous terrain (NABARD 2004). The rainfall is erratic and cases of cloud bursts are reported **from** many locations almost every year. Torrential rains occurred during the monsoon of 2010 and 2011 leading to vast devastation of soil and farm lands as well as to people's lives.

The National Water Policy 2002 emphasizes reorientation of institutional mechanisms to initiate participatory water resource management along with traditional water conservation practices. The Draft State Water Policy of Uttarakhand (dated 3rd November 2005) also emphasizes conservation and management of water resources through participation of all tiers of the Government. It reiterates the importance of rainwater harvesting as one of the strategies by promotion of technological options for water harvesting and transfers for different topographical/ecological conditions. It also emphasizes conducting education and awareness campaigns on Himalayan environment, ecology and water resources, as well as the roles of the state and citizens in water resource management.

Conservation of soil and moisture and improvement in forest and vegetation cover in the state's watersheds will enhance the productivity of natural resources so that the people can improve their quality of life and increase their income levels. Given the climate, topography and the terrain, irrigation becomes a crucial limiting factor in agricultural performance[9]; hence the soil and water conservation interventions play a very important role of for sustaining the agriculture.

Within this context, the PAD mentions that:

Communities will prioritize and implement sub- projects for soil conservation on arable lands (e.g. bunds, vegetative barriers, agro-forestry, etc.); development of non-arable communal and government lands (e.g. forest regeneration, pasture development, silvi-pasture development, soil erosion bunds, vegetative barriers, etc.); and, activities other than watershed-treatment related (e.g. upgrading of link roads, bridle paths/mule tracks, potable water supply, etc.).

To achieve the objectives related to soil and water conservation the Result Framework has identified the main outcome indicators at final stage of the project as:

[8] http://india.gov.in/knowindia/st_Uttarakhand.php (and Govt of Uttarakhand, undated a)

[9] http://gov.ua.nic.in/planning/annualplan0708/Vol.%20I%20%20Gen%20Profile.doc

- 15% increase in irrigated area in treated areas
- 10% increase in percentage of households accessing water for domestic use

This chapter thus attempts to analyze the achievements made to achieve the above mentioned indicators along with the efforts of restricting soil erosion.

Interventions under the project

The following are the UDWDP interventions targeted for soil and water conservation:

1. Drainage line treatment and soil conservation:
2. Construction of vegetative check dams
3. Construction of dry stone check dams
4. Construction of crate wire check dams
5. Mortar stone masonry work
6. Mortar bounded stone masonry work
7. Road side erosion control
8. Construction of spurs
9. Riverbank protection
10. Vegetative treatment
11. Terrace repair/ vegetative field boundaries
12. Construction of cross barriers
13. Afforestation to check soil erosion
14. Land slide treatment

Water harvesting:

1. Irrigation channel with PCC lining
2. Irrigation tank with delivery pipeline
3. Village pond with lining
4. Village pond without lining
5. Roof Water Harvesting Tank
6. Percolation well construction/digging
7. Potable Water Supply – pipeline
8. *Tal/Naula/Khala* Rejuvenation

The following is a summary of interventions in the sampled GPs.

Table 7.1 Summary of interventions in sampled GPs

Soil Cons. Work				Water Harvesting			
Vegetative Checkdam (cum.)	Stone Checkdem (cum.)	Irrigation Channel (km)	Irrigation Tank (No.)	Roof Water Harvesting tank (No.)	Village Pond (No.)	Drinking water Pipe line (km)	Chari/Nala/khala rejuvenation (No.)
536	80118.42	35.971	223	2180	65	21.82	449

Assessment of Impacts

Increase in irrigated area (Outcome indicator)

It is seen that the key focus has been on stone check dams, irrigation tanks, roof water harvesting tanks and the rejuvenation of *chari/nala/khala.* It is also to be noted that plantation activities play a significant role in checking soil degradation.

An important feature of this project is the wide range of interventions targeting increased access to water for various purposes such as domestic use and irrigation.

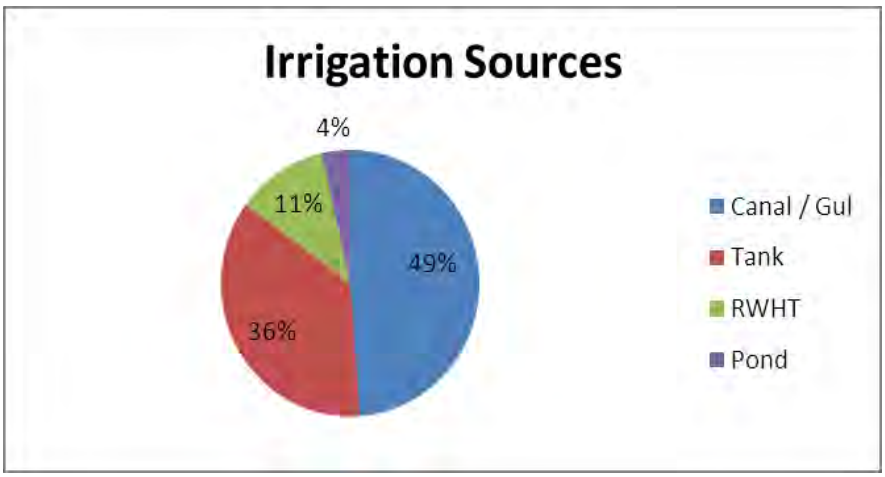


Figure 7.1 Sources of irrigation in sampled GPs

In practice, it is difficult to estimate increase in water availability in volumetric terms. Increase in area under irrigation attributable to the project serves as a proxy indicator for availability of irrigation water. Fig. 7.1 suggests that the maximum irrigation (49%) is carried out through Canals and *Gul*s followed by Tanks (36%). Amongst the other sources, the contribution of Roof Water harvesting Structures (11%) and Village ponds (4%) have been very crucial for increasing irrigated area as well as domestic access to water.

While most of the agricultural land still remains unirrigated, there has been a significant increase in irrigated agricultural land by about 25%. The land under irrigation has increased from 611.2 ha to 762 ha in 50 sampled Gram Panchayats, resulting in this increase. Table 7.2 details the landuse changes in agriculture and horticulture, that can be attributed primarily to the increased availability of irrigation. The area under irrigated agriculture has increased by 24.73%, and horticulture by 55.82%. That irrigation has played an important role in the

enhancement of the areas under agriculture and horticulture is corroborated by a decrease in the area under unirrigated agriculture (-4.6%) and culturable wasteland (-2.29). The increase in area under irrigated agriculture is also associated with the diversification of cropping patterns with an emphasis on short rotation crops such as vegetables that yield relatively quick returns.

Photo 7.1 Cemented *Gul* serving a function similar to canals

Table 7.2 Impact of irrigation on various landuses related to agriculture and horticulture

S.No	Land use	Area in ha (Before)	Area in ha (After)	% change
1	Agriculture (irrigated)	611.19	762.39	24.73
2	Agriculture (unirrigated)	3195.33	3045.18	-4.6
3	Horticulture land	106.21	165.50	55.82
4	Culturable wasteland	2598.19	2538.64	-2.29

The decentralised options for irrigation that have been introduced through the project has influenced the use of water for various agri-horticultural activities. Rain water harvesting tanks are an excellent example. The construction of these structures in large numbers has helped in conserving waste water that would otherwise be lost as out-flows from pipes, channels etc. and from run-off. It has increased the availability of water for domestic purposes and also for kitchen gardens. Based on the group discussions and field surveys, it is estimated that on an average, each roof water harvesting structure irrigates about 0.01 ha of land. The conversion of unirrigated land to cultivation of vegetables or horticultural crops due to availability of water has been an important source of income to project beneficiaries.

Increase in percentage of households accessing water for domestic use (Outcome indicator)

Access to domestic water sources is a key factor for reducing the drudgery of womenfolk in rural conditions . Table 7.3 suggests that there has been positive change in terms of access to water for domestic use.

Table 7.3 Increased access to water for domestic purposes for families in sampled villages

	Tap water*	**Stream**	Others
Before	599	17	191
After	672	5	133
% increase	12.18	-70.5	-30.3

*includes RWH structures connected with drinking water pipelines

There is an increase in access to domestic water from taps (12.18%) largely attributable to the contribution of RWH structures. This has reduced the dependence of people on streams and other sources by 70% and 30% respectively.

More than 63% of households now use the private domestic water sources in comparison with pre-project conditions in the sampled villages (Table 7.4) while the use of public sources of water has now decreased by about 7%).

Table 7.4 Usership of sources of domestic water in sampled villages.

Usership of source of domestic water	**Private**	**Public**
Use of water sources by Households - Before	76	696
Use of water sources by Households - After	124	650
% increase	63.15	-6.60

The interventions described earlier for irrigation have had very positive impacts on the access to water, as is seen in the sampled villages (Table 7.4). There is a 48.45% increase in the number of households spending <1 hr on fetching water in comparison to the pre-intervention status (Table 7.5). There is a 39% decrease in the number of households that spend between 1-2 hours on fetching water, and very importantly now no household spend more than 3 hours on fetching water. This suggests that the project activities have been extremely effective in reducing people's drudgery, and in saving time for women folk who are now free to use this additional time for other activities important to their households. The economic analysis of the project incorporates this benefit in terms of the opportunity cost of time saved in fetching water for domestic purposes.

Table 7.5 Time taken to fetch domestic water in sampled villages

Time spent (hr)	Before %	After %	% Change	Difference
<1	49.7	73.8	48.45	24.1
1-2	41.5	25.3	-38.88	-16.2
2-3	6.2	0.5	-91.83	-5.7
>3	2.4	0		-2.4

Based on the increase in access to water using taps, hand-pumps and tanks along with increase in privately owned water sources and the reduction in time spent to fetch the domestic water it can be suggested that for the sampled village the project has been successful in achieving the target indicator of 10% increase in percentage of households accessing water for domestic use.

Table 7.6 Performance of irrigation structures in sampled villages

	Irrigation Channel (km)	Irrigation Tank (No.)	Roof Water Harvesting tank (No.)	Village Pond (No.)
Achievement	36	223	2180	65
Potential to irrigate land in ha (Nali) per unit of irrigation structure	2.5 (125)	0.3 (15)	0.01 (0.5)	0.1 (5)
Total Potential irrigated land in ha, (Nali) per unit	90 (4500)	67 (3345)	21 (1090)	6.5 (325)

Source: Group discussions and field validation

The table regarding the performance of the various structures suggests that intensive work has been done to enhance the availability of land for irrigated agriculture. The above table provides an estimate of potential of four types of soil and water conservation structures constructed. The potential of these structures to irrigate land has been assessed based on the group discussions and field validation. It suggests that one kilometre of irrigation channel has potential to irrigate about 2.5 ha of land, every irrigation tank has potential to irrigate about 0.3 ha of land, each roof water harvesting tank has potential to irrigate 0.01 ha of land and every village pond has potential to irrigate about 0.1 ha of land. With this potential in the sampled villages about 185 ha land should have been brought under irrigation. The project has been able to tap more than 80% of its potential in this regard by bringing about 151 ha under irrigation. The remaining 20% potential though not tapped for irrigation at this time could still play an important role in retaining soil moisture. It has had a positive impact on the regeneration of vegetation like grasses and shrubs. This process has been evident in incremental changes observed in biomass and percentage of barren land converted into culturable land. This process has been able to hold the soil especially on barren land which otherwise would have got exposed the torrential rains.

Efficacy of Soil Conservation Efforts

Soil and water conservation efforts have been one of the most intensive ones in terms of creating physical infrastructure. About 10,000 Stone Check dam structures of varying sizes ranging from about 6 m^3 to about 14 m^3 which have been constructed in the sampled GPs. Field observations have revealed that about 30% of the total structures have been fully filled with sediment at the time of survey. At the same time about 15% of structures have been found damaged in normal monsoon conditions.

Turbidity is the amount of cloudiness in the water. The factsheet of World Health Organisation suggests that turbidity can be caused by:

- silt, sand and mud ;
- bacteria and other germs ;
- chemical precipitates.

Turbidity is usually measured in nephelometric turbidity units (NTU). Drinking water should have a turbidity of 5 NTU or less.

The immediate impact of these structures has been in form of reduction in turbidity of water as evident from readings were recorded by the WMD at several locations at various intervals.

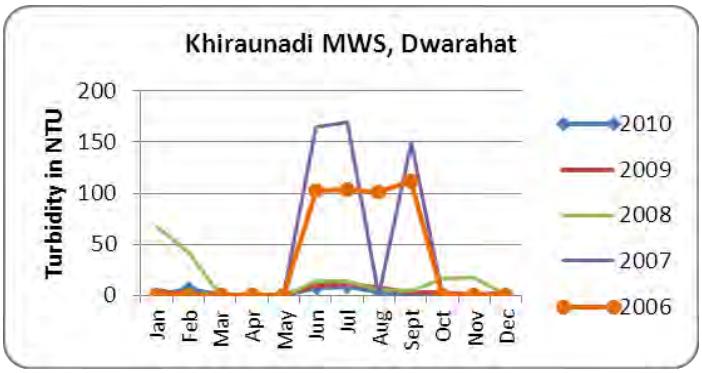
While standards of turbidity relates primarily to the potability of water, turbidity levels are an important indicator for assessing reduction in the sedimentation after constructing a check dam or after treating the watershed catchment.

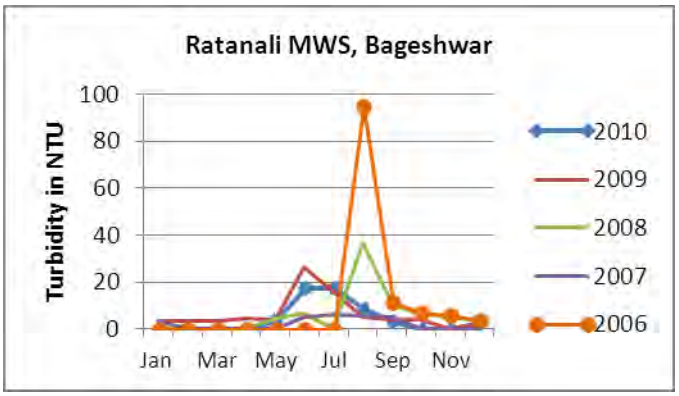
Based on the data collected by WMD on the turbidity levels, the graphs for treated catchments in various micro-watersheds namely Khiraunadi (Dwarahat), Ratanali (Bageshwar), Lahoor Nadi (Bageshwar), Kanalgarh (Bageshwar), Kuthlargarh (Dwarahat), Pasiya Gad (Haldwani) the changes in turbidity levels have been assessed. The results have been summarised in the following table and the graphs. The table 7.7 shows that in case of successful catchment treatments, the current turbidity level is around 7% of the pre-treatment value.

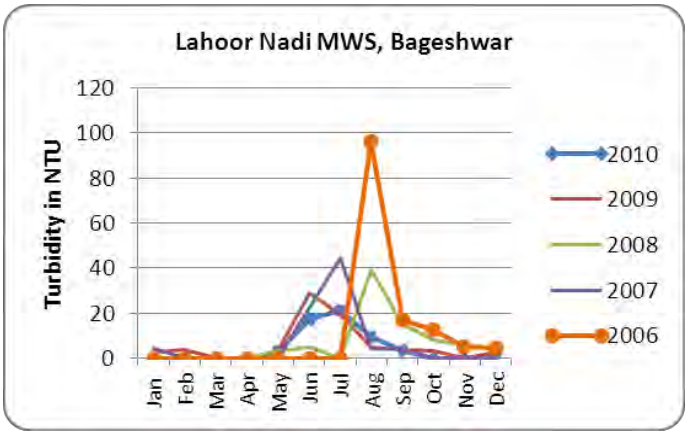
Table 7.7 Percentage change in the turbidity levels

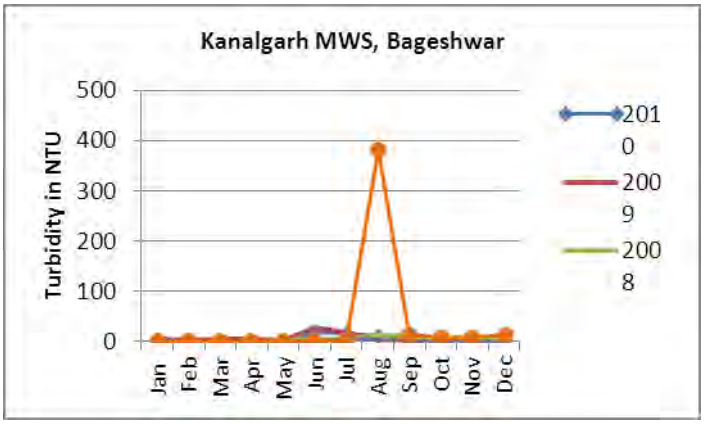
MWS	Highest turbidity levels during monsoon months in NTU		2010-11 value as % of 2006-07
	2006-07	2010-11	
Khiraunadi	169	9	5.33
Ratanali	94.8	8.5	8.97
Lahoor Nadi	96.4	9.75	10.11
Kanalgarh	383	8.75	2.28
Average			**6.67**

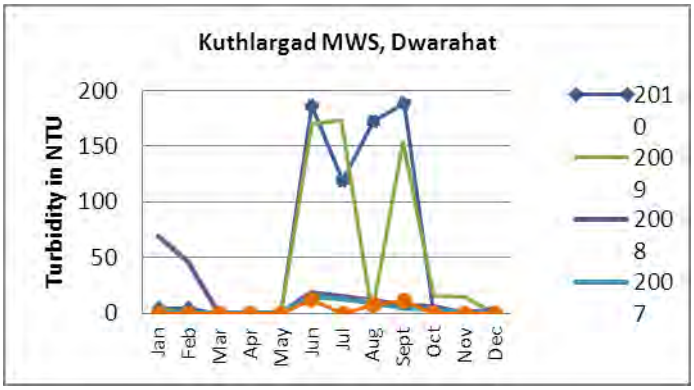
The following graphs for the clearly depict the successful sites and the sites where there have been moderate levels of success mainly due to the damage to the structures because of heavy rainfalls in 2010 and 2011. The successful sites such as Khiraunadi, Ratanali, Lahoor Nadi and Kanalagarh graphs show the drop in the turbidity levels for 2010-11 but for Kuthlargad and Pasiya Gad the 2010-11 turbidity levels are higher than the values before the structures were constructed. The graph shows reduction in sedimentation for Kuthlargad during 2007, 2008 and 2009 onwards the sedimentation levels have increased multifold suggesting damage to the structures. In case of graph of Pashya Gad for the year 2009 there has been a reduction in sedimentation but 2010 onwards the turbidity levels have increased. This again suggests the damage to the structures possibly attributing to higher monsoon in 2010.

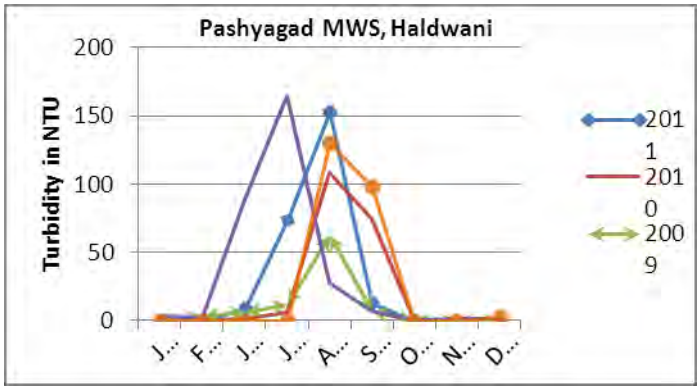












Source: WMD data

Figure 7.2 Monitoring of turbidity levels in selected MWS.

Overall impacts of soil and water conservation efforts

The conservation of soil and water has immediate impacts on the soil moisture regime and availability of water. These components are substantially contributing to the project objectives as mentioned in PAD - *community participation in watershed development and management aimed at integrating land-water use with the objectives of moisture retention and biomass production, while simultaneously enhancing incomes and livelihood options;*

In the sectoral chapters on agriculture and forests the achievements in the sampled GPs have been elaborated. The overall impacts of soil and water could be captured with the help of RS-GIS information. The depiction in change at every MWS will not be possible mainly due to the site specificity in terms of success rate of the structures, soil characteristics and existing anthropogenic influences. Hence, the overall impact needs to be understood at the scale of all samples and not at the individual MWS level. The changes depicted in the FCCs (False Colour Composites) of Kuthlargad and Ganai Gadhera MWS nicely point out the influence of increased soil moisture regime on the agricultural and plantation areas located in the command areas of two check dams and water channel. The red colour in FCCs suggests biomass and blue stands for ground water. The changes visually observed in satellite imageries of 2010-11 in comparison to 2004-05 suggest increase in biomass as well as increased availability of water for both the MWS.

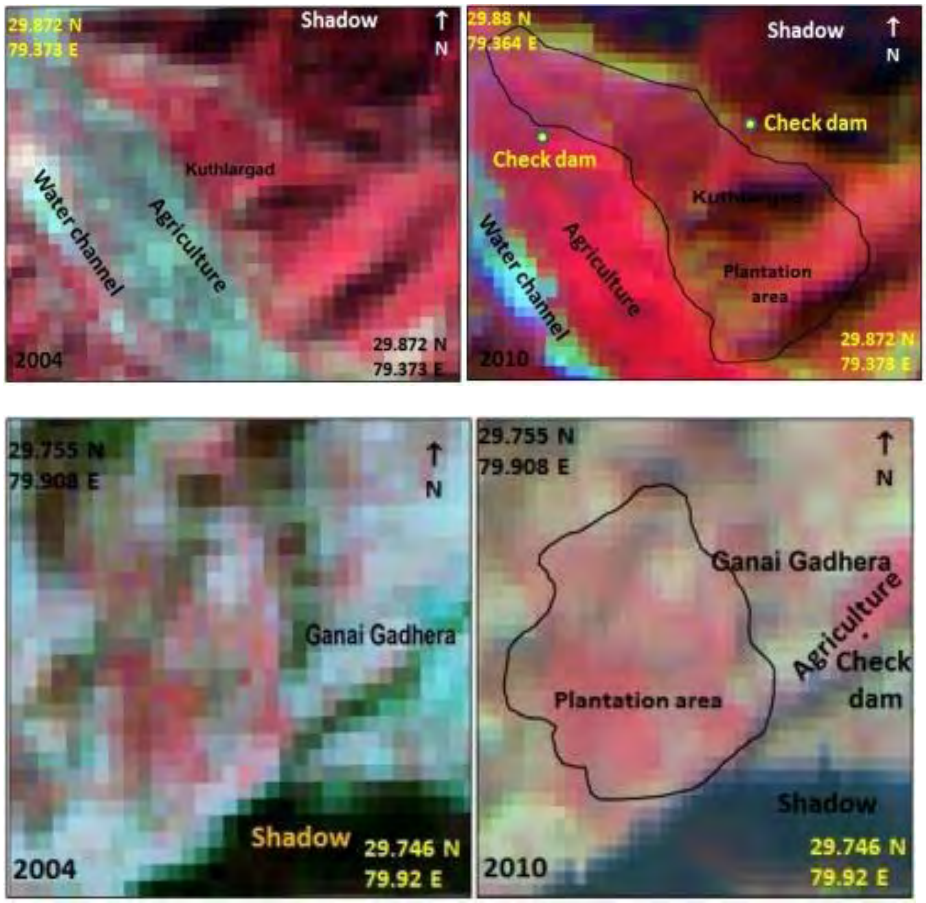


Figure 7.3 Changes in the MWS characteristics due to soil and water conservation activities

Sustainability

The sustainability of various interventions made depends on the maintenance of these structures. In case of soil conservation structures such as stone check dams about 30% dams are filled with sediment and thus the structures have fulfilled the capacities of restricting soil erosion. At this stage there is a need to hold that soil by planting riparian species such as bamboo so that the soil gets compacted and soil moisture regime gets developed for surrounding vegetation. This would sustain the impacts of the project over a longer period of time.

Recommendations

1. Plantations should be undertaken in the soil filled structures so as to compact the soil.
2. The Ridge to Valley approach of watershed treatment has not been fully deployed due to the non access to Reserve Forests in the ridge areas. Efforts should be made to also undertake watershed treatment in the RF areas.

Conclusion

The indicators for soil and water conservation efforts as defined by the Results Framework related to increase in the irrigated area and increased access to water have been achieved in the sampled GPs. The soil and water conservation achievements have been responsible for increase in the agricultural productivity and the forest biomass and further leading to the chain of livelihood activities in the respective MWS. This process has ably demonstrated the integrated approach of the project in accordance with the first objective defined in PAD. The economic analysis of several soil conservation interventions also indicate positive returns in the medium run (5-10 years).

8. Biomass assessment, Forestry and Biodiversity

Introduction

About 65%percent of the total geographical area of Uttarakhand is recorded as forest area. The actual forest cover however is 45.80% of the state's geographical area (FSI, 2011). The altitude of the state ranges from 300 m to 7817 m, resulting in significant variations in flora and fauna. The predominant forest species in the state are Conifers, *Rhododendron* spp., Oak (*Quercus leucotrichophora*), Maple (*Acer* spp.), Kirmor (*Berberis aristata*), *Primula* spp., and Orchids. In terms of jurisdiction, the forests of the state are classified as Reserve Forest, Civil-soyam forest and Van panchayats. The state forest department has exclusive control over Reserve Forests, the Civil-soyam forests fall under the jurisdiction of the revenue authorities of the state while Van panchayat forests are under the control of local communities. At present, there are over 12,000 Van panchayats, managing 5400 km^2, which is approximately 11% of the total forest area of the state (Sarkar, 2008). In terms of watersheds, there are 8 catchments, 26 watersheds, 116 sub-watersheds and 1120 micro-watersheds spread throughout the state.

UDWDP is currently one of the major watershed programmes of the state. Its objective was to treat 76 micro watersheds spread over eleven hill districts of the state. The project area lies in the middle Himalayas ranging from 700-2000 m above sea level. The forests in this altitudinal zone are primarily of Chir pine (*Pinus roxburghii*) and Oak *(Quercus leucotrichophora*) as either pure stands or mixed with other species. Under the project, a major emphasis was meeting the fuel wood, fodder, minor forest produce and timber demands of local people. Hence species of their choice were given preference while doing the plantation activities. Van panchayats have been the nodal institutions for undertaking all the forestry interventions in the project. Existing Van panchayats were strengthened through training and capacity building. Forestry activities such as afforestation and soil conservation works were carried out in Van Panchayat and Civil and Soyam forests under the project. The Van Panchayat forests in the project villages constitute 30% of the total area where as Civil Soyam forest constitute only 4% of the area. The cultivable and non-cultivable waste together constitutes about 25% of the total area. Forestry interventions were expected to help in soil and water conservation, land reclamation, and increase in moisture content of the soil.

Of the total 50 sampled GPs, afforestation activity has been carried out in 47 GPs. Total 1154740 saplings were planted in 1141.4 ha area within the sampled 47 GPs. Division wise, maximum plantation area was covered in Vikasnagar division (302 ha), followed by Augustyamuni (270 ha), Champawat (187 ha), Dwarahat (84 ha), Gangolihat (80 ha), Nainital (74.5 ha), Chinyalisaur (41.9 ha), Bageshwar (40 ha), Kothdwar (32 ha) and Gairsain (30 ha). Similarly, maximum saplings were planted in Augustyamuni (310000) followed by Vikasnagar (307800), Champawat (146400), Nainital (94300), Gangolihat (73000), Dwarahat (70500), Chinyalisaur (46040), Bageshwar (41500), Kothdwar (39200) and Gairsain (26000).Details of the afforestation activities are provided in Annexure -1.

In this chapter we review the impact of UDWDP's forestry interventions and the consequences for forests and biodiversity and provide estimates of biomass increase based on remote sensing techniques and field surveys.

Interventions under the project

In UDWDP, forestry interventions have been segregated into fuel wood plantations, afforestation, silvipasture development, Rambans *(Agave americana)* and bamboo (*Dendrocalamus strictus*) plantations, assisted natural regeneration (ANR) of Oak areas and forest fire management. Except for ANR of Oak areas and forest fire management, all other interventions have been undertaken in the sampled areas. Detail of the interventions in the sampled GPs is placed in the Annexure 1.

Forestry activities were undertaken in two phases. In the first phase, advance soil work was carried out in the winter of the first year and in the next phase plantations were completed during the rainy season. Advance soil work includes land preparation, pit digging and creation of saucers around the pits for water conservation. Forestry interventions started relatively late in the project. These interventions were undertaken between 2006- 2011.

Fuel wood plantation

The objective of this intervention is to supplement fuel wood availability of the local communities by planting suitable fuel wood yielding species on degraded lands that, in turn, would reduce pressure on natural forests of the area. Species like Khair (*Acacia catechu)*, Babul (*Acacia nilotica*) Bheemal (*Grewia optiva*), Oak (*Quercus leucotrichophora*), Bakain (*Melia azedarach*) and Surai (*Cupressus torulosa*) have been planted under this project in the study area.

Afforestation

The main aim of this intervention was to reforest degraded areas and help in conserving soil and water in the watersheds. In general, afforestation also contributed to the project objectives of increasing vegetative and biomass cover in the project area. The key species have been Oak (*Quercus leucotrichophora*), Kachnar (*Bauhinia variegata*), Reetha (*Sapindus mukurossi*), Mulberry (*Morus alba*), Bakain (*Melia azedarach*), Bheemal (*Grewia optiva*), Walnut (*Juglans regia*), Deodar (*Cedrus deodara*), *Ficus* spp, and Shisham (*Dalbergia sissoo*) etc.

Silvipasture plantation

This intervention aims to supplement fodder availability in the project area through plantation of trees and grasses of fodder value. Multipurpose species like Oak (*Quercus leucotrichophora*), Mulberry (*Morus alba),* Bheemal (*Grewia optiva*) have been planted. Besides, *Napier* grass has been planted in various treated micro watersheds.

Bamboo/Agave plantation

The purpose of this intervention is to check soil erosion along the slopes, nullahs and degraded lands. In addition, it also makes available to local communities useful materials like bamboo and fibre.

Methodology

Biomass estimation using remote sensing techniques

In the present study panchromatic (PAN) sharpened IRS 1C and IRS 1D with Cartosat 1 was used. The data was procured by WMD from the National Remote Sensing Centre (NRSC) and forwarded to TERI for further analysis. Few vector layers such as micro-watershed boundaries were also provided by WMD to facilitate the study. The satellite data sets of 2004 - 05 and 2010 - 11 provided by NRSC were geo rectified and mosaicked (stitched together). Later these two data sets were classified to identify different major land cover units such as forest, agriculture, bare land, settlement, landslide, water, snow and shadow. During field surveys several sampling quadrats were laid to capture the data in terms of forest composition and biomass and later these quadrats were used to validate the classified image.

To estimate the increment of biomass in the treated area, multi-temporal satellite data was used. As there was no baseline data, a number of control quadrats were identified within the untreated forest areas nearby the treated area. It is expected that the untreated forests would not accumulate significant amount of biomass within the duration of 3 to 4 years. Conversely, within the treated areas, due to afforestation, maintenance, fencing and protection against grazing and over exploitation, the natural vegetation (bushes, shrubs and grasses etc.) will grow and accumulate substantial amount of biomass within last 4 years.

The sample quadrats in the untreated (control) forest areas were taken as the 'baseline', assuming no change in the biomass for last 3 to 4 years. The biomass stock in the untreated forest area was calculated through field data collection. This calculated biomass was used for 2004-05 satellite images. Similarly, present biomass stock for the treated forest area was calculated and the same value was used for 2010-2011 satellite images. Further a linear fit equation was developed through correlating the biomass values with the NDVI values of same coordinates (pixel) in both years (2004-05 and 2010-11) satellite imageries. Using the linear fit equation, biomass for all the micro watersheds was calculated.

Ground truthing

The ground truthing for biomass sampling was conducted in eleven revenue villages of seven blocks in seven districts of Uttarakhand state. All these villages (except one) were selected from the overall sample of 50 Gram Panchayats (GPs) used for the final impact evaluation of UDWDP. Four blocks (Agustyamuni, Chinyalisaur, Gairsain, and Jaiharikhal) were selected from the Garhwal region, while three blocks (Garur, Lohaghat and Gangolihat) were selected from the Kumaon region. The selected revenue villages were Ghimtoli, Toli, Babina, Gair, Dungri and Sigangaon from the Garhwal region, while Pau, Kheskande, Nag, Khethigaon and Majhkhet were from the Kumaon region. All the selected villages fall within an altitudinal range of 300 m to 1500 m and have a subtropical to temperate climate. Most of the plantations were carried out in the community forests such as Van panchayats, while a few were carried out on Civil and Soyam forest.

Field data for biomass assessment was carried out in the month of October to November, 2011. To assess the standing biomass, quadrat sampling method developed by Misra (1968) was used in all the selected eleven villages. At all the selected sites, quadrats of size 20 x 20 m for trees, 10 x 10 m for shrub and saplings, and 1 x 1 m for herb species were laid out randomly. Depending upon the plantation area, 3 to 6 quadrats were laid within each

treated plantation site along with one quadrat at untreated area, which was considered as the control quadrat. In order to avoid sampling errors, three quadrats along with one control were laid in cases of 5 ha of plantation area, while 6 quadrats along with one control were laid in cases of 10 ha of plantation area.

On the basis of the field data, standing biomass stock was calculated separately for the treated and untreated sites. The standing biomass stock was calculated through the volume equations provided in the Forest Survey of India Report, 1996. In order to extrapolate it for the entire project area, a regression equation was developed between the standing biomass stock (treated and untreated) with the NDVI values of the satellite imageries (2004-05 and 2010-11). The linear fit equation further provides the biomass values of the entire project area. The details of the biomass change in each micro watershed are listed in Table 8.1.

Survival percentage

Survival percentage was also calculated based on the same eleven surveyed sites within the project area. In each surveyed site, around 3 to 6 quadrats were laid depending upon the plantation area. 3 quadrats were laid out at 5 ha treated area, while 6 quadrats were laid at 10 ha treated area. In each quadrat, total number of planted saplings and number of dead saplings were counted separately. Further, percentage of existing plants and dead plants were derived separately for each quadrat and then extrapolated it for individual project site.

Species diversity and richness

The vegetation survey was conducted in the same sites selected for the biomass ground truthing. At all the selected sites, quadrats of size 20 x 20 m for trees, 10 x 10 m for shrub and saplings, and 1 x 1 m for herb species were laid out randomly. All these villages were selected from the overall sample of 50 Gram Panchayats (GPs) used for the final impact evaluation of the UDWDP.

To assess the vegetation composition at each selected plantation site of the eleven revenue villages, same methodology developed by Mishra in 1968 was adopted. Saplings of various tree species were planted as part of the forestry component of UDWDP. Species and diversity index are determined from species richness and abundance. Diversity is represented in the form of indices. Diversity indices attempt to incorporate both richness and abundance into a single numerical value. To compare the diversity between the study sites with control, Shannon-Weiner Diversity Index was calculated. The data was analyzed for density, species richness and abundance of the plant species by using the formulae mentioned below:

Density: Total number of individuals in all quadrats / Total number of quadrats studied.

Diversity index: Diversity index of the plants was calculated according to Shannon-Weiner Diversity Index (Michael 1984).

$H' = \sum p_i . \ln p_i$

where, $p_i = n_i / N$

= Number of individuals of one species /Total number of all individuals in the samples

'ln' is the natural logarithm to base.

The value of Shannon Wiener Index varies from 0 to log K. A value of 0, indicates the presence of only one species, while that of log K means that all species are equally represented within the study area.

Agriculture and Soil

To identify different landuse/landcover (LU/LC) supervised classification is a common method. In this method, the user supplies a set of information (training sets) to a computer as guide to classify satellite images in different LU/LC based on their spectral properties. During ground truthing the user collects information of different surfaces and later these are used as 'guide'. For the present study supervised classification was used to identify different LU/LC from 2004-05 and 2010-11 satellite image. After classification agricultural land and bare/un-vegetated areas were extracted for further processing.

Findings

Biomass estimation

Overall it was observed that the biomass of the treated areas has increased by 9.37% from 2004-05 to 2011-12 (averaged across Micro watersheds). This biomass increase excludes the areas under Reserve Forest, agriculture and habitation. The areas which were covered the Van panchayat forests, Civil and soyam forests and Barren and fallow lands. These changes were on account of increase in vegetation cover due to new plantations under the project and natural regeneration of grasses, shrubs and tree seedlings because of the protection against grazing and over usage. Since the planted saplings are very young (hardly 3 to 4 years old) the increase in the biomass on account of plantations is relatively low. However, biomass accumulation through natural regeneration that has occurred through protection is likely to have contributed to the overall biomass increase. Soil conservation structures and drainage line treatment (DLT) have been important project interventions and these have also contributed to biomass increase by preventing soil erosion and conserving the moisture regime. Bringing additional land under irrigation has also contributed to moisture conservation not only in and around agricultural land but also around structures such as water channels and irrigation tanks.

In Baniyari, Surgad, Kuthlargad and Pasiya Gad Micro watersheds the biomass increment is negative.This is due to massive road construction activities under Pradhan Mantri Gram Sarak Yojna (PMGSY) and other developmental schemes since last 3 to 4 years in these micro watersheds, which has resulted increase in land sliding, destruction of the flora and damage to the structures constructed under the project.

Table 8.1 provides information on change in biomass in the treated micro watersheds. It is evident from Figures annexed at the end of this chapter that due to soil and water conservation measures the biomass of the treated MWS has increased. In the figures, the plantation areas that are close to check dams are shown. In the FCC it can visually interpreted that vegetation cover has increased over time which is supported by the colour coded biomass map of the same area.

Table 8.1 Change in biomass within the treated micro watersheds.

MWS	Division	2004 (t/ha)	2010 (t/ha)	% change
Amergad	Champawat	20.18	22.04	9.20
Baniyari	Augustmuni	20.84	20.79	-0.24
Bisgadikhala	Kotdwar	26.72	27.13	1.51
Chariyagad	Champawat	23.60	29.35	24.34
Chhanigad	Pithoragarh	14.57	14.65	0.49
Chhinka	Augustmuni	30.68	35.99	17.31
Dhawalgad	Vikasnagar	9.35	11.64	24.49
Dolgad	Nainital	12.26	12.69	3.51
Dudharkhal	Kotdwar	22.96	25.13	9.44
DusadGadhera	Dwarahat	25.83	26.89	4.09
Gairgad	Chinyalisaur	13.75	16.00	16.32
GanaiGadhera	Pithoragarh	18.44	18.86	2.30
Gomti River	Bageshwar	16.83	20.86	23.91
Jaidwar	Vikasnagar	13.04	16.06	23.12
Jargad	Bageshwar	18.69	23.32	24.81
Kaindul	Kotdwar	23.76	30.35	27.74
Kuthlargad	Dwarahat	18.41	18.12	-1.55
Kyari	Chinyalisaur	10.07	12.03	19.48
Kyunjgad	Augustmuni	33.74	34.25	1.52
Linggad	Pithoragarh	15.73	16.28	3.46
Lohaghat	Champawat	30.47	30.82	1.14
Mothu gad	Gairsan	20.61	21.10	2.38
NargalNala	Pithoragarh	9.69	9.96	2.72
Pasiya Gad	Nainital	5.35	4.92	-8.09
Pili Gad	Champawat	26.70	27.08	1.45
Pogtagad	Augustmuni	29.80	36.06	21.00

MWS	Division	2004 (t/ha)	2010 (t/ha)	% change
SarnokaKhala	Vikasnagar	14.30	18.57	29.91
Saulagad	Champawat	24.45	24.32	-0.54
Sunindagad	Vikasnagar	10.77	13.77	27.85
Surgad	Augustmuni	30.02	29.12	-3.00
Tatapani	Bageshwar	15.88	16.30	2.67

Survival percentage

It was assessed that the average survival percentage varies from 23% (Sigangaon, Uttarkashi) to 85% (Gairsain, Chamoli) within the eleven surveyed sites. In Toli, Dungri, Pau, Kheskande, Babina, Majhkot, Gimtoli, Khetigaon, and Nag sites the survival percentage was recorded as 66.66%, 58.33%, 55.83%, 52.08%, 34.16%, 33.33%, 32.5%, 32.5% and 24.16 % respectively. Overall average survival percentage within the surveyed sites was around 45%. In Gairsain site, the survival percentage was highest because the plantation was only one year old, while the other sites were 2 to 4 years old. Low survival in most of the sites was due to ineffective maintenance and low protection from cattle grazing. Besides, there were various site specific reasons for low survival percentage. In case of Uttarkashi and Pithoragarh districts, there is a serious problem of land sliding and most of the new plants were affected by this. Similarly, in Rudraprayag district, huge road construction activity is going on, which affects the new plantation activities. In a few sites, there were cases of forest fires, which also caused damage to the young saplings.

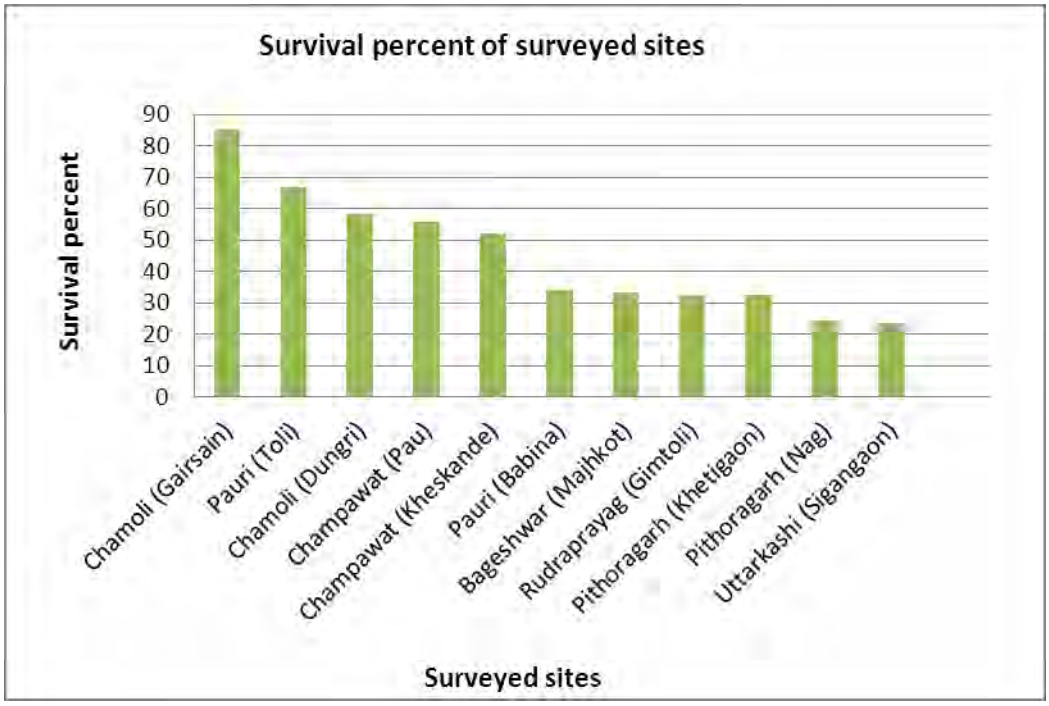


Figure 8.1 Survival percentage of surveyed sites

Species diversity and richness

Species diversity and richness was calculated separately for tree, shrub and herb species of treated as well as untreated sites (control) in order to compare the vegetation status in the selected treated plantation sites. Details of the diversity index and species richness are provided in Table 8.2.

The findings of the study revealed that the treated plantation sites have higher values of diversity and species richness as compared to the control sites. The shrubs have higher diversity values and species richness as compared to the tree and herb species. Increase in the species richness and diversity index were probably due to effective dry stone fencing and watch and ward in a few plantation sites. Conservation and protection activities creates conducive environment for various other local species to grow and survive better. Also, due to the construction of various soil and water conservation structures, there is increase in the moisture content, which also results in increase of herb and shrub species within the treated area. However, in the control sites, which were open to cattle grazing and anthropogenic disturbances, low species richness and diversity is recorded.

Table 8.2 Species diversity and richness in the selected sites.

Revenue villages	Blocks	Vegetation type	Diversity index		Species richness	
			Treated site	Control site	Treated site	Control site
Garhwal region						
Gair	Gairsain	Tree	1.609	0.324	5	2
		Shrub	2.491	1.635	17	6

Revenue villages	Blocks	Vegetation type	Diversity index		Species richness	
			Treated site	Control site	Treated site	Control site
		Herb	0.292	0.655	6	2
Dungri	Gairsain	Tree	1.000	1.000	1	1
		Shrub	2.422	1.510	12	5
		Herb	1.484	1.476	8	5
Ghimtoli	Agastyamuni	Tree	0.881	0.500	4	2
		Shrub	1.924	1.365	13	4
		Herb	1.751	0.693	7	2
Sigangaon	Chinyalisaur	Tree	0.974	1.000	3	1
		Shrub	1.816	1.291	7	4
		Herb	1.431	1.078	6	3
Toli	Jaiharikhal	Tree	0.544	0.000	2	0
		Shrub	2.505	1.573	12	5
		Herb	1.611	1.125	9	4
Babina	Jaiharikhal	Tree	1.682	0.562	8	2
		Shrub	2.269	1.534	14	5
		Herb	1.468	0.429	6	2
Kumaon region						
Nag	Gangolihat	Tree	1.000	1.000	1	1
		Shrub	1.597	1.466	7	5
		Herb	1.872	1.052	9	4
Khetigaon	Gangolihat	Tree	1.000	0	1	0
		Shrub	1.844	1.220	8	4
		Herb	1.679	0.682	8	2
Pau	Lohaghat	Tree	0.655	1.000	2	1
		Shrub	2.105	1.706	12	7

Revenue villages	Blocks	Vegetation type	Diversity index		Species richness	
			Treated site	Control site	Treated site	Control site
		Herb	1.027	1.212	5	4
Kheskande	Lohaghat	Tree	0.693	0.000	2	0
		Shrub	2.600	1.432	14	5
		Herb	1.499	1.265	8	4
Majhkot	Garur	Tree	0.173	1.000	2	1
		Shrub	2.054	1.954	10	6
		Herb	2.367	1.019	14	4

Agriculture and Soil

In the present study the satellite images were classified to identify the agricultural land and open bare land including eroded land. The satellite images of 2004-05 and 2010-11 were classified based on their spectral properties and ground observations. After classification it was observed that there is significant change in agricultural land and minor change in bare/eroded land. There is a huge positive change in agriculture including grass/herb. The following table (Table 8.3) shows the per cent change in agriculture over the time (2004-05 and 2010-11).

Table 8.3 Change in agricultural land

MWS	Division	2004	2010	% change
		(sq km)	(sq km)	
Amergad	Champawat	6.82	6.42	-0.14
Baniyari	Augustmuni	5.19	4.25	-0.48
Bisgadikhala	Kotdwar	5.30	5.88	0.31
Chariyagad	Champawat	18.44	16.90	-0.33
Chhanigad	Pithoragarh	9.36	19.56	1.09
Chhinka	Augustmuni	6.25	7.60	0.33
Dhawalgad	Vikasnagar	3.23	19.18	3.36
Dolgad	Nainital	5.93	8.53	1.90

MWS	Division	2004 (sq km)	2010 (sq km)	% change
Dudharkhal	Kotdwar	2.55	2.78	0.12
DusadGadhera	Dwarahat	10.50	22.09	1.73
Gairgad	Chinyalisaur	3.90	6.30	0.52
GanaiGadhera	Pithoragarh	11.60	19.95	0.84
Gomti River	Bageshwar	7.93	23.60	4.56
Jaidwar	Vikasnagar	4.20	6.57	0.62
Jargad	Bageshwar	4.32	9.40	0.80
Kaindul	Kotdwar	1.72	3.06	0.98
Kuthlargad	Dwarahat	8.54	22.73	3.28
Kyari	Chinyalisaur	0.99	3.02	1.15
Kyunjgad	Augustmuni	13.46	13.90	0.19
Linggad	Pithoragarh	11.33	20.14	0.87
Lohaghat	Champawat	16.48	15.31	-0.23
Mothu gad	Gairsan	14.35	25.95	2.63
NargalNala	Pithoragarh	13.86	26.53	1.43
Pasiya Gad	Nainital	14.55	9.72	-3.24
Pili Gad	Champawat	16.25	15.83	-0.09
Pogtagad	Augustmuni	26.68	25.03	-0.39
SarnokaKhala	Vikasnagar	4.45	15.05	1.95
Saulagad	Champawat	10.59	12.37	0.32
Sunindagad	Vikasnagar	1.78	10.33	1.97

MWS	Division	2004 (sq km)	2010 (sq km)	% change
Surgad	Augustmuni	7.97	9.79	0.46
Tatapani	Bageshwar	5.02	8.11	0.66

Findings revealed that there were several areas with small landslide scars that are directly related to developmental activities such as transport network. In the following table micro watersheds with higher risk of soil erosion are presented.

As observed after classification, several harvested lands fall in the class of bare/eroded land. The spectral properties of bare/eroded land and harvested land are almost the same and very difficult to differentiate except in the case of fresh erosion or soil transport. In the heterogeneous LU/LC areas the scenario is more complex. However, with adequate ground surveys and thorough interpretation, the errors were eliminated in most cases. In the following table (Table 8.4) the change in bare/open land is presented.

Table 8.4 Change in bare land

MWS	Division	2004 (sq km)	2010 (sq km)	Change (sq km)
Amergad	Champawat	2.79	2.05	-0.75
Baniyari	Augustmuni	2.48	1.57	-0.91
Bisgadikhala	Kotdwar	6.56	6.90	0.33
Chariyagad	Champawat	6.46	1.00	-5.46*
Chhanigad	Pithoragarh	0.91	3.01	2.10
Chhinka	Augustmuni	3.13	1.20	-1.94
Dhawalgad	Vikasnagar	6.40	0.54	-5.86*
Dolgad	Nainital	7.62	3.03	-4.58
Dudharkhal	Kotdwar	3.06	3.61	0.54
DusadGadhera	Dwarahat	1.95	3.47	1.53
Gairgad	Chinyalisaur	4.61	1.48	-3.13
GanaiGadhera	Pithoragarh	1.00	2.75	1.74
Gomti River	Bageshwar	1.24	4.46	3.22
Jaidwar	Vikasnagar	3.79	1.00	-2.79
Jargad	Bageshwar	0.47	2.84	2.36

MWS	Division	2004 (sq km)	2010 (sq km)	Change (sq km)
Kaindul	Kotdwar	3.08	1.03	-2.05
Kuthlargad	Dwarahat	3.98	6.48	2.50
Kyari	Chinyalisaur	5.20	5.52	0.32
Kyunjgad	Augustmuni	9.37	4.37	-4.99*
Linggad	Pithoragarh	1.24	3.78	2.54
Lohaghat	Champawat	4.73	2.20	-2.53
Mothu gad	Gairsan	6.49	7.85	1.35
NargalNala	Pithoragarh	1.61	3.24	1.63
Pasiya Gad	Nainital	10.72	3.21	-7.51*
Pili Gad	Champawat	2.67	5.10	2.43
Pogtagad	Augustmuni	14.25	8.81	-5.44
SarnokaKhala	Vikasnagar	4.28	7.15	2.87
Saulagad	Champawat	3.40	2.76	-0.64
Sunindagad	Vikasnagar	6.58	9.80	3.22
Surgad	Augustmuni	4.57	3.23	-1.34
Tatapani	Bageshwar	0.44	1.77	1.32

*Some areas with thin cloud cover in the satellite imageries appeared as bareland.

The micro watersheds recording negative change are those where developmental activities such as road construction are being undertaken on a large scale. These areas have more anthropogenic pressure resulting in degradation due to overgrazing, lopping of trees, fodder and more dependence of local people on forest.

Impact assessment

In most of the treated sites where conservation measures were done through construction of dry stone wall fencing, vegetation growth was found very effective. In these sites, growth and survival of natural vegetative flora was observed better as compared to the control sites. Due to increase in ground vegetation cover, there is improvement in the soil texture and moisture content, which results in increase in the vegetative biomass. In some of the afforestation sites, effective protection and maintenance was also observed, which results in better survival and growth of the planted saplings as compared to the other treated sites. Besides, horticulture plantations in the private fallow land also increase the biomass. In a few sites, soil and water conservation structures were very effective in controlling the run off

of the soil and increasing the moisture content. While in some conserved areas, weed such as *Eupatorium* species grew vigorously, which suppressed the growth of other species. In a few sites, rainwater harvesting ponds were constructed nearby the treated areas, which also provided moisture to support good vegetation cover.

Due to large scale plantation activities within the project area, availability of fuelwood, fodder, timber, minor forest produce and NTFPs would increase in the near future. The demand and supply gap of these forest resources would reduce within the treated watersheds in the near future. Construction of soil and water conservation structures would check the surface runoff and increase the percolation rate of water inside the ground, which would help in increasing the ground water level and recharge of natural water springs. These structures also check the soil erosion and moisture conservation and provide suitable micro environment for the vegetation to growth in near future. It is assumed that once there will be increase in the vegetative ground flora, the faunal biodiversity would also increase.

The plantation area is used by villagers to harvest fodder grass after the rainy season, during this practice the villagers also cut the thorny and undesirable shrubs to favour the palatable grasses. This affects the biodiversity adversely but favours the natural regeneration of various useful species. Due to conservation afforded to the sites continuously for 3 to 4 years some weeds specially *Eupatorium* species got a chance to proliferate within plantation areas resulting in suppression of other species and prevention of natural regeneration of local species. The presence of such weeds has contributed to the biomass productivity but reduced the species richness. The sites were spread between elevations of 300 to 1500 m. This elevation is favourable for species richness but also favours human habitation and agriculture, resulting in huge biotic pressure on the forests. In this zone plantation sites need protection for longer duration. If the protection is removed then the site has the tendency of reverting back to its original status. In Van panchayat forest the protection can be sustained, but in Civil soyam forests there is greater chance of degradation unless the village community decides to manage it.

Sustainability

Most of the project activities have been carried out in Van Panchayats forest areas. These Van Panchayats are managed by the Van Panchayat Commities (VPC). After completion of the project, activities conducted under the project will be maintained by VPC.

During the field survey, it was observed that most of the check dams were completely filled with sediment. To sustain these structures for a longer duration, vegetative treatment should be carried out at the backfilled areas of these check dams, so that the loose soil will become compact and the structures will retain for a longer duration.

Recommendations

- Vegetative fencing through planting of species suitable for live hedge along with dry stone wall should be carried out for effective protection and conservation of the plantation sites.
- Brushwood check dams should be constructed against the small gully erosion formation within the project area.
- The Van Panchayats should manage the plantations and take up fire protection measures and watch and ward of the forest. To control forest fire, collection of Chir

pine (*Pinus roxburghii*) needles should be encouraged where they exist. Further, these should be used for preparing pine briquettes.

- Soil conservation activities should be carried out using the ridge to valley approach. In a few sites, structures were not created at the upper reaches of the catchment areas, which were under Reserve Forest.

Conclusion

During the field survey, it was observed that species were planted in consultation with the local people. Species such as Oak (*Quercus leucotricophora*), Deodar (*Cedrus deodara*), Pangar (*Aesculus indica*), Angu (*Fraxinus micrantha*) etc. were planted at the higher altitude of the project area, while Amla (*Emblica officinalis*), Ritha (*Sapindus mukurossi*), Bamboo (*Dendrocalamus strictus*), Kachnar (*Bauhinia variegata*), Siris (*Albizia lebbek*), Oak (*Quercus leucotricophora*) and *Ficus* species were planted at the lower altitude of the project area. Maximum plantation within the project was carried out in between 2007-08 to 2010-11. Thus average age of the saplings was thus 3 to 4 years at the time of survey.

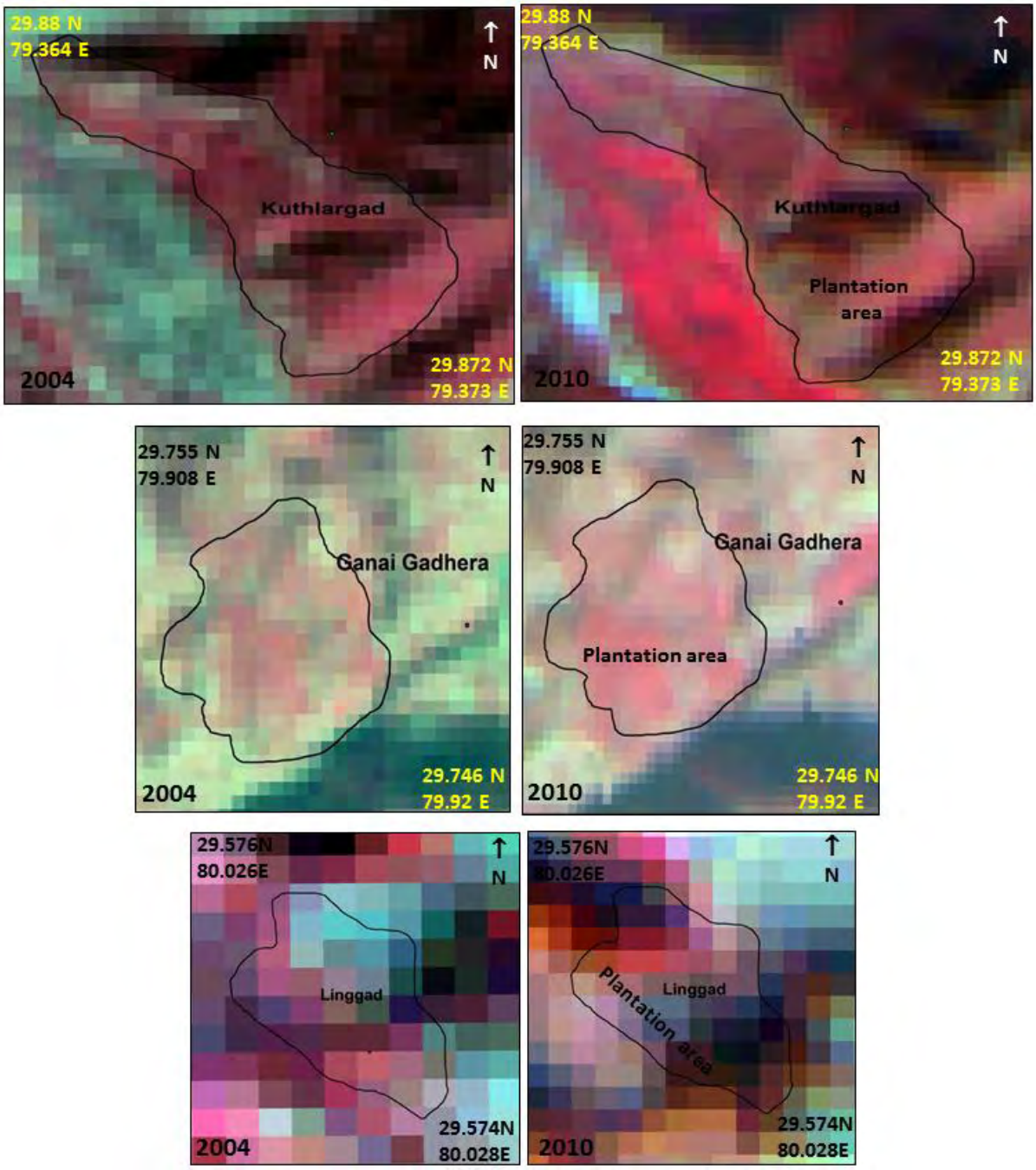
Field observations suggest that in the past there have been relatively few interventions in the form of fodder grass cultivation such as *Napier,* which was one of the potential activities envisaged for the project. Promotion of these activities is a requirement for the similar future schemes. Interventions such as soil and water conservation measures, afforestation activities and dry wall fencing for natural regeneration in Reserve Forests could also be important in order to check soil erosion and for the recharge of water and moisture particularly around the habitations.

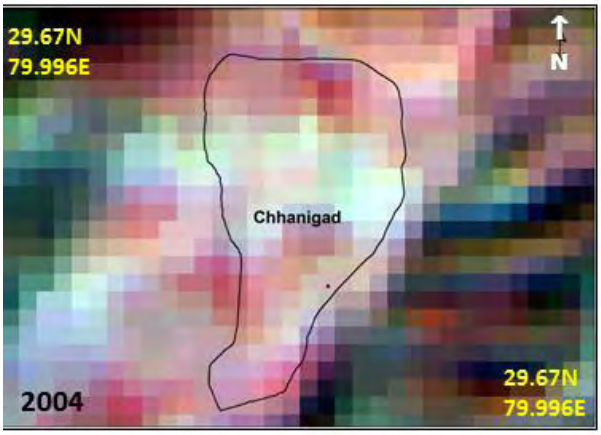
Field surveys also suggest that there have been introduction of exotic species, and spread and proliferation of invasive species. However, it is possible to mitigate these impacts through selection of native species, plantation of broad leaved species for fodder and providing alternative means to meet the needs of local people.

Although there is low survival of the plantation in the treated areas, the project has largely succeeded in achieving its overall goals under forestry and biodiversity component. As against the target of 10% increase in the biomass index and vegetation index, the project has achieved around 9.37% increase in biomass across all the project watersheds. The project has also achieved substantial increase in the biodiversity richness, especially in the case of herbs and shrub species.

Annexure to Chapter 8

1. Status of plantation areas in few selected micro-watersheds (Kuthiargad, Ganai Gadhera, Linggad, Chhanigad and Nargal Nala) in False Colour Composite (FCC). The darker red colour represents higher vegetation density.

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Chhanigad
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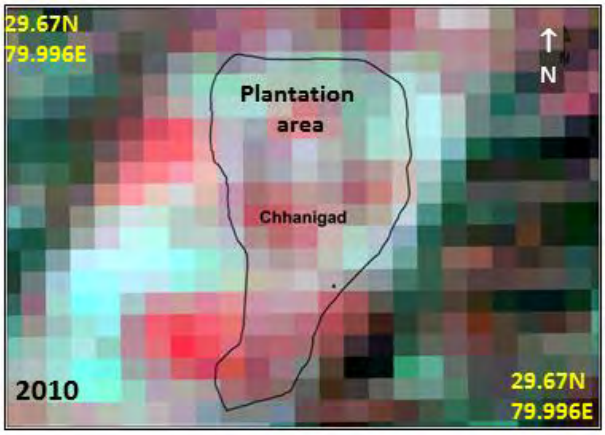
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Plantation
area
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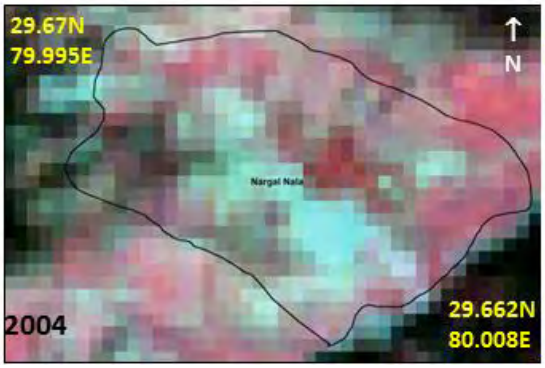
2010
29.67N
79.996E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Nargal Nala
2004
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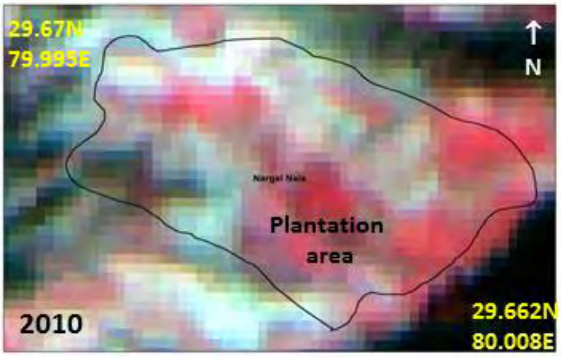
80.008E


29.67N
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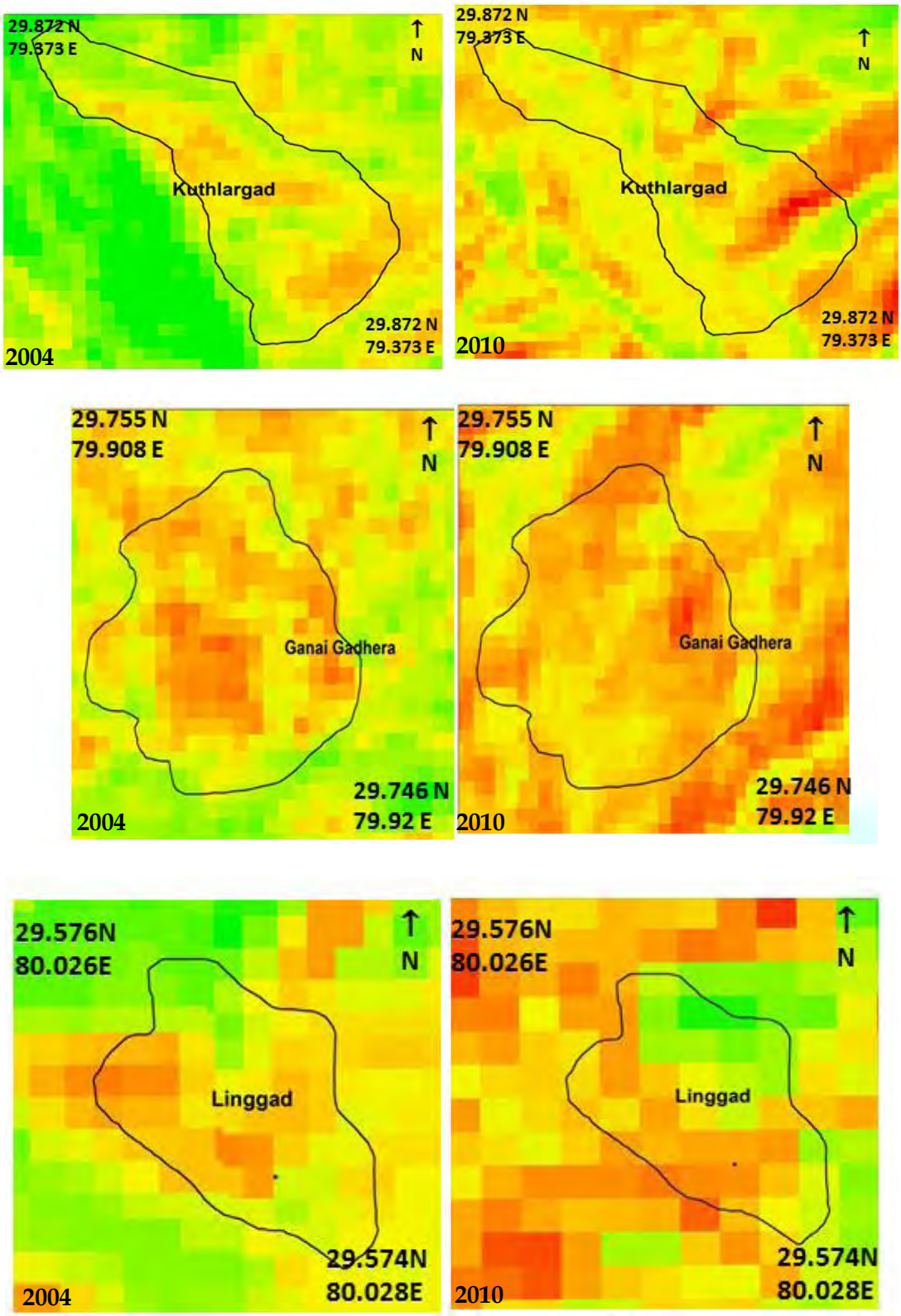
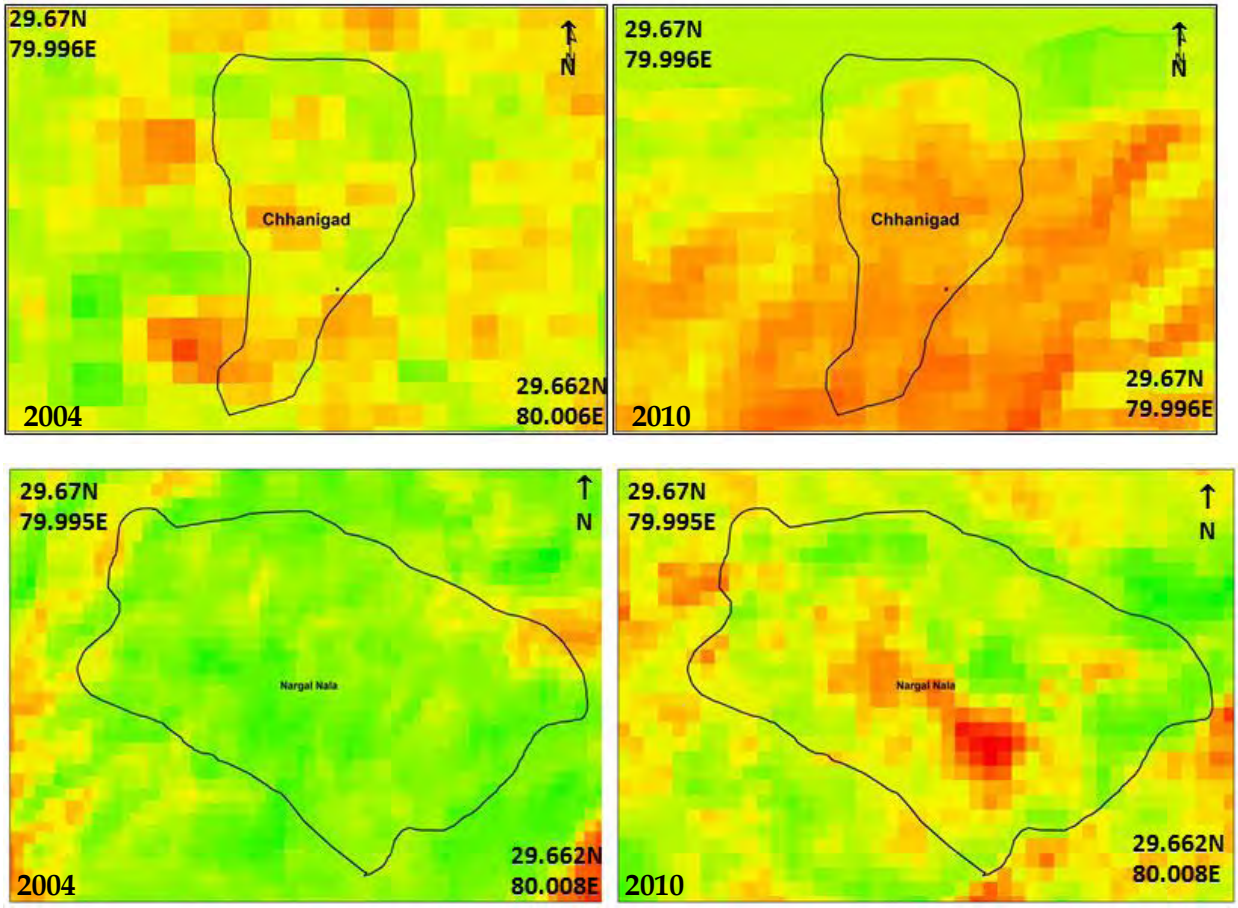
Nargal Nala
Plantation
area
2010
29.662N
80.008E

2. Status of biomass in plantation areas in few selected micro-watersheds (Kuthiargad, Ganai Gadhera, Linggad, Chhanigad and Nargal Nala) in enhanced colour code. (Red to green colour stretch is used to depict high to low biomass value).




29.67N
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Nargal Nala
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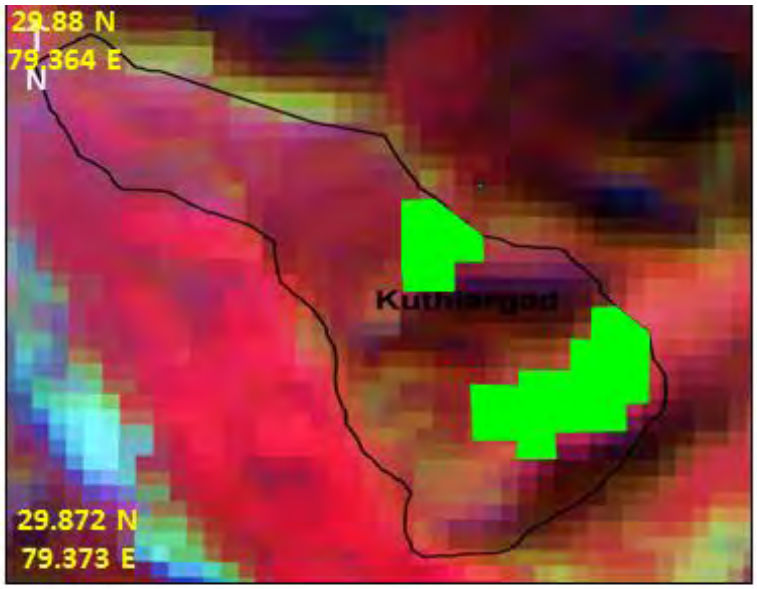
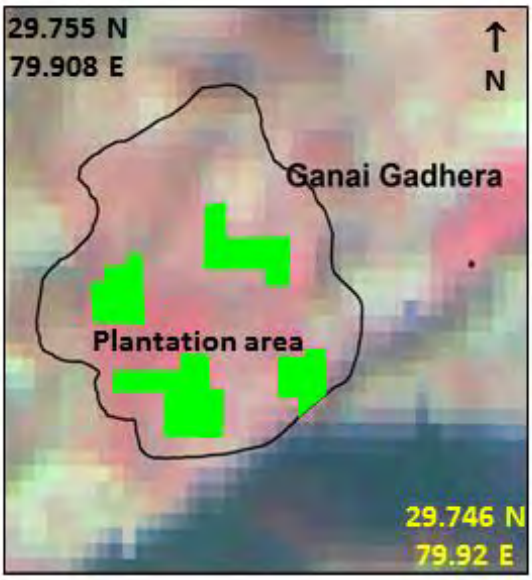
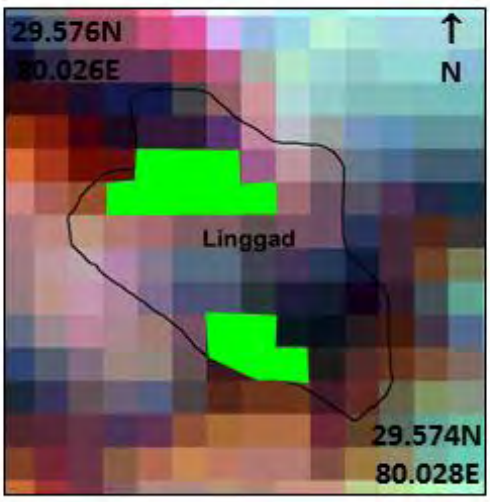
80.008E
2004
29.67N
79.995E
N
Nargal Nala
29.662N
80.008E
2010

3. Areas with higher vegetation cover overlayed (in green) on False Colour Composite in treated micro-watersheds (Kuthiargad, Ganai Gadhera, Linggad, Chhanigad and Nargal Nala).





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9. Community participation and institutional development

Introduction

UDWDP draws upon the lineage of the World Bank funded IWDP (Integrated Watershed Development Project) Hills – II, which laid emphasis on a participatory watershed approach. The project development objective (PDO) of UDWDP *"To improve the productive potential of natural resources and increase incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches"* encompasses three themes or components:

1. Community participation in watershed development and management aimed at integrating land-water use with the objectives of moisture retention and biomass production, while simultaneously enhancing incomes and livelihood options;
2. Strengthening administrative capacity of GPs to manage project financial resources, implement sub-projects, deliver legally mandated services (in the context of natural resource management), and to sustain those services beyond the duration of the project; and,
3. Ensuring equitable participation by all groups especially the landless and women who rely disproportionately on common pool resources for fodder, fuel and other forest products.

The involvement of the community and their empowerment cuts across all the three themes and components. Given these overarching themes, the project has been designed to adopt a participatory approach that entails community involvement at all stages, that is, starting from project planning up to implementation. The project has adopted a decentralized institutional setup with the Gram Panchayat as the main planning and implementing agency. The Watershed Management Directorate (WMD), the nodal agency for the project is playing the role of a facilitator, rather than that of an implementer. It is the Gram Panchayats (GPs), the elected body at the village level, that are the real implementers. The objective of working through the GPs is to develop real functional autonomy of local self-government, to encourage participation, upgrade skills and build capacities of local self-government, and to increase accountability and responsibility of GPs towards the community (WMD, undated). More importantly, the GPs, being elected representative of the local community, are perceived to be reflective of the aspirations of the community members residing within the respective GPs. The village community, thus, is involved from planning to implementation, handling of funds, procurement to maintenance of assets.

After Uttarakhand became an independent state in 2000, the state policy has been to integrate the local self-government in rural development. The first Panchayat elections, of the newly formed state were held in the year 2003, followed by the next in the year 2008. Thus, UDWDP which commenced in the year 2004, during its tenure engaged with its first set of GP institutions. This combined with the scale of UDWDP, that covers 11 districts of the state is critical for empowering these grassroots institutions of self-government. Furthermore, in the case of a newly formed state like Uttarakhand, empowerment of these institutions strengthens the paradigm of development that the state is steering forward to.

Given the emphasis on the close involvement of the GPs and of the community in the project implementation, various interventions have been devised to give institutional support and to aid the community and community based groups in project participation. The project has been implemented in 468 GPs; Gram Panchayat Watershed Development Plans (GPWDPs) have been finalised for all these GPs; 536 Self Help Groups (SHGs), and 1943 User Groups have been formed (WMD, 2012). In addition, a total of 8137 members belonging to the Vulnerable Group category (a sub set of Category 'C' as identified in the GPWDP) have been provided financial support for Income Generation Activities (IGAs).

Interventions

The project interventions for community participation and institutional strengthening have been specifically targeted towards constituents of Gram Sabhas, elected members of Gram Panchayats, community based groups like User Groups, Self Help Groups (SHGs), Vulnerable Groups (VGs), Farmers' Interest Groups (FIGs), and Project staff at GP level, namely, woman Village Motivator, Accounts Assistant.

The interventions broadly include the following:

a) Mobilisation and facilitation support for: i) involvement of households in the preparation of GPWDP, ii) formation of community based groups, viz. SHGs, VGs, User Groups and FIGs.

b) Capacity building activities for i) project management and ii) livelihood enhancement. These included specifically trainings, exposure visits, entrepreneurial development programmes (EDPs) and workshops for GP staff, SHG, VG and FIG members. Table 9.1 shows the numbers of persons trained under the project.

c) Special provisions to enhance women's participation like organising Women's Aam Sabha, having a woman Village Motivator, woman ward member as co-signatory.

d) Particular focus to enhance livelihood opportunities for Vulnerable Groups: a Vulnerable Group Fund (VGF) has been initiated and one time grant given to those belonging to VG category as identified in the GPWDP. 720 groups and 3340 individuals, that is, a total 8137 VG category members were provided with financial support for IGAs. (WMD, 2012).

Table 9.1 Number of persons trained up to December 2011

Activities	Unit	Cumulative since inception (up December 2011)*
Capacity building of community members (Training)	Person	314976
Capacity building of staff (Training)	Person	4150

*Could include multiple trainings of the same person

Source: Watershed Management Directorate

Assessment of Impacts

In order to assess the impact of the decentralised participatory approach of the project, institutional outcome indicators were designed to address the related elements in the PDO and the three components. The results of these institutional outcome indicators used for the final impact assessment are summarised in table 9.2 against the respective objective / component and discussed in detail in the section below.

Table 9.2 Institutional Outcome Indicators

S.No.	Outcome indicator	Final Impact result
***PDO**: To improve the productive potential of natural resources and increase incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches*		
1	20% improvement in administrative capacity of GPs as measured by performance indicators Measured against the following indicators: a. Increase in overall attendance in Gram Sabha meetings b. Increase in attendance of women in Gram Sabha meetings c. Increase in attendance of VG members in Gram Sabha meetings d. Increase in number of Gram Panchayat meetings e. Increase in attendance in Gram Panchayat meetings	a. Overall attendance in Gram Sabha meetings increased by 102.5% b. Attendance of women in Gram Sabha meetings increased by 482.33% c. Attendance of VG members in Gram Sabha meetings increased by 200.56% d. Number of Gram Panchayat meetings increased by 110.98% e. Attendance in Gram Panchayat meetings increased by 52.05%
***Component one**: a) Communities are mobilized and prioritize their own mix of watershed and village development technologies by actively involving all households*		
2	80% households are included in preparation of GPWDP	An average 78.96% of total households in a Gram Panchayat have been involved in the preparation of GPWDP
***Component two**: c) Vulnerable Groups (including women and landless) establish IGAs through VG and SHGs*		
3	30% increase in number of functioning SHGs	30% increase in number of functioning SHGs.
4	Number of IGAs funded under the project	A total 4060 (720 for groups and 3340 for individuals) IGAs funded under the project
5	15% increase in average net income generated by IGAs for VG households (Rs/HH)	65% increase (in nominal terms) in the non-farm income for VG households (29.6% in real terms – on adjustment for inflation). The high BCRs reported for most VG group activities over the medium term (5 and 10 years) also corroborate the fact that the benefits from IGAs in terms of net income is well above the target.

S.No.	Outcome indicator	Final Impact result
6	50% of Income Generating Activities still active after two years from the start of the activity	About 90% of IGAs that are two years or older were found to be active at the time of survey
***Component three**: a) GPs and other relevant local institutions have developed sufficient capacity to design, prioritize, implement watershed treatment and operate and maintain assets created*		
7	At least 50% attendance in statutory Gram Sabha meetings (% of households)	An average 46.8% attendance in statutory Gram Sabha meetings (increased from an average 23.1% to an average of 46.8%, showing an average increase of 102.5%)
8	50% of GP constituents aware of annual budget and expenditure	An average 48.7% of GP constituents aware of annual budget and expenditure
9	80% of GPs targeted under project having satisfactory annual audit report	100% GPs had satisfactory annual audit reports (of audit by CA at GP level). Audit reports found to be satisfactory by the auditors, wherever objections were raised, these were settled. No major irregularity in expenditure reported to the external evaluator during the survey.
***Component three**: b) All stakeholders are informed and educated about key design and participation features of the project using targeted messages evolved through a comprehensive communication strategy*		
10	50% of target households aware of project objectives, activities and methodologies	91% households aware of project objectives, activities and methodologies
	***Component three:** c) Effective and efficient project coordination, management, monitoring and evaluation system are established and operationl*	
11	PME regularly (at least 3 times) carried out in 400 GPs and reports received by WMD	PME carried out regularly (at least thrice) in all sampled GPs
12	90% staff deployment as per agreed schedule	100% staff deployment (of account assistant and village motivator) in sampled GPs

Note: The results are based on primary survey undertaken through questionnaires as defined in the ToR.

Administrative Capacity of the Gram Panchayat

The improved administrative capacity of the GPs is an outcome indicator that addresses the overall PDO. The improvement in the administrative capacity of the GPs has been assessed against the following:

a) Overall attendance in Gram Sabha meetings

b) Attendance of women in Gram Sabha meetings

c) Attendance of VG members in Gram Sabha meetings

d) Number of Gram Panchayat meetings

e) Attendance in Gram Panchayat meetings

Each of the measures shows a marked increase, when compared with the control GPs where the increase is next to negligible. These are individually discussed in detail below. However, a comparison in table 9.3 and figure 9.1 below shows an appreciable increase in all the measures.

Table 9.3 Increase in administrative capacity of GPs

Description	Before Project	After Project	Increase (%) in sample (project) GPS	Increase (%) in Control GPS
Attendance in Gram Sabha meetings (%)	23.1	46.8	102.5	6
Attendance of women in Gram Sabha meetings (%)	7.7	44.84	482.33	0
Attendance of VG in Gram Sabha meetings (%)	10.58	31.8	200.56	0
Number of GP meetings (No.)	5.28	11.14	110.98	0
Attendance in GP meetings (%)	44.72	68	52.05	3

Source: TERI Primary Survey 2011

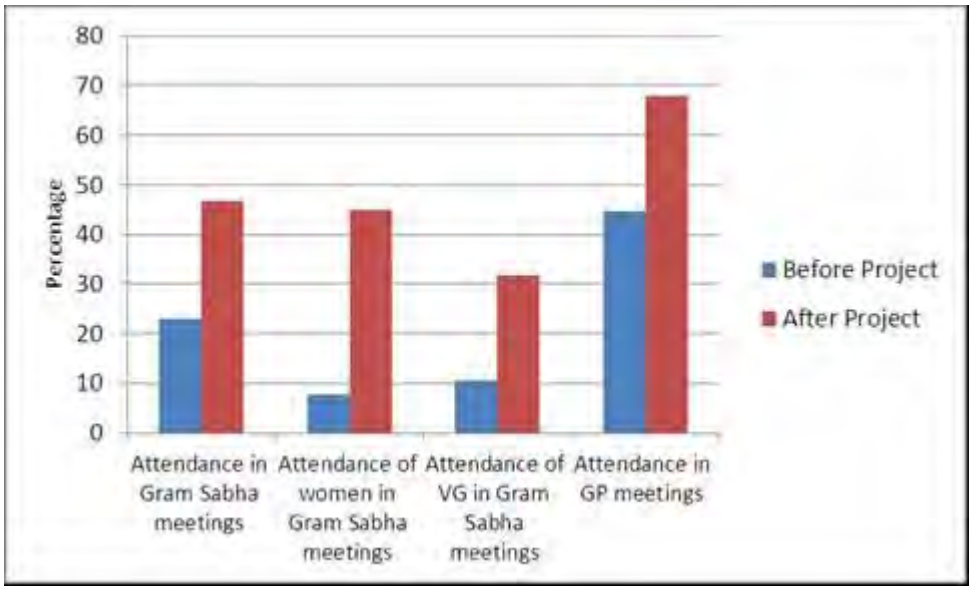

Figure 9.1 Increase in administrative capacity of GPs

The improved administrative capacity of GPs was also corroborated in group discussions, where community members asserted that this has been enhanced with UDWDP interventions. This was perceived in terms of better participation of GP members in planning and execution of GPWDP, increase in frequency of GP meetings, and increased interest of elected representatives in village development issues. Community members also noted that GP members were now better aware of budget and planning, and that there is increased participation of women ward members. An increased initiative in village development activities by GP members was also cited in a few GPs. For example in Maror in Vikasnagar Division and Banelagaon in Pittoragarh Division, during Group Discussions, the community adhered that with the intervention of the project activities, the GP has become more active about the development of all the villages that fell under the GP and different Government Schemes implemented at district level were now being explored for village development.

Attendance in Gram Sabha Meetings

Results of the primary survey show that in all Gram Panchayats, Gram Sabha meetings are being held once in six months or twice a year, as per schedule, without any exception. The attendance in the statutory Gram Sabha meetings has increased from an average 23.1% to an average of 46.8%, showing an average increase of 102.5%, whereas the control GPs showed no increase. Figure 9.2 below shows GP wise increase in average attendance in statutory Gram Sabha meetings.

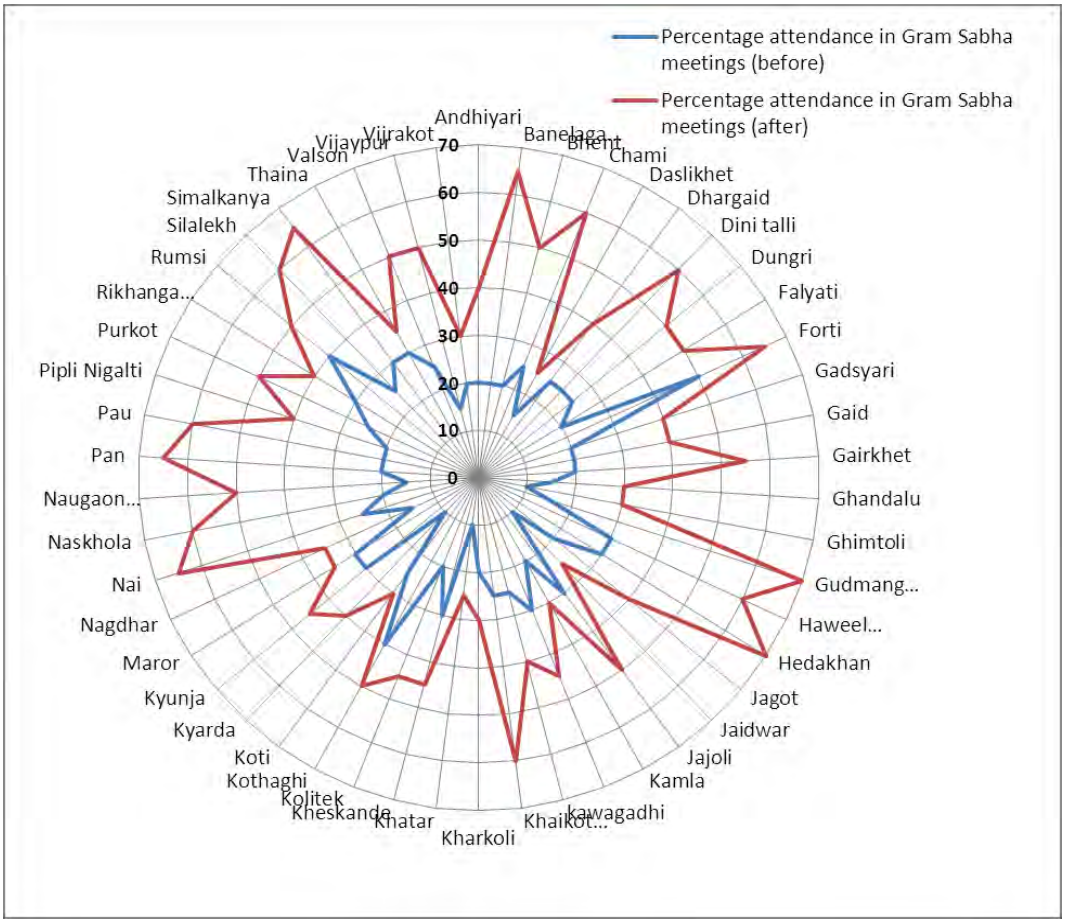

Figure 9.2 Attendance in Gram Sabha meetings

Attendance of Women in Gram Sabha Meetings

The attendance of women in Gram Sabha meetings has increased from an average 7.7% to an average 44.84%, showing an increase of 482.33%, while the control scenario shows no increase. In group discussions, community members noted that women's attendance, as also their participation in Gram Sabha and other common village meetings has positively increased. This was attributed to the focused activities of Gramya for women, like organising them into SHGs, VGs and having focused IGA support activities for these groups. Having women motivators at the village level has also influenced the increased attendance and participation of women. In many cases the capacities of the UDWDP Village Motivators themselves have been built to such an extent that they have taken on leadership roles as Gram Pradhans. It was noted in group discussions that the confidence level of women has increased, and they are observed to be more vocal and participating in meetings. Enhanced participation of women was also cited as one of the best outcomes of UDWDP during community interactions in Dasilakhet and Jajoli GPs in Pithoragarh Division, and Maror GP in Vikasnagar Division. Figure 9.3 below shows the GP wise increase in average attendance of women in Gram Sabha meetings.

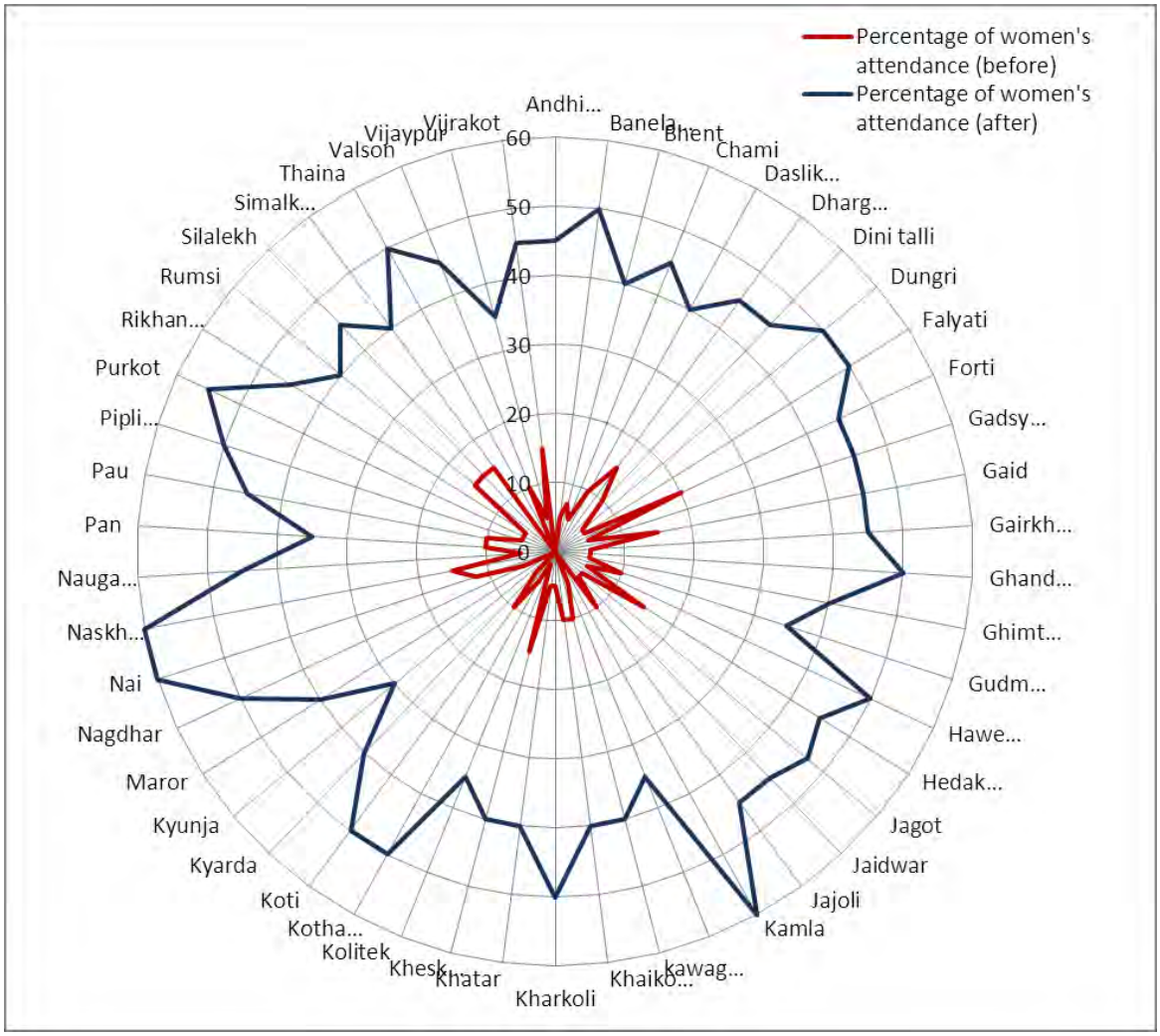

Figure 9.3 Attendance of women in Gram Sabha meetings

Attendance of VG Members in Gram Sabha Meetings

The average attendance of Vulnerable Groups (VGs) in Gram Sabha meetings has increased from an average 10.58% to an average 31.8%, showing an average increase of 200.56%, whereas the control scenario reports no increase. During group discussions this increase was attributed to the special efforts made under the project as support for VG like for promotion of IGAs. Figure 9.4 below shows the GP wise increase in average attendance of VG in Gram Sabha meetings.

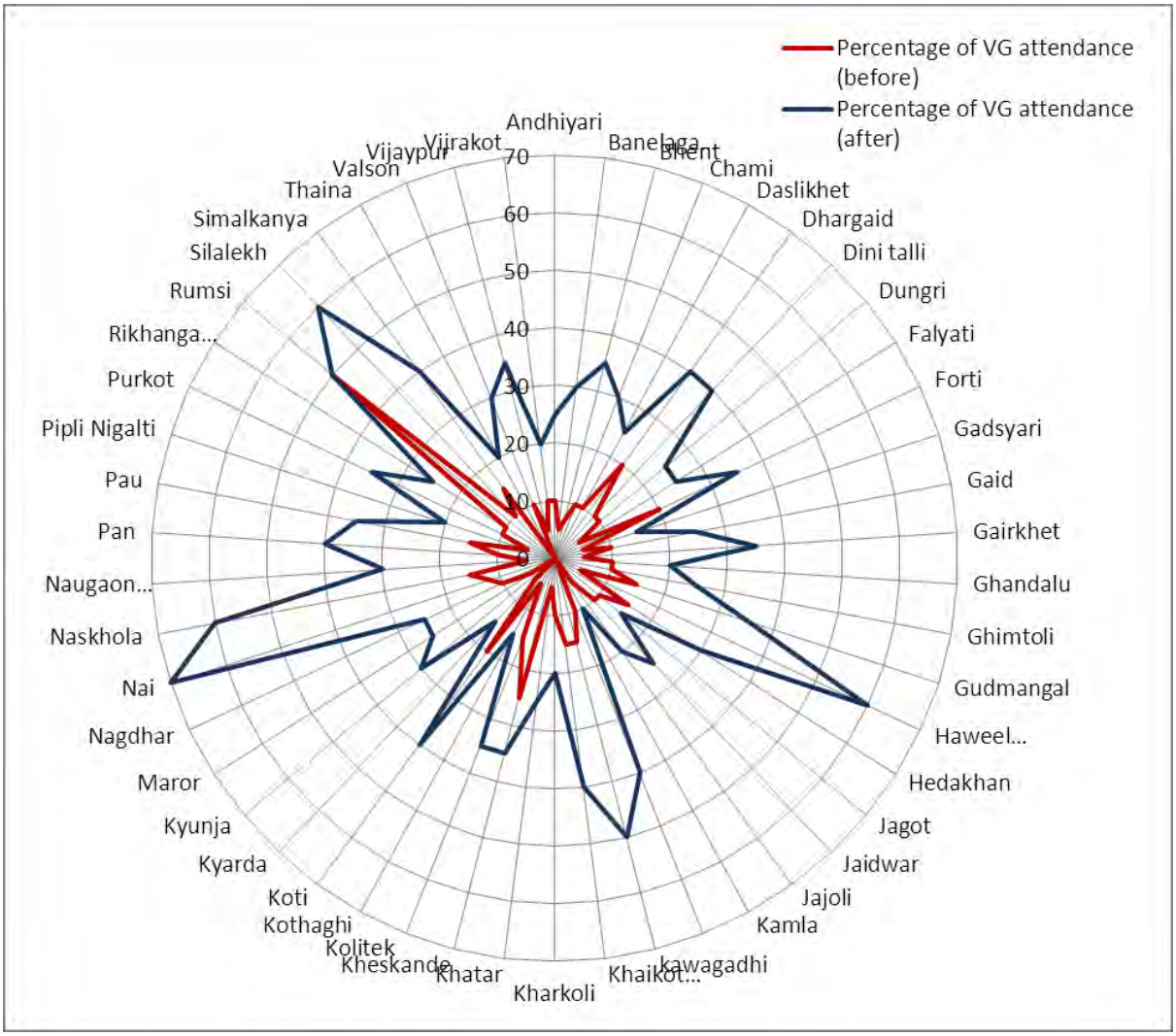

Figure 9.4 Attendance of VG in Gram Sabha meetings

Number of Gram Panchayat Meetings

The average number of GP meetings has increased from 5.28 in a year to 11.14 in a year, showing an increase of 110.98%, while no increase was seen in the control scenario. Figure 9.5 below shows the GP wise percentage increase in number of GP meetings.

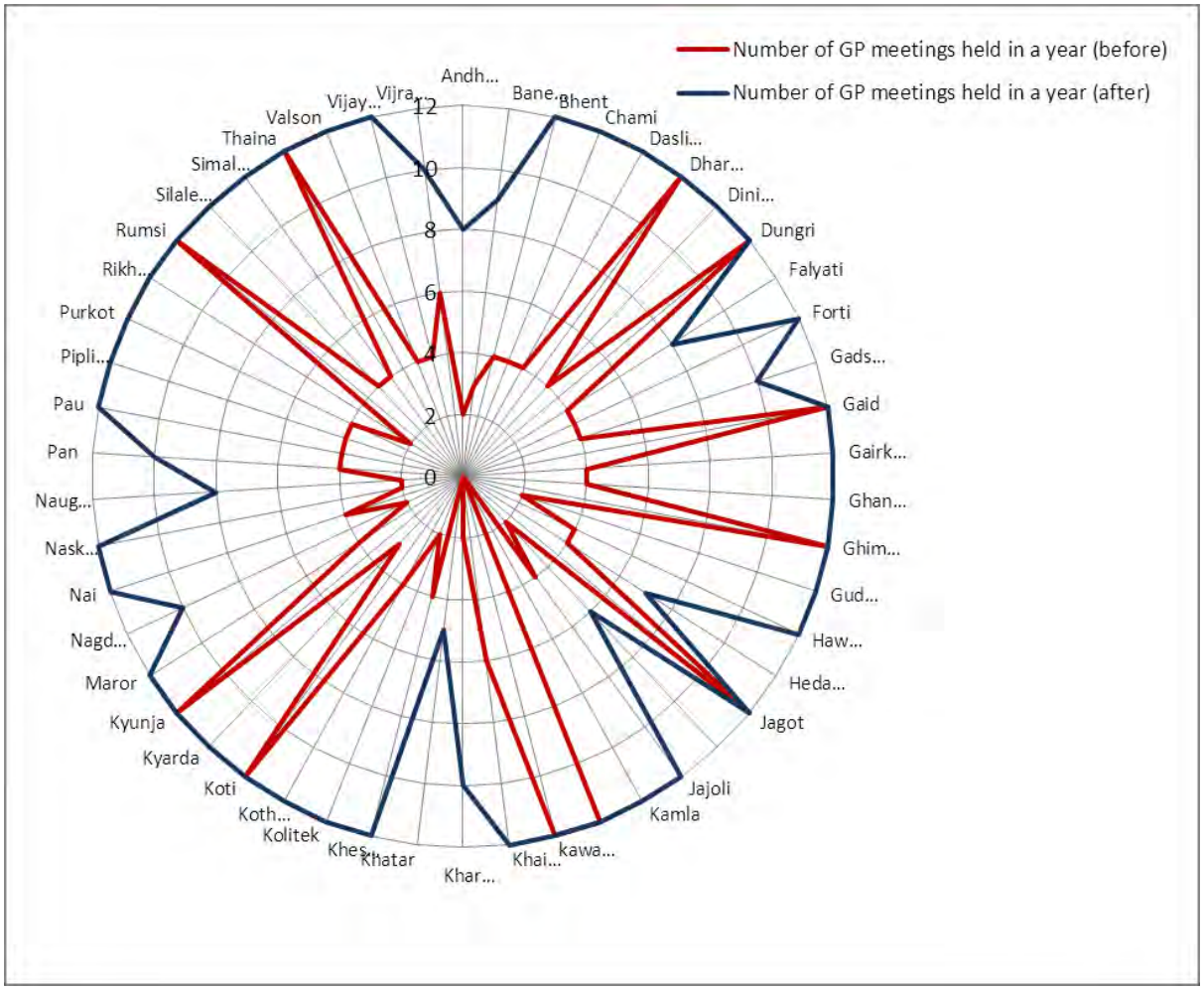

Figure 9.5 Number of GP meetings held in a year

Attendance in Gram Panchayat Meetings

The attendance in GP meetings has increased from an average 44.72% to an average 68%, showing an increase of 52.05%. In the control scenario, whereas, only a 3% increase was noted. The participation of women ward members has also increased in the sample GPs. For instance, in Khatar in Vikasnagar Division, during Group Discussion, community members evinced that two women ward members have become more vocal now owing to the project. The village community, in turn, has been reporting positively about their empowered status to the other ward members. Figure 9.6 below shows the GP wise increase in average attendance in Gram Panchayat meetings.

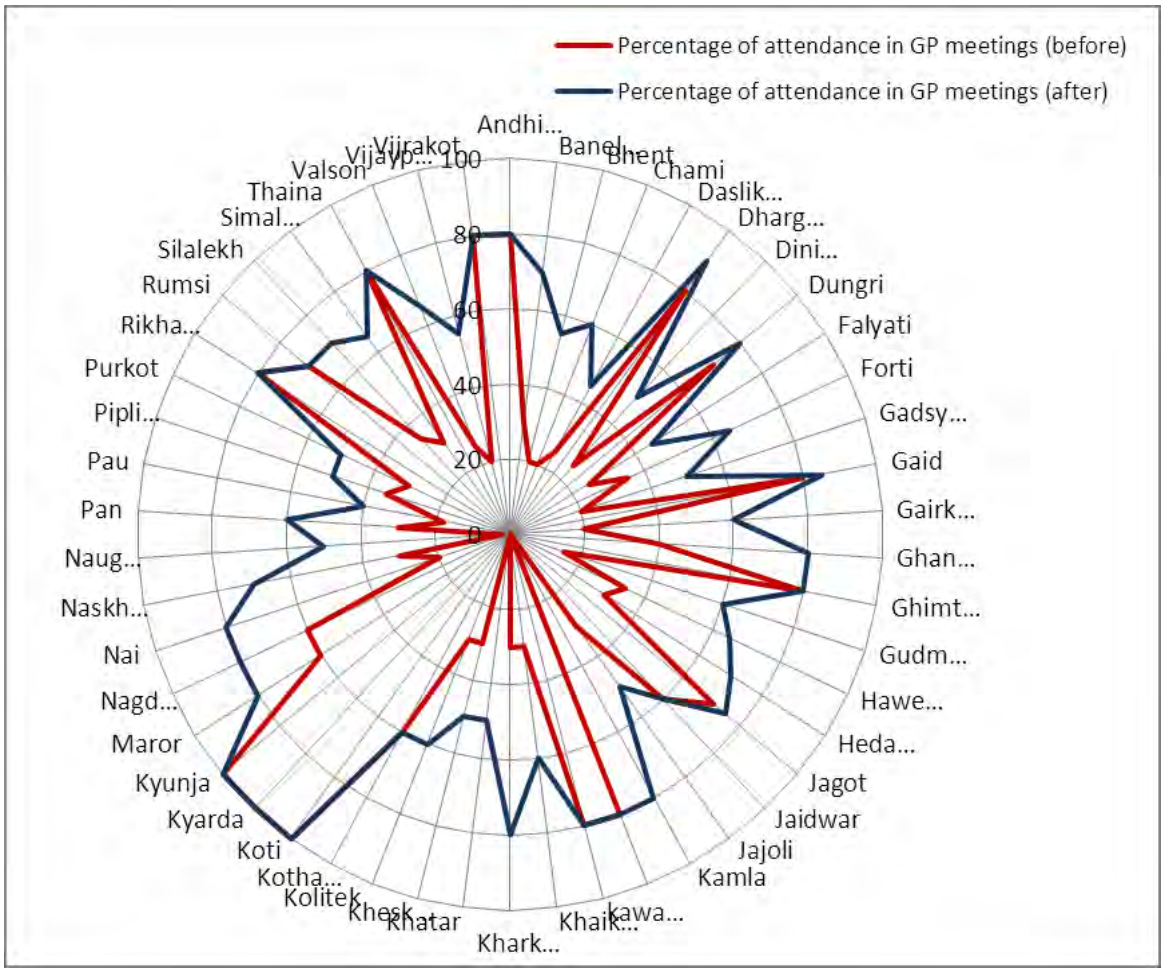

Figure 9.6 Increase in average attendance in GP meetings

Empowerment of Community Members

UDWDP has empowered many grass roots level community representatives, who were associated with the project, to become elected members in the state's decentralised administrative system (Gram Panchayat system). A total of 311 such community members who were involved with UDWDP in various capacities, viz. village motivators, members of SHGs, VGs, FIGs or User Groups, etc. are now holding positions in the Gram Panchayat system. Table 9.4 below gives the details in an overall project scenario. The empowerment of women is particularly notable. As is seen in the table, number of project associated community level women holding elected positions is 229, while the number of men is 82. In the sampled GPs, specifically, the number of project associated women holding elected positions is 42.

Table 9.4 Number of project associated community members holding elected positions

S. No.	Name of the Post	Total Male	Total Female
1	District Panchayat Member	1	1
2	Block Pramukh	1	2

S. No.	Name of the Post	Total Male	Total Female
3	BDC Member	3	3
4	Pradhan	19	47
5	Ward member	49	159
6	Anganwadi worker	-	9
7	Van Panchayat Sarpanch	4	1
8	Motivator in Sarv Shiksha Abhiyan	5	1
9	Others	-	6
Total		**82**	**229**

*One male is holding two posts: as *Up-Pradhan* and Ward member

Source: Watershed Management Directorate.

Administrative Reforms

UDWDP has introduced administrative reforms and innovative policy measures like Women Aam Sabha, women ward member as co-signatory, and encouraged women focused broad based participation in the project level committees.

Women Aam Sabha was being held every month in all sampled GPs, without any exception. The purpose of the Women Aam Sabha was to review those activities that target women beneficiaries. It was organised once a month by the facilitator and village motivator. The attendance in the Women Aam Sabha showed a variation from 30% to 70%.

In 18 GPs among those sampled, there were women ward members as co-signatories; and of these 7 GPs also had women as Gram Pradhan, and therefore, in these GPs both the co-signatory and the main signatory were women. Besides, in 12 sampled GPs, women were Gram Pradhan and thus, the main signatories.

Participation of Households in GPWDP Preparation

The participation of households in the preparation of the GPWDP is assessed in terms of the percentage of households involved in its preparation, as also feedback received on the process of preparation, notably whether community opinions were addressed or not.

Primary survey results show that an average 78.96% of the total families in a Gram Panchayat have been involved in the preparation of GPWDP. Figure 9.7 shows the GP wise percentage of families involved in GPWDP preparation.

Results of Group Discussions show that the GPWDP was prepared in all sampled GPs and that community members were aware of the preparation of the GPWDP and the process followed for preparation. In Group Discussions, participants observed that the preparation evinced satisfactory to good participation of households in the GP. Furthermore, the

opinions of community members were sought and taken into account in the final document that was prepared. The attendance and participation of women and VG members was also cited to be good in the preparation of GPWDP. One of the reasons cited for effective participation, was good leadership of the Gram Pradhan. In only one case (GP Dasilakhet in Pithoragarh Division), it was pointed out that the lack of an approach road prevented many from participating.

Field interactions show that the preparation of GPWDP through PRA was given great importance which produced good micro-plans (GPWDP) for the GP to implement, and its annual phasing helped positive response from the members of the community.

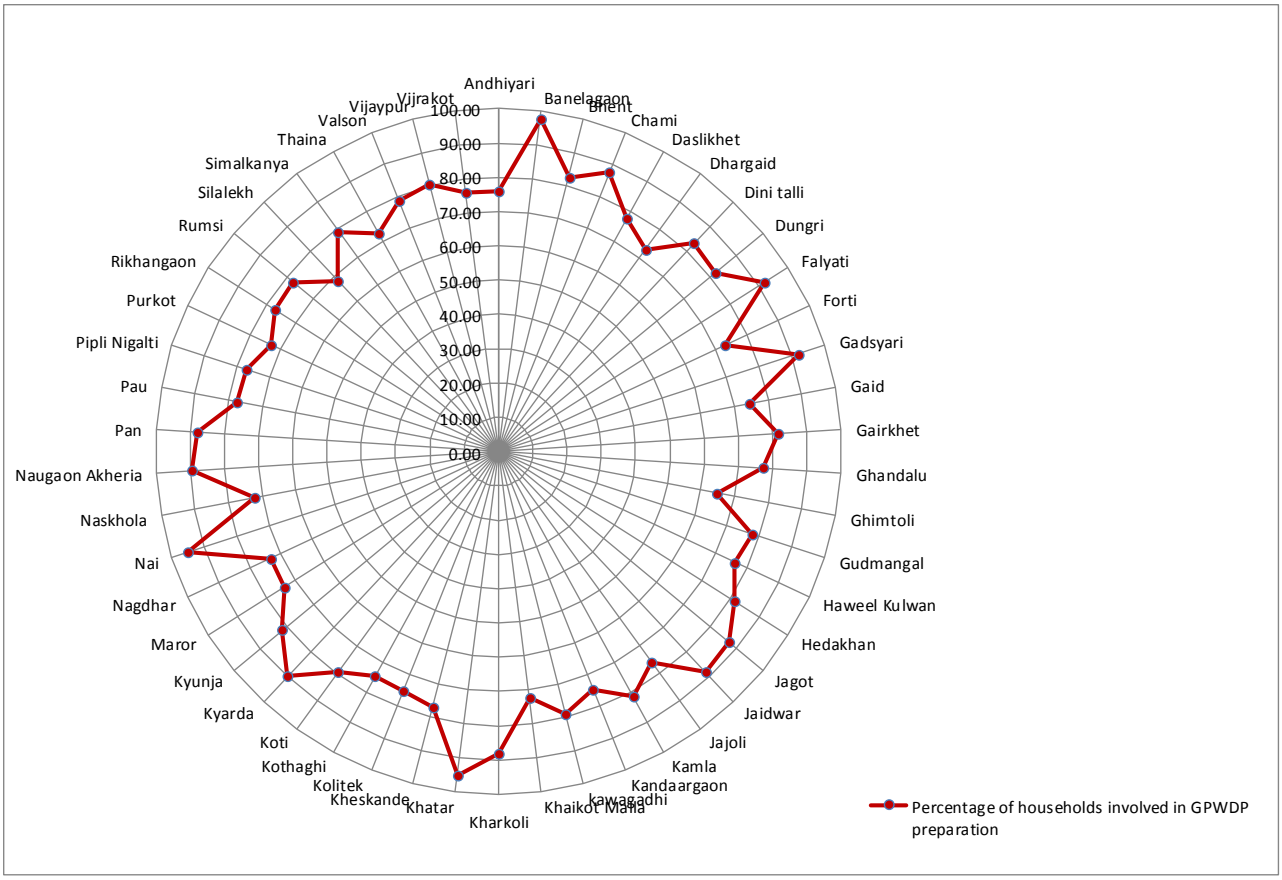

Figure 9.7 GP wise percentage of households involved in the preparation of GPWDP

Community Based Institutions formed under the Project

Three key community based groups, namely, Self Help Groups (SHGs), Vulnerable Groups (VGs), and User Groups (UGs) have been formed under the project; the first two, given the project's specialised focus on support for women and weaker sections (under Vulnerable Group Category identified in the GPWDP), and the third, important from post project management and sustainability point of view. Activities under taken for SHGs, largely included, mobilisation and facilitation support for the formation of SHGs; while for VGs, financial support was given for carrying out IGAs (to both individuals and groups). In the form of SHGs, the project has formed a strong base of local institutions that display group cohesion. While in the case of VGs, the establishment of such group cohesion remains to be seen in a more long term scenario, which would spill over post project. Also, VGs vis-à-vis SHGs are more recently formed and include not just group based but also individual based

activities. However, the project has made availability of financial support to the VGs, the poorest of the poor, accessible, which is a significant achievement.

SHGs

In order to address the lack of access to financial support to the rural poor, the project has attempted to develop a more sustainable and reachable financial system in the form of thrift and credit through community based groups, the Self Help Groups. A total of 536 SHGs have been formed in the entire project area with 8447 members.

In the sampled GPs, 92 SHGs have been formed under the project with a total membership of 1171. These include newly formed SHGs or revived old SHGs (those that were formed prior to the project but were defunct or non-functional). Among these, 87 SHGs (or about 95%) are at least two years old or older, and were found to be active during primary survey. It can be inferred that since SHGs (newly formed or revived) that have completed a reasonable period of existence are currently all functional, there is certainly a 30% increase in the number of functioning SHGs.

The role of F-NGO was seen as an important factor by the community in the formation and continued functioning of SHGs. Community members conceded that the continued persuasion and meetings of women members of the village by F-NGO women workers was regular and useful.

In sampled GPs, an average sum of Rs.20350 has been saved by SHGs (Table 9.5). The monthly contribution by members from sample villages ranges between Rs 10/- and Rs 100/-, with an average of Rs 23 per month per member. This amount acts as a good saving by women folk who traditionally do not have any savings of their own.

Table 9.5 Details of funds of SHGs in sampled GPs

Saving	Amount given on loan (internally to members)	Amount given on loan (externally to non-members)
Rs.20350 (average per SHG)	Rs.10966 (average per SHG)	Rs.10166 (average per SHG)

Source: TERI Primary Survey, 2011

Inter loaning among members is being carried by SHG members. The repayment of loan was reported to be in time, even when the loans were taken for unproductive causes like marriages and illness. The loaning is mostly for purchase of milch cattle, treatment of illness, school and college education of children (especially of girls), marriages and other unforeseen events. This source that women can make use of in times of need gives them financial self-reliance.

An example is cited as follows: In Kamla GP, a woman SHG member upon being asked how the SHG fund has helped women in financial freedom narrated that her husband was not willing to finance the college education of their daughter. The daughter needed to be sent out of the village for her college education. The SHG member, then borrowed money from the SHG and sent her daughter to college, to which her husband also agreed.

SHG fund also provides security to women against emergencies. Women living in the interior areas are more vulnerable to accidents, snakebite, burns and other kinds of emergencies. An example from village Thalin is illustrated: In Thalin village of Vikasnagar

Division a poor young woman was bitten by a dog at night. The women of the SHG there got together, hired a taxi and rushed her to the hospital. The money for the taxi was paid from their SHG fund.

During primary survey it was observed that the loan amount from SHG fund was not being used much for starting IGAs. One SHG in Dhargaid GP of Gairsain Division is linked with pine briquette and is successfully conducting the activity. The use of the SHG fund, for various purposes by women, however is clear from few examples given above, and was seen to serve as a handy capital with them to be utilized in an emergency situation when even the family is unable to arrange funds immediately.

The SHGs initially drew on their own accumulated savings to provide loans to their members, but have later also linked with more formal credit systems to access funds for overcoming limitations of their own resources. Under the Swarnjayanti Gram Swarozgar Yojna (SGSY) of Government of India, SHGs (constituted of members belonging to BPL) are graded and provided a first round loan of Rs. 100000/- with 25% subsidy for IGAs. If their performance is found to be up to the mark, in the second round grading they are entitled to a bigger loan amount with greater subsidy. SHGs in Gramya that were constituted of members belonging to VG categories (and fell in BPL) benefitted under this. In Andhiyari, Rikhangaon and Kyarda GPs of Chinyalisaur Division, one SHG each with VG members formed under the project was graded for a first round loan of Rs 1 lakh with 25% subsidy for IGAs. In Ghandalu in Kotdwar 3 SHGs qualified for SGSY and got the benefit of loan and subsidy. The guidance given under the project and continued persuasion and regular meetings of SHG members were cited as factors for these SHGs to be able to qualify for being graded under SGSY. All the SHG members (20 female and 6 males) in Ghandalu work in the processing centre that was established under the project.

Box 9.1 Kamla Gram Panchayat – SHG (Vikasnagar Division)

UDWDP started in GP Kamla in 2004-05. This was the first GP where the exercise for preparation of GDWDP was started. Incidentally TERI team also started its baseline survey from this GP in 2007-08. Kamla has 4 Revenue Villages, namely, Kamla, Thalin, Pingiri and Badeth. Thalin is linked by motorable road, whereas the other 3 RVs are 2to 4 km away. The GP is in Jaunsar Bhabar tribal area. The terrain is steep, largely devoid of trees and prone to erosion. Agriculture is mostly subsistence in nature, but some surplus produce is also sold in Vikasnagar market, the hub of business for Jaunsar area. The traders, who are mostly outsiders, earn by buying farmers' produce and then selling it at a higher price in the market, and secondly, by selling various commodities of day-to-day needs to farmers. Womenfolk of the villages in this region are very hard working, but remain in village meetings and other village affairs due to their busy schedule of looking after children, domestic animals, agriculture, and other household duties.

At the time of preparation of GPWDP in Kamla, the GP had a male head, Gram Pradhan. The elected GP membership also remained male dominated. The traditional sayana system, a tribal village community system that has been continuing since generations still has its influence on the present day election of Pradhan.

Women SHGs were formed in 2005-06 with the efforts of F-NGOs, and supported at the grassroots by village motivators. In village Thalin, an SHG of 18 women who belonged to various socio-economic groups was formed. The SHG was named Mahasu Devta. They were assembled by facilitators and motivators every month and started contributing Rs. 10/- every month towards a common SHG fund. The meetings started creating interest in the women and they started feeling empowered as their savings grew. Even the menfolk started borrowing money from them during emergency, and for improved variety seeds and other facilities created under Gramya through micro-planning. Uttarakhand state had its second Panchayat elections in the year 2008. In between there were elections for local bodies and Kamla GP elected an educated woman, Smt Radha Tomar, as their Gram Pradhan, who was also a member of the SHG. This gave further impetus to the SHG. The SHG members took interest in various trainings and exposure visits and their awareness increased. They started getting involved in group level IGAs like making juice from Rhododendron flowers, pickle from garlic and local lemon etc. As irrigation facilities improved under the project, they started growing vegetables and cash crops in their kitchen gardens and then started a FIG. At first, they sold some products at a small scale to local people in the village and the nearby villages. The FIG members contribute Rs. 20/- per month and has saved a fund of Rs. 12,000/-, as a result.

One of the most useful activities started by the SHG was undertaking an afforestation programme of 10 ha of barren land. This activity was undertaken by them out of their initiative and in which they carried out all the labour activities themselves. The plantation is being looked after by the members and there is no damage dye to grazing as they have strictly enforced their will to protect the plantation. The most useful usufruct from their 500 Nali (10 ha) area is the fodder grass which is distributed equally not just among the members but to other families as well. App. 6 to 7 head loads per family (1 head load = 30-40 kg) after rainy season is distributed every year to all the families without any dispute. The rate of survival of the plantation is 70%. There is no boundary fencing and the protection is totally social. The women were keen to get money for boundary fencing money; however, the rules did not permit this.

Today, all the 18 SHG members have a uniform, a beautiful dress of local attire. In all their meetings held on the 7th of every month they attend wearing their dress. They have prepared the dress from their own money. An amount of Rs. 52,000/- has been saved in their SHG fund, which is being used for inter-loaning and for emergencies. Recently a poor woman of the group was bitten by a dog late in the night and was rushed to the hospital by hiring a taxi, which was funded by the group. During Group Discussion, male members of the village confided to being jealous of their success, as they felt that today for any emergency they have to look up to the women for help.

Source. TERI Primary Survey, 2011

VGs

UDWDP places special emphasis on Vulnerable Groups (VGs) (sub section of Category 'C' people) such as women, Scheduled Caste, Scheduled Tribes, landless and marginal farmers and transhumant population to ensure equity. One of the key features of the project to

support these groups is through the promotion of Income Generation Activities (IGAs). Towards this a Vulnerable Group Fund (VGF) has been set aside in the project. The objective of this fund is to enhance social equity in villages through the project and assist those who receive little benefits from watershed development activities. Through VG fund, funding support/working capital assistance was provided to the VG members.

The VG fund was utilized for activities which could be performed by individual VG members or as a joint activity by members of a VG. The activities for individuals or groups were selected in consultation with the VG members in each village. Activities that have been promoted in sampled GPs include the following: handicrafts, livestock production (backyard poultry, goat/sheep units), dairy processing plants, stitching and tailoring, shops or stall, tools for artisan activities, bakery etc. A total of 4060 IGAs have been supported under the project: 3340 IGA have been supported for Individuals and 720 for groups (altogether benefitting 8137 persons).

The position of VG activities funded in the sampled GPs both for individuals and groups is given in table 9.6 below.

Table 9.6 VG activities funded under UDWDP in sampled GPs

S. No.	Name of Activity	No. of Beneficiaries		Fund provided under Project (Rs)	Whether Group or individual
		Male	Female		G- Group, I- Individual
1	Goatery	137	113	1599870	G & I
2	Horse/ Mule	2	0	52000	I
3	Tent house	70	92	1069000	G
4	Carpenter	25	2	278600	G & I
5	Flour/ Rice/water/Spice Mill	27	1	227000	G & I
6	Blacksmith	46	6	387385	G & I
7	Sewing/Knitting/Stitching	13	36	476020	G & I
8	Band	32	2	189700	G
9	Beautician	0	4	63070	I
10	Barber	4	0	43400	I
11	Poultry	63	106	1401566	G & I
12	Catering	0	25	139900	G
13	Cobbler	4	0	38350	I
14	Dairy	28	89	1567300	G & I
15	Fibre works	4	0	78000	I

S. No.	Name of Activity	No. of Beneficiaries		Fund provided under Project (Rs)	Whether Group or individual
		Male	Female		G- Group, I- Individual
16	Pottery	4	1	100000	G
17	Photography	1	0	20000	I
18	Shops/Provision stores etc.	29	9	630900	I
19	Off season Veg./Cash Crops	2	31	87000	G
20	NBC Goat	1	0	5000	I
21	Fruit Preservation	1	0	26400	I
22	Bee keeping	1	2	39300	I
23	Mason	6	0	90000	I
24	Grading Packing	0	16	73578	G
25	Fisheries	1	0	80000	I
	Total	**501**	**535**	**8763339**	

Source: Watershed Management Directorate and TERI Primary Survey, 2011

In the sampled GPs, an average amount of Rs 8450 has been spent per individual as support for VG. The maximum funding, nearly 81.4%, went to the following activities: Goatery (18.3%), dairy (17.9%), poultry (16%), tent house (12.2%), shops and provision stores (7.2%), sewing, knitting and stitching (5.4%) and black smith (4.4%). Those benefitting from these activities also account for 81% of total beneficiaries.

Furthermore, of the total, the number of female beneficiaries (52%) is more than that of the male beneficiaries (48%). Activities like tent house, catering, sewing/stitching and knitting, poultry, dairy, offseason vegetable and cash crop cultivation, and grading and packaging saw more female beneficiaries than male beneficiaries. Whereas activities like barber, cobbler, horse/mule, fiber work, photography, NBC goat, mason and fisheries saw male beneficiaries.

Activities like carpentry, blacksmith, barber, cobbler and mason are traditional occupations of hill areas and those practicing these belong to the economically and socially weaker sections. These traditional IGAs, which were mostly for individuals and few for groups, received app. 9.6% of the total amount for VG funding and benefitted 9% of the targeted beneficiaries. Qualitative data gathered during primary survey revealed that these activities have had good impact and are also likely to be sustainable, as the beneficiaries are traditional workers of these IGAs and support from Gramya has further enhanced their work.

Poultry, which accounted for 16% of the fund spent on VGs, and which benefited 16.3% of those targeted, succeeded as a commercial activity. Activities like tent house and catering were taken up by VGs. The scope of earning livelihood through these was mostly at the time of marriages with in the village. About 14% of the VG fund was spent on these activities and benefitted 18% of those targeted, that mostly included women.

About 36.2% of the VG fund was spent on goatery and dairy that benefitted 35%. Multiplication of goats is very fast and their market price is increasing day by day. Milk and milk products from buffalos and cows provided under the project have a ready local market (with in the village itself) and are also important for self-consumption. Due to these reasons both the activities were found to be successful and their sustainability potential of these activities was also gauged to be high. These are also largely women's activities, and have succeeded due to the hard and sincere efforts of the women beneficiaries.

IGA for VGs started in the sampled GPs in 2006 when only 4 activities were taken up. In 2007, 13 activities were started; and in 2008 the pace of these activities picked up when 28 activities were funded. The programme was at its peak during 2009 and 2010, when majority of activities were funded. In 2009, 93 activities were completed and in 2010, 62 were undertaken. However, in 2011 only 26 activities were funded. 68.5% of the IGAs have been initiated in the last 2 years, that is, in 2009 and 2010, 11.5% were funded in 2011, 12% in 2008 and only 7.5% in 2006 and 2007. Thus a majority of IGAs are yet to complete two years of operation. However, among those that are two years or older, about 90% were found to be active at the time of survey.

Box 9.2 Case study on VG group activity

Ekta Tent house, village Silalekh, Nainital Division

The all women group Ekta Tent House has seven members and was given a one time VG grant of Rs 35000 under the project in the year 2008. In addition, all the members together contributed Rs.10000. The total amount was used to buy the required items for the tent house. The group started earning Rs 25000 to 30000 per annum, out of which Rs 17000 was spent on transport and other maintenance expenses. The share of the group members in the capital invested was refunded out of the net profit in the first year. Thereafter, the profit earned was given on inter-loaning at 2% interest per month. During the time of primary survey (October 2011), the group had Rs.7546 in its savings account. The activity has become an additional source of income to the group members.

Source: TERI Primary Survey, 2011

Box 9.3 Case study on VG individual activity

Sewing machine, in GP Balson, Champawat Division

Jhoopa Devi of village Balson in Champawat Division was selected as a VG beneficiary for tailoring activity. She was given a VG grant of Rs. 17,000 under the project for the activity. She invested another Rs. 7,000 from her pocket. The total amount was used to buy a sewing machine, its accessories and to construct a small room to house the tailoring unit. Jhoopa Devi spends 6 hours per day on tailoring and earns Rs. 1500 to Rs 3000 per month. Her expenditure on the upkeep of the activity is Rs 500 per month, and the remaining amount is her profit. Before she took to this activity her family was dependent on their small landholding of about 3 nalis. The tailoring activity has given a steady source income to the family.

Source: TERI Primary Survey, 2011

Pine Briquetting

Nearly 80% of the UDWDP area lies in *Chir* Pine zone. This zone is characterized by high population density and consequently high dependence on natural resources use for meeting the household energy requirement as well as livelihood needs. Majority of forest fires also occur in this zone. Due to accumulation and slow decomposition of pine needles (*Pirool*) in this region, the project introduced pine briquetting as a pioneer venture in the project to meet its objectives of reducing drudgery of women and reducing forest fires. This was undertaken for the development of cost effective technology for utilization/conversion of *chir* pine needles into pine briquette which can be used as fuel for meeting household energy requirements. The possible fuel switch from traditional wood based fuel to a non-wood based one will go a long way in reduction of fuel wood consumption from the adjoining forest area. Additionally, pine briquette making is also being taken up as a viable income generating activity by VGs or SHGs functional in the area.

Under the miscellaneous innovative activities, 260 pine briquette mould demonstration and 7375 pine briquette stoves demonstration were carried out. Out of this 39 pine briquette moulds were given in the sample villages along with demonstration to prepare the briquettes: 10 in Garhwal region and 29 in Kumaon region where *chir* pine forests are in the vicinity of the villages. The stoves provided to the groups are in demand because the smoke free blue flame improves their health conditions. The selling price for the briquettes ranges from Rs 7 per kg to Rs15 per kg. However an average of Rs. 10 per kg was the selling price in most of the selected GPs. During community interactions and Group Discussions, the following observations were made by the users:

1. Machine and stove should be given to those GPs which have a scattered population; or small user groups should be promoted.
2. Technical training on operation and maintenance of the briquetting machine should be organized frequently or an operation manual in simple local language needs to be provided.
3. Some of the beneficiaries faced mechanical problems in operating the briquetting machines and requested for providing replacements.

The number of user group members who were involved in pine briquette making was found to be maximum in P-NGO (Dwarahat), followed by Nainital, Champawat, Gangolihat and Bageshwar Divisions of Kumaon region whereas only Chinyalisaur Division and P-NGO (Kotdwar) in Garhwal promoted this activity.

The impacts of pine briquetting activity are expected to bear on the condition of forests as well as on the health of the womenfolk getting exposed to the smoke. Both the types of impacts are slow in nature and subject to several related aspects as mentioned below.

The fire incidences have been localized to start with and then get spread due to connected forests. So there is a need to monitor the intensity and incidences of fire in the areas where pine briquetting activities have been initiated. Similarly, natural regeneration of species other than pine is expected as a part of ecological succession since pine needles are removed from the forest floor. Both these processes would be visible over a longer period of time that goes beyond the project period.

Similarly, as regards impacts on health and drudgery (of bringing firewood) reduction for women, longer term monitoring is needed. During the primary survey womenfolk involved in the activity have however positively narrated its utility.

Pine briquettes are used with specialized stoves. The increased access to such stoves would increase the response of people in terms of local use of pine briquettes. Currently briquetting is mainly used by User Groups/SHGs for generating finances by selling the briquettes in the open market. There is a demonstrated scope for using this activity to have large-scale impacts on the health of forests and of the womenfolk if the stoves are made available at concessional prices.

User Groups

User Groups (UGs) have been formed for the operations and maintenance of the various community water structures created as a part of the project. A total 1449 User Groups of irrigation tanks, 421 irrigation channels, 60 water storage ponds and 13 naulas were formed. Out of the total 1943 groups, 1636 groups have generated revolving fund. The total fund in the credit of all UGs (till date) is Rs 1405312. The groups formed have generated their own funds through membership collection for future maintenance and operations. The table 9.7 below gives the detailed status of UGs in an overall project scenario. As seen in the table, an amount of Rs 303324 (out of the total) has already been utilised for operations and maintenance. The members of the UGs will need to make regular contribution to the revolving fund in order to ensure proper maintenance of the structures.

Table 9.7 Status of User Groups

S. No.	User Groups	Total User Group Formed	No. of User Groups who have deposited the money	No. of members	Revolving Amount utilized for Repairing / Maintenance	Total Amount Deposited up to January 2012 (in Rs.)	Grand Total Amount (in Rs.)
1	Irrigation Tank	1449	1203	8124	250670	675767	926437
2	Irrigation Channel	421	398	3141	52654	393353	446007
3	Water Storage Pond	60	22	258		21693	21693
4	Naula	13	13	2532		11175	11175
Grand Total		**1943**	**1636**	**14055**	**303324**	**1101988**	**1405312**

Source: Watershed Management Directorate.

Transhumant Groups

Transhumant groups such as *Gujjars* and *Bhotias* migrate from higher altitude to lower altitude and vice-versa in different seasons during a year. They camp in the project area during such migration, for short durations. The condition of the transhumant groups is poor

and they have to face hardships during transit. The project made provision for certain activities to help the transhumant groups improve the quality of their lives. The activities for them include: health programmes for cattle, insurance of livestock and transhumant population, distribution of tent and other camping equipment, first aid kits, development of pastures, provision of drinking water, training and capacity building. No major activities for transhumant groups were observed in the sampled GPs, as there were very few GPs that had these groups pass by during transit.

Awareness about Gramya Objectives

A high level awareness of Gramya objectives was reported in the mid-term assessment (94%). During final assessment it was found that the awareness was 91%, close to the mid-term result. The measures taken for creating awareness were wall paintings, writings, boards, puppet show, folk theatre, audio visual show etc. WMD also brought out a quarterly newsletter "Gramya Darpan", printed in Hindi, to which all DPDs, and also P-NGOs and F-NGOs contribute articles. A wide circulation of this newsletter has also brought out greater awareness among the community, particularly, as education on critical aspects of the project.

Awareness of Annual Budget and Expenditure

According to results of the primary survey, an average 48.7% of the GP constituents were aware of annual budget and expenditure. The measures used for creating budget awareness were largely wall paintings and monthly meetings.

Audit Report Available

The GP financial reports are audited by the Chartered Accountant (CA) annually. In addition, there is also an audit by the Accountant General, Uttarakhand and an internal audit by the WMD. Primary survey results indicate 100% availability of audit reports (of audit by CA at GP level) in all sample GPs. All the audit reports were found to be satisfactory by the auditor and wherever objections were raised, these were settled. No major irregularity in expenditure was reported to the external evaluator during the survey.

Participatory Monitoring and Evaluation (PME)

Participatory Monitoring and Evaluation (PME) is the process of social audit, which involves project beneficiaries and other stakeholders in the monitoring and evaluation of the project. The process aims to assess whether the planned interventions are being executed as per the intended objectives. The PME indicators are finalized after a series of consultative village level workshops. These are used for assessment by the community on the level of awareness about the project, participation, inclusiveness and equity, transparency, creation of assets and financial management. After the mid-term review the PME format was revised keeping in view the changing scenario and advanced implementation stage of the project in most GPs and also based on feedback from project beneficiaries.

Till date, PME has been done in all sampled GPs regularly, that is, at least thrice. During field survey interactions and group discussions, project beneficiaries highlighted that regular PME has helped in increasing awareness among village communities particularly of women. They perceived that the participation of communities in project activities especially those on common property resources increased substantially after midterm assessment, and that PME also helped in equity issues, transparency and financial management.

Regular PME could speed up the interventions across all sectors including forestry, drainage line treatment etc.

Grievance Redressal

The PME gives an opportunity to the beneficiaries and community members to redress their project related grievances, as during PME the project functionaries (implementation team) are also present. During primary survey community members shared that the village community in general, and particularly those belonging to the lower socio-economic strata (Vulnerable Group category) got regular opportunity to approach the PME team for grievance redressal and resolving issues of minor nature at the village level itself. No major grievances came to the notice of the evaluation team.

Procurement Committee

It was found during the primary survey that all sample GPs had formed a Procurement Committee as per World Bank guidelines.

Staff Deployed

Staff deployed at GP level for the project purpose includes village motivator and account assistant. In all sample GPs, there was 100% staff deployment of account assistant and village motivator.

At the Division level the project deploys a multi-disciplinary team (MDT) that consists of experts of forestry, horticulture, agriculture, soil conservation, minor irrigation, and animal husbandry. During survey, it was observed that the MDT has not been complete in any of the Divisions, with one or the other expert lacking. The non-availability of particularly, assistant engineer, agriculture/horticulture officer, and livestock development officer has remained a weak area.

Role of NGOs

NGOs have been involved in the project at different stages of implementation, in order to bring in transparency in implementation, speed up the activities of awareness building and gaining trust of communities and ensuring proper conduct of activities of a specialized nature. Three kinds of NGOs were involved in the project:

1. Facilitating NGOs or FNGOs
2. Partner NGOs or PNGOs.
3. Divisional Support Agencies or DSAs.

F-NGOs

Since its inception, the project has deployed Facilitating NGOs (F-NGOs) in all divisions except two (where Partner-NGOs have been deployed). One F-NGO each in Kumaon and Garhwal was engaged: in Gharwal the F-NGO is Manav Bharti (Angela Hills Ghangora, Dehradun) and in Kumoan it is the Himalayan Study Circle for Environment, Child Education and Research (HSC) (Pitthoragarh).

The main purpose of F-NGOs is awareness generation, and community mobilisation. The F-NGOs were engaged from the first stage of the project when they facilitated PRAs for preparation of GPWDPs. They had to ensure participation of weaker sections and marginalized communities in the project and assist WMD in implementation of the project.

At the field level they had women facilitators and coordinators who worked closely with women motivators engaged by the project in each RV and in some larger RVs even two women motivators were engaged. The women facilitators were generally local and were largely responsible for creation of SHGs, VGs, User Groups and FlGs. Through regular monthly meetings held on a particular day in each village under their charge they were instrumental in bringing about awareness among women especially of the weaker section of the village society, ensuring the upkeep of records, collection of monthly subscription to various committees, community participation in various training programmes and exposure visits for IGAs, and trust building between communities and WMD field functionaries. The success of F-NGOs can be judged by the formation of a large number of community based institutions and their sustainability, involvement of VGs in several successful IGAs and regular subscription to the fund of these institutions. Majority of members in all the community based institutions are women. The credit for involvement of women and weaker section of society in the project activities on a large scale goes to F-NGOs. Few short comings that came to light during survey was change of facilitators and induction of new ones during the last phase of the project in some Divisions that resulted in a break in the speed of work. Also, giving of more number of GPs to certain facilitators in some other Divisions resulted in less than one visit per month to interior villages. During field surveys for the evaluation, facilitators were present without exception (except in P-NGO Divisions that do not have F-NGO) and facilitated group discussions and collection of information.

P-NGOs

Partner-NGOs (P-NGOs) have been hired in two Divisions, namely, Kotdwar and Almora, to carry out project implementation. Their responsibilities are identical to those of the DPD and MDT, except that they are not responsible for transferring funds to GP accounts (that responsibility remains with WMD).

The two P-NGOs were Asian Society For Entrepreneurship, Education & Development, New Delhi (ASEED) in Kotdwar and Institute of Himalayan Environmental, Research and Education, Masi, Almora (INHERE) in Almora. This is the first time that NGOs have been entrusted with project works funded by the State Government; the objective of the innovation was to see if a multidisciplinary project of this magnitude involving community participation could be implemented without direct involvement of Government machinery. The working of P-NGOs was closely supervised by a team of WMD particularly to supervise and monitor the implementation.

The responsibilities of P-NGOs included mobilization of communities, facilitation of PRA at village level, preparation of GPWDP and implementation of UDWDP involving communities as per guidelines set by WMD. In these two divisions P-NGOs had roles and responsibilities like government run project officers in other divisions.

Involvement of NGOs to this level in the project can be treated as a progressive feature of UDWDP which also provides a means of comparison between government and NGO implementation and learning for future projects.

Staff component of each PNGO included a Group leader under whom there was a MDT consisting of experts in Agriculture/ Horticulture/Forestry/ Minor irrigation/ Agribusiness. At field level the area under their responsibility was divided into units which were under the change of a unit-in-charge and at the village level they had village-in-charge.

Accounts Assistant and women motivators were hired at GP/RV level. Community mobilisation and agribusiness activities were also the mandate of the P-NGO.

The MDTs of the P-NGOs consisted of young professionals who had less field experience compared to departmental officials. However they displayed enthusiasm and drive to work, transparency and openness to new ideas. The field level staff had the disadvantages of less experience in the field.

Agribusiness performance by ASEED at Ghandalu processing centre in one of the sampled GPs was remarkable with the formation of the Farmers' Federation of 8 FIGs named "Gramya Kisan Bahudeshiya Swayat Sahakari Samiti".

Divisional Support Agencies (DSAs)

Various input supports in farming sector increased the productivity of some of the agricultural crops, cash crops and vegetables. With subsistence farming in hills there was hardly any surplus available for marketing. Any surplus of coarse grains etc. was taken by middle men at thrown away prices resulting in discouragement of farmers. Input support helped enhancement of production particularly that of cash crops and vegetables. The surplus production if not properly marketed at prevailing market rate will discourage farmers from providing inputs and improved technology.

In order to make the benefits of the project sustainable, agribusiness has been made an important component of the project. In order to promote agribusiness, the project has engaged Divisional Support Agencies (DSAs) in six of the ten UDWDP divisions. The two P-NGO divisions have their own agribusiness expertise and in remaining two divisions agribusiness consultants have been hired by WMD. DSAs hired for agribusiness promotion are given in table 5.1 in the agribusiness section. The DSAs started functioning from 2008 onwards and will remain active till the project period.

DSAs also surveyed the traditional crops that were being cultivated in the area before project and support for cultivation of these crops was also enhanced. FIGs were formed at RV level that included farmers interested in marketing their products. DSAs were instrumental in forming FIGs with support of WMD field staff. Production plans were prepared for Rabi and Kharif crops. This was done in advance (as a forecast) upon assessing the production through FIGs. The expected production helped DSAs to establish forward backward market linkages for sale.

FIGs joined together at cluster level to form Farmer Federations. 27 Farmer Federations had been formed in sample GPs till the time of survey. Details of agribusiness activities with FIGs, FAs, trademarks, mandis and buyers etc. have been listed in the section on agribusiness. The listed benefits and case studies from sampled GPs mentioned in the agribusiness section highlight the performance of DSAs.

Training and Capacity Building

Given the scale of community involvement in the project, extensive training and capacity building was required for awareness and institution building at various levels of implementation. At the start, as narrated by motivators and staff, it was challenging to build the confidence of the community, and take activities forward according to the GPWDP prepared through PRA, and to make the work of the implementing agencies transparent at the GP/RV level. The trainings, exposure visits, capacity building and skill up gradation activities changed the attitude and perceptions of the community in a big way. The overall impact of the training programmes was visible in the on-going activities in the sampled GPs,

and also, in the running of the agribusiness processing centres. The institutional development and awareness building was done at different levels through the following efforts.

Trainings

The project has provided a total of over 46955 centralized and decentralized three day trainings at Division level since the inception of the project on topics such as project orientation, ESMF, PRA, GPWDP planning, accounts, SHGs and FIGs, livestock, nursery techniques etc. Similarly the project has imparted 7619 events (one day village level trainings) in project villages on issues related to participatory approach, watershed approach, role of communities in UDWDP, role of GP in UDWDP, watershed activities and budget envelop, formation of FIGs and agri/Agri horti inputs, ESMF and financial management, project implementation, livestock, agriculture/horticulture and forestry activities under UDWDP.

Exposure Visits

About 30638 villagers (including elected representatives of GP) were taken to Doon valley and IWDP project areas within the state on exposure visits, to broaden their understanding of integrated participatory watershed management works. In the visit, the participants were exposed to the work done in the projects on participatory watershed management, off season vegetable cultivation, high value crops, FIGs etc. 977 community members were also sent out of the state for exposure visit to various institutions like YS Parmar Agriculture University, Solan for advanced practices in animal husbandry, agriculture diversification, off season vegetables cultivation and floriculture.

The project staff was also provided with regular training and participated in exposure visits to ensure continuous learning and information sharing. 1675 project staff members were also sent to IWDP areas, the HARC centre Naugaon and outside the state. Till date over 4150 staff trainings (repetitive numbers) have been imparted on project orientation, project components, accounts, farming system, monthly progress, MIS, silt observation etc., which have helped in staff capacity building. Not only were trainings and exposure visits within and outside the state organized for project staff, but 16 officers and staff members were also sent for overseas exposure visit and training.

Workshops

In each division samvad (communications) workshops were conducted, to establish dialogue between the community members of the project area, GP representatives, project officers and staff. It was observed that in terms of participation by the communities, GP members and project staff, the workshops were successful as they created awareness among them. Roughly 350 participants from sample villages took part in workshops. A number of village level, unit level and Divisional level workshops on various issues like care of orchards, advance soil working, seasonal and off seasonal vegetable farming, pine briquetting, fruit processing, FIG documentation, seed sowing, poultry raising, animal husbandry and organic farming were organized. In addition to this training on participation of women in Watershed Management Projects, bio farming and vermi-composting, agribusiness, soil and water conservation, post project management, capacity building of institutions, exit policy etc. were imparted to the community members in which about 1000 participants took part from the sample villages.

Table 9.8 shows the list of activities linked with different institutions, which has resulted in good impact for training.

Table 9.8 List of activities linked with different institutions

Activity	Institution
Agriculture and Horticulture issues	Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora
Livestock and IGA issues	Govindh Ballabh Pant University of Agriculture and Technology, Pantnagar
Forestry and Van Panchayat issues	Uttarakhand Forest Academy, Haldwani
Financial and Procurement issues	D.S.Jaji & Co. Chandigarh
Organic Training issues	SUPA Biotech Nainital
Bamboo related issues	Bamboo and Fibre Board Dehradun
Medicinal and Herbal related issues	CIMAP / Field Unit Pantnagar
Field Demonstration related issues	KVK of respective district
Training	Uttarakhand Forest Training Institute, SIRD, CSWRCTI, EMPRI, Pant Nagar University
NGO Support	KAGAS, HARC, Jan Kalyan Samiti

Source: Watershed Management Directorate.

EDPs

Entrepreneurial Development Programmes (EDPs) were organised specifically for capacity building of VGs for IGAs. These special programmes have benefited the VG members. In the case of traditional occupations like carpentry, blacksmith etc., the support has led to skill up-gradation for the use of new technologies and implements. For activities like goatery, dairy etc. the beneficiaries received the technical knowhow for the respective activity. While in the case of group based activities like tent house, bakery etc. the capacity building helped in running the IGA as a group enterprise.

Convergence

A large number of activities in the agriculture and animal husbandry sector needed convergence with the state government departments, starting from the village level up to the state level. This was particularly prominent in livestock programmes where the training of para-vets, health care programmes for livestock, breed improvement programmes etc. were mostly dovetailed with the Uttarakhand Livestock Development Board. Similarly, some of the activities under agriculture and horticulture like procurement of fruit plants etc. were dovetailed with the respective state government department.

Equity

Of the total beneficiaries in the sampled GPs, the number of female beneficiaries was found to be more than that of male beneficiaries. The benefits were well distributed across all socio economic groups. The weaker sections of the society (cobblers, barbers, carpenters, blacksmiths, masons, potters) received 9.6% of the fund which was utilized by them on their traditional occupational activities. Further, 34 of the beneficiaries who were given fund and training for a Musical Band (played during marriages) were also exclusively from weaker socio-economic groups. In all other activities a fair share was made available to these groups. In Vikasnagar Division 100% fund went to scheduled tribes (ST) and schedule castes (SC) as the project area in Kalsi Block is a tribal area. In Jaunpur Block 100% funds went to Backward Caste and Scheduled Caste, as the Block is considered as a backward area.

Apart from supporting individual VG members, VG groups were also formed to facilitate funding for particular type of activities. 84 VG groups were formed in sampled GPs, with more than two third of the members as women. Some of the SHGs formed earlier having majority belonging to VG category were converted into VG groups to support them under Vulnerable Group Fund. Most VG groups were funded under VG fund for poultry, goatery, tent house and dairy activities. Formation of VGs for goatery, poultry, dairy, and tent house was adhoc with little or no cohesiveness among group members. 36 of the VGs do not have any kind of saving or common group fund, while the remaining groups had some funds in their accounts. Three VGs have over Rs. one lakh in their account.

Withdrawal Strategy

The Withdrawal Strategy for the project has been put in place for which WMD has issued detailed instructions that are being followed. At the state government level, policy decision has already been taken for operations and maintenance of various assets created under the project. All the assets created are to be entered into a separate register at the GP level, mutli utility centres are to be utilised and operated by the GPs, the processing centers established at the GP level are to be utilised and maintained by the registered FFs and the weather stations are to be vested in the departments on whose land they are located. The assets / equipments provided to DSAs under the project are to be transferred to the concerned Project Director (PD). Similarly, the assets and equipments provided to P-NGOs and F-NGOs are to be handed over to the concerned PDs.

Sustainability

Sustainability is reflected in the achievement of financial stability of the community based groups. In sampled GPs, an average sum of Rs.20350 has been saved by SHGs. Inter loaning among members is being carried by SHG members. The repayment of loan was reported to be in time. The SHGs initially drew on their own accumulated savings to provide loans to their members, but have later also linked with more formal credit systems to access funds for overcoming limitations of their own resources. These are indicators of the achievement of financial stability of the SHGs, due to which the potential of their functioning post project is perceived to be high. Moreover, the regular functioning and awareness among the women members of the SHGs, increases their sustainability.

User Groups have also generated their own funds through membership collection for future maintenance and operations. The groups formed have generated their own funds through membership collection for future maintenance and operations. The total fund in the credit of

all User Groups (till date) is Rs 1405312, out of which Rs 303324 was utilized for repairing and maintenance.

Traditional activities such as carpentry, cobbler, blacksmith, barber, potter, mason and band parties have the potential to sustain, as the beneficiaries are well trained in these and have been carrying it as family profession. Dairy and goatery are also sustainable due to the ready local market, better returns and traditional occupational background. Grading, packing, fruit preservation and growing of off-season vegetables and cash crops will be sustainable if linked with agribusiness activities like processing centres etc. Tent house and catering are highly seasonal IGAs and need management and capital in future for their maintenance; village communities are also likely to interfere with the VGs in such IGAs, treating them as common resources. The rest of the IGAs will be sustainable only if they are run on commercial basis and the beneficiaries earn profit to keep up the interest.

Recommendations

It is important that the institutions created under the project be ultimately linked up with other government programmes that promote institution building. In case of VG activities, the project has provided initial support that has led to good returns in the short run. However, support for mobilisation of VGs on a longer term basis could be useful to keep up the interest and enhance group cohesion.

Conclusion

This is the first time that local grass roots level institutions have experienced decentralization in any government project to an extent where the funding and account keeping of a budget of this magnitude was entrusted to Gram Panchayats.

When looking at the outcome indicators and the project components / themes identified to address the PDO, it can be concluded that the project has been successful in sustaining continued community involvement at all stages. Towards community participation in watershed development and management, an average 78.96% of total households in a Gram Panchayat have been involved in the preparation of GPWDP, 91% households were found to be aware of project objectives, and methodologies. Community involvement is also reflected in the social audit. PME was carried out regularly (at least thrice) in all sampled GPs.

Results show strengthened administrative capacity of GPs on various aspects and also on the increased role being played by the GPs now even outside of the project. The results for the indicators to measure this show an average 46.8% attendance in statutory Gram Sabha meetings (increased from an average 23.1% to an average of 46.8%, showing an average increase of 102.5%), an average 48.7% of GP constituents aware of annual budget and expenditure, 100% GPs had satisfactory annual audit reports (of audit by CA at GP level).

To ensure equitable participation, the project has laid special focus on women and VG members. The project brought about awareness among women and VGs in each GP, and empowered them through organised groups like SHGs and VGs. There has been a 30% increase in number of functioning SHGs.

In a word, a high degree of social mobilization and inclusiveness has been a standout feature of the project.

10. Economic analysis

UDWDP is targeted at 468 GPs where 258000 people are expected to be benefitted. With agriculture as the primary source of household income for over 70% of the population, the key benefit of the project is expected to arise out of increased potential of natural resources. However the project also targets households who own relatively smaller amounts of land – households who are typically poorer than landed households. Income generating activities (IGAs) targeted at these groups form a major component of the project.

The economic analysis follows the approach provided in Annexure 9 of the PAD. Beyond that, the standard methodology for economic analysis, based on computation of the discounted net benefits has been used. In a few cases, the assumptions used in the PAD have been modified to reflect field conditions and these have been mentioned in relevant places.

While the benefits are computed sector wise, the overall results are presented across sectors as the benefits cannot be linked to a specific cost head in many cases. The costs are incurred over a period of five years in each GP. Since the benefits are captured over a five year period (pre and post project), attribution of benefits on a yearly basis has not been attempted.

The project focuses on improving the productive potential of natural resources and increasing incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches. As in the PAD, on-farm and off-farm benefits are distinguished and the benefits shown separately.

On farm benefits

Agriculture

The on-farm benefits for agriculture is comprised of the increased area under crops and the increased productivity of the crops. The pre and post project values for the area under key crops and pre and post project values for the productivity of these crops have been taken into consideration while determining the increase in the value of these crops. The incremental values have been multiplied by the crop price to obtain an estimate of the benefit. Crop prices considered here is current (2011-12) Minimum Support Prices (as specified in the Ministry of Agriculture website[10]) and wherever not available/applicable, farmgate prices based on field data has been used. Input costs have been deducted from the total benefit to obtain the net benefit. Input costs or the costs of production per quintal for Uttarakhand (2008-09 levels) were obtained from the Ministry of Agriculture website. Where input costs for crops grown under the project intervention were not available, national average data was adjusted[11] to arrive at the State level data. Further, using the relevant consumer price index , input cost was corrected for inflation to bring it to current year levels.

[10]Directorate of Economics and Statistics, Ministry of Agriculture, GoI. Weblink: dacnet.nic.in/msp/MSP_09-11-2011.pdf -

[11] Proportion of cost of production (national average for 2008-09 levels) to the minimum support price (2008-09 level) was determined which was used later to arrive at the final input cost (2011-12). National average input cost was found to be higher by 18% over that of Uttarakhand, hence, figures were adjusted downward in relevant cases.

The increase in agricultural benefits could be attributed to both the inputs in the agricultural sector such as the use of improved varieties and the use of improved techniques such as polyhouses/ polytunnels, and the adoption of soil and water conservation measures.

The net benefits projected over five years is shown in the Table below.

Table 10. 1 Agriculture Benefits

Agriculture	Year1	Year2	Year3	Year4	Year5
Rs. in '000	**NB***	**NB***	**NB***	**NB***	**NB***
Division					
Vikasnagar	67727	62710	58065	53764	49781
Chinyalisaur	22888	21192	19623	18169	16823
Augustmuni	26615	24644	22818	21128	19563
Gairsain	13295	12310	11398	10554	9772
Champawat	60778	56276	52107	48247	44673
Bageshwar	23830	22064	20430	18917	17515
Nainital	21797	20182	18687	17303	16021
Pithoragarh	31896	29534	27346	25320	23445
Almora	21867	20248	18748	17359	16073
Kotdwar	26738	24758	22924	21226	19654
Grand total	**317431**	**293917**	**272146**	**251987**	**233321**

*NB: Net Benefit (calculated as Total Benefit – Input Cost)

NB discounted at 8%

Horticulture (Fruit trees)

Key fruit trees distributed under the project include apple, citrus fruits, and pear. The benefits comprise increase in numbers of fruit trees, and consequent increase of fruit production. Costs of inputs are based on field survey. An approach similar to agriculture is used in the case of horticulture to determine the net benefits. The main point of difference, however, in this case is that the benefits accrue after a time lag (time taken for the trees to bear fruits). Hence, net benefits considered here covers the time period from plantation till these trees reach their maturity period (15 years). In the overall project level cost benefit analysis, net benefits for horticulture (both for 5 years and 10 years scenarios) considered is that for 15 years. In the following table, net benefits over periods of 5, 10, and 15 years have been projected for discount rates of 8%, 6%, and 4%.

Table 10. 2 Horticulture Benefits

Rs. in '000

Total NB	5 years	10 years	15 years
8%	-450886	2867	471168
6%	-448520	78681	676777
4%	-445198	169571	937610

Livestock

We have reported a significant increase in the holdings of improved breed livestock in our sample. Net benefits stream accruing out of sale of key livestock products (for the incremental livestock holding) for a period of 5 years is given in the table below. Input cost has been taken from the field survey.

Table 10. 3 Livestock Benefits

Rs. in '000

Livestock	Year1	Year2	Year3	Year4	Year5
Rs. in '000	NB	NB	NB	NB	NB
Division					
Vikasnagar	17045	15783	14614	13531	12529
Chinyalisaur	11724	10855	10051	9307	8617
Augustmuni	18664	17282	16002	14816	13719
Gairsain	8802	8150	7546	6987	6470
Champawat	18296	16940	15686	14524	13448
Bageshwar	13609	12601	11667	10803	10003
Nainital	8783	8133	7530	6973	6456
Pithoragarh	12245	11338	10498	9721	9001
Almora	11770	10898	10091	9344	8652
Kotdwar	5440	5037	4664	4318	3998
Grand total	**126379**	**117017**	**108349**	**100323**	**92892**

NB discounted at 8%

Soil conservation

The amount of land that could be potentially brought under cultivation due to soil conservation measures is an indicator of the benefits of soil conservation activities. This area has been estimated using satellite imagery of the pre and post project periods (assumed to be without and with project scenario). The average productivity of land (based on key crops) has been multiplied by this area to obtain an estimate of the benefits of the soil conservation activities. With an estimated decrease in barren land of approximately 19 sq km[12], the monetary value of the productive potential of this land (under the most plausible land use) has been worked out.

Off-farm benefits

Forestry

The benefits comprise projected harvest of timber and fuelwood based on estimates of MAI and survival rates of species used for plantation activities. Current prices of fuelwood and timber are used and a 30 year rotation is assumed.

The MAI is taken as 1.31 cm (based on Troupe) and the survival rates are based on the field survey. The average (current) survival rate is 45% (in a range of 23% to 85% across 11 sites). It is further assumed 75% of plants currently surviving would survive *at maturity*. Fuelwood yield is projected every 5 years, beginning from the 10th year and timber yield is projected at the end of 30 years.

Domestic water

The measure of benefit in this case is the amount of time saved in obtaining water in the dry season. Prevailing wage rates are used to compute the opportunity cost of the time saved. On an average, a single household saves 125 hours of time per year due to increased availability of domestic water. Imputing a wage cost on this time provides an estimate of the benefit. For the wage cost a lower end estimate is used as it is expected that the opportunity cost of labour will be lower than the prevailing (official) wage rate[13] (60% of the prevailing wage rate, i.e., Rs. 70.21). The benefits are presented in Table 10.4.

Table 10. 4 Domestic water benefits

Domestic Water	Year1	Year2	Year3	Year4	Year5
Rs. in '000	NB	NB	NB	NB	NB
Division					
Vikasnagar	7012	6492	6012	5566	5154
Chinyalisaur	4823	4466	4135	3828	3545
Augustmuni	7678	7109	6583	6095	5643
Gairsain	3621	3353	3104	2874	2661

[12] Based on estimates provided in Chapter 8
[13] Wage rate used here is the current (2011-12) minimum wage rate for agriculture labour, which is Rs. 117.02 (inclusive of variable dearness allowance), as mentioned in the Ministry of Labour Govt. of India, website.

Domestic Water	Year1	Year2	Year3	Year4	Year5
Champawat	7526	6969	6452	5974	5532
Bageshwar	5598	5183	4800	4444	4115
Nainital	3613	3346	3098	2868	2656
Pithoragarh	5037	4664	4319	3999	3703
Almora	4842	4483	4151	3844	3559
Kotdwar	2238	2072	1918	1776	1645
Grand total	**51988**	**48137**	**44571**	**41269**	**38212**

NB discounted at 8%

Environmental and natural resource benefits

The environmental and natural resource benefits such as the increase in soil fertility and moisture levels are already captured through increases in the value of agricultural production. The value of ecosystem services of forests are not being considered due to lack of site-specific secondary estimates and the impracticability of generating primary estimates within the time frame.

Other benefits

Employment Generation

The project has generated additional employment opportunities for the rural population in the project area at farm level as well as through project support-works such as drainage line treatments, rural infrastructure, water harvesting structures etc. A total of 7.69 lakh (data from UDWDP Status Report, December, 2011) of man-days have been generated in the entire project period, i.e., 1.538 lakh man-days per year. To arrive at the benefits due to this additional employment generation, the wage rate that has been used is the minimum wage rate for agricultural labour in Uttarakhand, specified by the Govt. of India[14] Benefit from employment generation during the project period is calculated for 3 discount rates as shown in the table below.

[14] information available at: http://labour.nic.in/wagecell/Wages/UttarakhandWages.pdf

Table 10. 5 Employment Generation Benefits

Rs in '000

	Net Benefit					
Discount rates	**Year1**	**Year2**	**Year3**	**Year4**	**Year5**	**Total Benefit**
8%	17997.68	16664.51	15430.11	14287.14	13228.83	77608.26
6%	17997.68	16978.94	16017.87	15111.2	14255.85	80361.52
4%	17997.68	17305.46	16639.86	15999.87	15384.49	83327.35

Economic Analysis from Selected Activities

The per unit potential of irrigation structures to irrigate land was obtained from the field survey. For the benefits calculation, as an outcome of this intervention, the agricultural benefits with most plausible mix of crops were estimated per hectare of land, which was later converted into net returns per irrigation structure. The per unit discounted Net Benefit (NB) for a time period of 1, 5 and 10 year/s have been calculated, as well as the BCRs for 5 and 10 years. Irrigation channels and irrigation tanks return BCRs greater than unity in the 10 year scenario.

Table 10. 6 Net Benefits from selected interventions

Structure	**Unit**	**Unit Cost (Rs.)**	**1 Year**	**5 years**	**10 years**	**BCR**	**BCR**
		Revised	**NB/ unit**	**NB/ unit**	**NB/ unit**	**5 years**	**10 years**
Irrigation Channel with PCC lining mini section/ km	**km.**	630000	119082.4	513498.5	862977	0.82	1.37
Irrigation tank with delivery pipeline (14-21 cum)	**no.**	67200	14289.89	61619.83	103557.2	0.92	1.54

Net Return calculated is the same as that used for agriculture sector.

Discounted at 8%.

Aggregate Benefits

The economic evaluation of the project includes estimates of the following benefits:

a) Increases in agricultural area and productivity

b) Increases in numbers of horticultural crops

c) Conversion of barren land to productive land on account of soil conservation measures

d) Increased availability of water for domestic purposes

e) Increased availability of timber and fuelwood

f) Increase in the overall value of livestock benefits

The data on benefits is sourced from our primary survey, except in the case of the estimate of conversion of barren land to productive land which is based on remote sensing techniques. The present value of the incremental benefit stream for 5 years, discounted at 8% is given below.

Table 10. 7 Benefit Cost Ratio

Sector	5 years	10 years
	PV (Rs. '000)	PV (Rs. '000)
Agriculture	1368802	2300386
Livestock	544960.5	915851.5
Domestic Water	224177.1	376748.3
Soil	390258.9	655862.5
Horticulture	471169	471169
Forestry	342541	342541
Employment	77608.26	77608.26
Total Benefits	**3419517**	**5140166**
Cost	**1953156**	**1953156**
BCR (WOE)[1]	**1.71**	**2.59**
BCR (WE)[2]	**1.75**	**2.63**

Net benefits discounted at 8%

[1]BCR (WOE): Benefit Cost Ratio without employment benefits

[2]BCR (WE): Benefit Cost Ratio with employment benefits

Project Costs

Project costs are based on detailed cost tables, excluding price contingencies and taxes. Estimated economic cost for the project in constant, undiscounted values works out to be Rs. 1,767.36 million. The present value of project economic costs split equally for 5 years, and inflated at 5% per year is Rs. 1,953.156 million.

Aggregate Economic Rate of Return

The economic analysis of the project has been undertaken at the aggregate level, summing up all benefits and costs of the project area.

Comparison of benefits and costs gives the project a benefit-cost in excess of unity, which is the case since benefits exceed costs in PV terms. The overall economic rate of return for the project assuming that the benefit stream would sustain for 5 years is estimated to be 18.5%, which exceeds the opportunity cost of capital (12%). Under the assumption that the benefits sustain for 10 years, the economic rate of return is estimated to be 22.4%.

Income Generating Activities for Vulnerable Groups

The key IGA were evaluated on case-study basis and the benefits extrapolated to the project level based on overall distribution of these activities in the sample and in the entire project. The total benefits in the form of incomes and/or opportunity costs saved, and cost data were obtained from field surveys. Based on the sample survey results, percentage of allocation of VG funds for selected activities (both group and individual), and the percentage of beneficiaries for each activity were calculated and compared for consistency to that reported in the WMD VG Fund Report, 2011. A total of Rs. 6,727,4098 was spent under the VG funds, the beneficiaries of which accounted to 7221 individuals (upto August, 2011) as reported in the WMD VG Fund Report, 2011.Agribusiness though not a VG activity is also analysed here for the sake of comparison.

As in the case of aggregate project cost, the costs incurred under IGA (project, individual, and O&M) were split equally in 5 years, and accounted for 5% inflation. The BCR for 5 and 10 years taking into consideration 14 income generating activities, comes out to be 4.09, and 6.87 respectively, which renders IGA interventions viable in both the scenarios.

Table 10. 8 Benefits from IGAs

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	5years	10 years
Rs. in '000	**NB**	**NB**	**NB**	**NB**	**NB**	**BCR**	**BCR**
Agribusiness*	329.75	305.32	282.71	261.77	242.38	4.51	7.59
Bakery*	1.00	0.93	0.86	0.79	0.74	0.16	0.27
Tyre repair*	26.40	24.44	22.63	20.96	19.40	2.58	4.33
Band	696.14	644.57	596.82	552.62	511.68	1.87	3.13
Blacksmith	10057.82	9312.80	8622.96	7984.22	7392.80	13.20	22.18
Carpentry	12985.25	12023.38	11132.76	10308.11	9544.55	23.69	39.81
Cobbler	446.08	413.04	382.45	354.12	327.89	5.91	9.94
Dairy (cow/buf)	5315.42	4921.69	4557.12	4219.55	3906.99	0.86	1.44
Goatery	56748.05	52544.49	48652.30	45048.43	41711.51	7.17	12.06
Poultry	5438.17	5035.34	4662.35	4317.00	3997.22	1.16	1.95
Shops	15071.76	13955.33	12921.61	11964.45	11078.19	5.94	9.98
Tailor	5546.51	5135.66	4755.24	4403.00	4076.85	2.71	4.56
Tent house	2822.88	2613.78	2420.17	2240.89	2074.90	0.96	1.62
Total	115708.28	107137.29	99201.20	91852.96	85049.04	4.09	6.87

*Benefits based on single case studies from survey (NB discounted at 8%)

Annexure to Chapter 10

Sensitivity table

	Cost (Rs. '000)	Benefit (Rs. '000)	BCR(WOE)
5 years (8%)	1953156	3341909	1.71
10 years (8%)	1953156	5062558	2.59
5 years (6%)	1953156	3889475	1.99
10 years (6%)	1953156	5845714	2.99
5 years (4%)	1953156	4698252	2.41
10 years (4%)	1953156	6929378	3.55

	Cost	Benefit	BCR(WE)
5 years (8%)	1953156	3419517	1.75
10 years (8%)	1953156	5140166	2.63
5 years (6%)	1953156	3969836	2.03
10 years (6%)	1953156	5926076	3.03
5 years (4%)	1953156	4781579	2.45
10 years (4%)	1953156	7012705	3.59

11. Conclusion

In this concluding chapter, we discuss our key findings vis-a-vis the objectives of the assignment and the scope of work as defined in the ToR.

The key objective was to determine whether the project objectives set in terms of expected outputs and outcomes using criteria and indicators in the PAD have been met. As summarised in the Results Framework Table following the Executive Summary of this Report, almost in every case, the achievements have exceeded the targets set for the end of the project stage.

The report also attempts to bring out the discernable changes in socio-economic and environmental parameters. For example, while incomes in real terms in the project area has gone up by 17%, there has also been a significant increase in the holding of consumer durables, indicating a general improvement in living standards. Likewise, there is a biomass increment of 9.37% over the baseline and a 24.7% increment in the land under irrigated agriculture. There is an increase in the area under almost all key crops and an increase in crop yields - a combined impact of interventions in soil conservation and agriculture. Details of these changes have been summarised in the Results Framework Table.

The project was implemented in a region where the majority of agricultural land is unirrigared, The region is characterised by subsistence agriculture with small and fragmented land holdings and the use of traditional techniques. Likewise, there was very little presence of improved breed livestock and consequently, the knowledge of practices associated with such livestock was poor. Due to the difficult terrain, the veterinary services were difficult to reach. Thus, the project began with a set of geographical constraints and the outcomes need to be viewed in this context. For long term sustainability of the impacts in such a context, it is important to develop strong mechanisms of convergence with state government departments. Specially, in case of assets created on community land, dovetailing with other state government programmes could enhance post-project maintenance.

The following paragraphs refer to the additional points of the ToR

1. The extent to which the project activities has improved natural resource management, incomes and livelihoods, and empowerment and capacities of GPs has been summed up in the Executive Summary of the report, in terms of the specific project development objectives. In terms of maintenance of community assets, the formation of User Groups has played a key role and it is anticipated that a process of convergence with government programmes could further facilitate this process.
2. A decentralised approach with a focus on institutional strengthening is key to this project. The devolution of financial powers to the Gram Panchayat level is an integral part of this approach. Besides, the preparation of the GPWDP through a participatory process and its periodic updation has been an important feature. As several indicators of participation and awareness show, this approach has worked well in meeting the project objectives. The involvement of PNGOs in two Divisions with roles and responsibilities similar to government run project offices has been a progressive measure and has been met with a high degree of enthusiasm. Also the promotion of cash crops and off season vegetables using modern agricultural techniques has caused a discernible shift in the cropping pattern. The significant

investment in soil/water conservation (leading to a large increase in irrigated agricultural land), combined with promotion of agribusiness operations have been key supporting factors in the overall improvement in agricultural practices, and the enhancement of returns from agriculture. Indeed, the focus on agribusiness as an integral part of agricultural interventions has held promise, and relatively better performances have been observed in divisions where DSAs have been put in place. Further discussion on the efficacy of individual project interventions have been provided in various sectoral chapters.

3. Equity and distributional impacts: The project has had an equity-enhancing impact. The analysis of income increases presented in Chapter 3 indicates that the incomes of VGs have increased by a higher percentage as compared with the incomes of non-VGs (with a difference of over 14 percentage points). Moreover, the focus on IGAs for VGs has been a significant success with several of these activities realising quick returns over the short run. The participation of women in various project processes and the targeting of specific activities for women have enhanced gender equity.

4. Potential poverty impact: The PAD mentions that about 7800 households below the poverty line will be direct beneficiaries of the project. The results suggest that the project has greatly exceeded the target. The sampled GPs are similar in demographic composition to the overall project GPs. If we assume then, that our sample is largely representative of the entire project GP composition, then about 50% of the households of the entire project area fall within the vulnerable group category, or about 12700 households of the estimated 25400 project beneficiary households. Given that in the 50 selected GPs, more than 50% of the vulnerable group have shown significant income increases, it appears that more than the stated objective of 7800 households below the poverty line have shown an increase in income.

5. Common property resources versus private lands: The hill population is heavily dependent on common property resources (requiring collective management approaches) because private land holdings are typically small and fragmented. While the exploitation of these resources is needed to sustain both human and cattle population, this often exceeds sustainable limits due to absence of alternatives, and communities tend to take little interest in their sustainable management. The project therefore attempted to take up interventions on a large scale on common property resources such as van panchayats, civil and soyam forests and village wastelands. It was observed during our baseline and midterm surveys that communities initially tended to show higher interest in activities on private lands as greater direct benefits were expected in these cases. However, over the period of project implementation, the importance of activities on common property resources even at the level of individual benefits was realised. For example, the investment in soil conservation activities resulted in the increase in cropped areas/yields leading to direct benefits to individual farmers. Interventions such as polyhouse, community orchards and irrigation tanks, while on private land, are usually used by a group of individuals. Since these provide direct economic returns, the interest is normally high.

6. The cost effectiveness of several innovations (agribusiness, VG activities) have been analysed in Chapter 10. It is seen that several VG activities based on traditional occupations (e.g. blacksmith, carpentry) show the potential to generate quick returns, and exhibit the relatively high benefit-cost ratios.

7. Impact and effectiveness of administrative reforms and innovative policy measures: UDWDP has introduced administrative reforms and innovative policy measures like Women Aam Sabha, women ward member as co-signatory, and encouraged women focused broad based participation in the project level committees. Women Aam Sabha is being held every month in all sampled GPs, without any exception. The purpose of the Women Aam Sabha is to review those activities that target women beneficiaries. The attendance in the Women Aam Sabha shows a variation from 30% to 70%. In 18 GPs among those sampled, there are women ward members as co-signatories; and of these 7 GPs also have women as Gram Pradhan, and therefore, in these GPs both the co-signatory and the main signatory are women. Besides, in 12 sampled GPs, women are Gram Pradhan and thus, the main signatories. Specific arrangement for the review of women focussed activities is a project innovation and has helped the process of empowerment in the wider sense.
8. Quality of participatory processes: The project adopted a participatory approach with the Gram Panchayat envisaged as the main implementing agency. In the process, the capacities of the Gram Panchayats were meant to get enhanced in more general terms, that is beyond the duration and scope of the project. The increased participation of GP constituents, and specially women and VGs, in Gram Panchayat and Gram Sabha meetings indicate, at a basic level, the strengthening of these institutions and their roles in being a deliberative platform for decision-making. The process of preparation of the GPWDP was highly participatory, and our assessment points towards a consensus that the specific activities chosen for implementation in a specific Gram Panchayat are reflective of the priorities of its constituents within the overall project frame. Besides, there was a high degree of awareness of the project objectives (91% of constituents aware) and a reasonable degree of awareness of the annual budget and expenditure (48.7% of constituents aware). The process of Participatory Monitoring and Evaluation played a major role in enhancing transparency among communities, also providing an opportunity, especially to people of the lower socio-economic strata, to resolve issues of minor conflict. The utilisation of FNGOs also facilitated the involvement of weaker sections in the preparation of the GPWDP and in the implementation of the project activities.
9. ESMF: The final GPWDP targets were fixed after due consideration to ESMF, and hence environmental and social risks have been addressed as a part of project design. For instance, during construction of village link paths , due consideration was given to checking of soil erosion by constructing retaining walls and breast walls and during the survey, no acceleration of erosion was found due to the construction of the walls. In case of DLT, the principle is to treat the drain from source downwards but in situations where the source was in the RF, the treatment was started midway and this was seen to cause erosion in the downstream side. It was also found that the kuchha ponds constructed for rain water harvesting at a few places increased downstream erosion.
10. Sustainability: Most of the interventions undertaken under the agriculture and horticulture component have strong potential of sustainability. For instance, minikits have been effectively utilized by almost all the farmers and wherever the productivity has substantially increased the farmers have retained the seeds to be used for the next agriculture season.

The sustainability of various interventions in soil and water conservation depends on the effective maintenance of these structures. In case of soil conservation structures such as stone check dams, about 30% of the dams are filled with sediment and thus these structures have already reached the limit of their capacities of restricting soil erosion. The soil conservation structures that withstood heavy rainfall in 2010 and 2011 have served their purpose to a large extent. At this stage, there is a need to hold that soil by planting riparian species such as bamboo so that the soil gets compacted and soil moisture regime gets developed for the surrounding vegetation. Besides, using other GP funds to bring about a convergence among structures along the same water stream could enhance sustainability.

The increase in the number of improved breed cattle and reduction in the number of local breed cattle shows that local scrub cattle has been phased out in favour of improved breeds. However, since improved breed are more susceptible to diseases and are often not able to withstand harsh weather conditions, there is a need to ensure continuous veterinary support, and provide timely vaccination and health care to ensure sustainability.

Formation of SHGs under the project with majority of women members is a key feature of the project. A high level of awareness and regular functioning of these SHGs makes for enhanced sustainability of these activities. User Groups formed under the project have generated their own funds through membership collection for future maintenance and operations. Traditional activities such as carpentry, cobbler, blacksmith, barber, potter, mason and band parties have the potential to sustain, as the beneficiaries are well trained in these and have been carrying it as family profession. Dairy and goatery are also sustainable due to the ready local market, better returns and traditional occupational background. Grading, packing, fruit preservation and growing of off-season vegetables and cash crops will be sustainable if linked with agribusiness activities like processing centres. Tent house and catering are highly seasonal activities and need management and capital for future maintenance; village communities have also been seen in a few cases to interfere with the VGs in issues of upkeep, treating them as common resources. The rest of the IGAs will be sustainable only if they are run on commercial basis and the beneficiaries earn profit to keep up the interest.

In cases of assets created on common property resources, sustainability takes on a different dimension. In this project, most of the afforestation work has been done on Van Panchayat lands. There is a Van Panchayat management committee in every Van Panchayat formed under Van Panchayat rules of the State. The State Government is also paying special emphasis on management of Van Panchayats, and funds are being made available to them. Dovetailing of these plantations with government programmes for their future upkeep and management will ensure their sustainability. In case of irrigation tanks, the formation of UGs with a monthly contribution for the upkeep of the structures has been an important factor in ensuring adequate maintenance.

11. Economic analysis: The economic analysis of the project includes benefits from agriculture, livestock, horticulture, forestry, soil conservation, domestic water and employment. Following the approach used in the PAD, aggregate level economic analysis has been done. The Benefit Cost Ratio (r=8%, t=10 years) works out to 2.63 including the employment benefits. The Economic Rate of Return is estimated at 18.5% over 5 years. Economic analysis has also been done for selected interventions

as well as for selected IGAs. Irrigation channels and irrigation tanks return BCR values of 1.36 and 1.54 respectively over a 10 year horizon, indicating their economic viability even in the medium run. Almost all IGAs return favorable BCR values with traditional/caste based IGAs such as carpentry and blacksmith returning the highest values, indicating that project support to buttress existing skills provide quicker returns.

12. Training and outreach: Given the scale of community involvement in the project, extensive training and capacity building was required for awareness and institution building at various levels of implementation. At the start, as narrated by motivators and staff, it was challenging to build the confidence of the community, and take activities forward according to the GPWDP prepared through PRA, and to make the work of the implementing agencies transparent at the GP/RV level. The trainings, exposure visits, capacity building and skill up gradation activities changed the attitude and perceptions of the community in a big way. The overall impact of the training programmes was visible in the on-going activities in the sampled GPs, and also, in the running of the agribusiness processing centres. Chapter 9 of the Report provides further details.
13. Changes in microwatershed characteristics: Using remote sensing techniques (elaborated in Chapter 8), the biomass change in treated watersheds is estimated at 9.37%, accompanied by decrease in the amount of bare land and an increase in the amount of agricultural land. Based on vegetation surveys, it was observed that treated plantation sites have higher values of diversity and species richness as compared to control sites.

Annexures

Annexure 1: Details of project activities in sampled GPs

Annexure 2a b c d: Questionnaires & Checklist

Annexure 3: Details of Sampled and Control GPs

Annexure 4: Economic Analysis computation (Forestry)

Annexure 5: Location of sampled GPs

Annexure 6: GP level land use changes

Annexure 7: Agribusiness Details

Annexure 8: Photographs

Annexure 1: Details of project activities in sampled GPs

S.No.	Activities in GP		Agriculture (ha.)			Horticulture (ha.)				Livestock			
	Name of Micro Watershed	Name of Gram Panchayat	Agri.Mini.	Compact area Demon.	Agribusiness	Off Sessoan Veg. Demo. (ha)	Poly Hose Const. (No.)	Bio Compost demon. (No.)	Dev. Of fruit orch.(Ha.)	Natural Breeding Center (No.)	Animal Shelter (No.)	Manger (No.)	Napier Plantation (Ha.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Division - Vikasnagar													
1	Sarnoka Khala	Kamla	0	6	0	8.4	0	60	18.2	1	56	78	4.1
2		Thaina	0	12.2	4.2	10.1	0	44	13.5	0	36	52	5.1
3	Jaidwar	Jaidwar	0	8.6	29.65	10.5	3	54	22	3	57	75	0
4		Maror	18.4	5.6	16.48	6.3	1	11	4.6	1	24	21	0
5	Sunindagad	Khatar	0	3	6	12.9	0	45	11	0	53	62	8.5
6	Dhawalgad	Koti	0.6	6.9	24.45	7	2	23	0	1	30	35	7.5
Division- Chinyalisaur													
7	Daskigad	Rikhangaon	0.6	6.84	4.84	5.36	1	53	5.10	0	24	37	1.00
8	Kyari	Andhiyari	7.2	0.00	0.50	5.00	0	18	1.00	0	19	44	9.50
9	Gairgad	Kyarda	0.08	2.00	1.60	0.00	0	9	2.87	0.00	9	6	1.00
10		Kandargaon	0	4.00	0.00	0.00	0	11	1.00	1	18	10	1.00
11	Dichligad	Kawagadi	2.32	2.33	6.15	4.00	0	21	2.72	0.5	17	52	2.00
Division - Champawat													
12	Saulagad	Forthi	8.60	1.12	26.1	1.75	4	29	5.70	0	64	29	0.00
13		Khaiskand	0.00	0.20	26.0	1.80	13	16	13.20	0	24	21	2.50
14		Kolidhek	6.00	2.00	8.1	15.46	2	18	1.96	0	36	33	0.00
15		Pau	1.60	5.55	14.2	2.30	9	22	10.40	0	15	35	2.50
16	Lohaghat	Naskhola	6.52	107.4	15.8	0.00	0	8	4.25	0	17	14	5.00
17		Gurmangal	37.8	7.19	2.3	6.10	1	8	5.15	1	18	4	3.00
18	Piligad	Khaykot malla	6.2	16.36	24.6	9.50	3	41	15.79	1	42	14	6.70
19	Amergad	Valson	8.1	5.62	0.0	4.31	0	6	4.00	1	23	2	1.00
20	Cheri	Chami	11.3	8.68	7.6	4.42	1	2	2.00	1	14	4	5.27
Division- Augustyamuni													
21	Kyunjagad	Kyunja	-	1.8	17.0	0.5	3	37	3.5	1	50	23	5.5
22	Surgad	Ghimtoli	-	7.0	42.0	5.9	7	47	10.3	0.5	48	75	14.5
23	Banyarigad	Roomsi	0.0	7.6	18.2	8.5	2	19	5.3	1	32	12	18.5
24		Jagoth	3.7	10.4	15.9	16.4	1	56	7.0	1	50	28	11
25	Pogtagad	Bijarakot	-	3.1	-	4.0	-	11	5.0	1	27	18	5.5
26	Chinkagad	Kotagi		14.2	31.3	2.6	1	14	3.8	1	29	6	10.0

S.No.	Activities in GP				Forestry Programme		Soil Cons. Work		Water Harvesting				
	Name of Micro Watershed	Name of Gram Panchayat	Fodder Minikit (ha.)	Paravat training (No.)	Plantation in (ha.)	No. of Plants	Vegetative Checkdem (cum.)	Stone Checkdem (cum.)	Irrigation Channel (km)	Irrigation Tank (No.)	Roof Water Harvesting tank (No.)	Village Pond (No.)	Drinking water Pipe line (km)
1	2	3	15	16	17	18	19	20	21	22	23	24	25
Division - Vikasnagar													
1	Sarnoka Khala	Kamla	3.56	0	61	56400	0	6327.18	0.22	19	27	10	7.52
2		Thaina	4.44	0	35	31600	0	1609.1	1	12	35	2	6
3	Jaidwar	Jaidwar	2.86	0	36	46800	0	426.95	3.83	1	68	5	0
4		Maror	2.44	1	22	28000	0	1006	1	1	24	0	0
5	Sunindagad	Khatar	4	1	68	62000	0	2991.53	0.35	6	59	0	2.95
6	Dhawalgad	Koti	12.04	0	80	83000	0	241.47	1.93	8	2	4	0
Division- Chinyalisaur													
7	Daskigad	Rikhangaon	0.00	0	7.90	12640	22	920.0	0.43	0	20	5	0
8	Kyari	Andhiyari	1.60	0	31.0	30400	20	708.0	0.75	7	32	2	0
9	Gairgad	Kyarda	0.00	0	0.00	0	36	616.0	0.00	0	36	0	0
10		Kandargaon	0.00	0	0.00	0	0	0.0	0.00	1	45	1	0
11	Dichligad	Kawagadi	0.00	0	3.00	3000	0	323.9	0.99	1	17	0	0
Division - Champawat													
12	Saulagad	Forthi	0.00	0	15.0	15000	0	2879.79	0.0	8	73	1	0.000
13		Khaiskand	0.00	0	9.0	9000	0	971.34	0.0	2	31	0	0.000
14		Kolidhek	0.00	0	10.0	10000	0	199.0	0.0	2	86	0	0.000
15		Pau	0.00	0	37.0	33000	0	15853.8	0.0	1	81	0	0.000
16	Lohaghat	Naskhola	1.42	0	24.0	18000	0	820.99	0.000	2	16	0	0.000
17		Gurmangal	0.00	0	17.0	12800	0	4561.9	0.186	2	23	1	0.000
18	Piligad	Khaykot malla	4.31	0	25.0	20000	0	1005.5	0.960	12	62	3	0.000
19	Amergad	Valson	1.05	0	30.0	13280	0	3875.17	0.000	2	28	2	1.640
20	Cheri	Chami	1.70	0	20.0	15320	0	2269.21	0.000	1	20	1	0.00
Division- Augustyamuni													
21	Kyunjagad	Kyunja	1	-	37	35600	86	1321.6	1.3	4	23	1	-
22	Surgad	Ghimtoli	1.8	1	40	58000	-	5382.3	1.0	-	70	1	-
23	Banyarigad	Roomsi	1.9	-	39	39200	-	2764.0	1.8	5	12	7	-
24		Jagoth	10.2	1	27	30600	-	992.0	0.8	3	43	2	-
25	Pogtagad	Bijarakot	0.4	-	57	81600	175	2125.0	-	3	28	3	-
26	Chinkagad	Kotagi	1.4	1	70	65000	20	2326.5	2.7	1	10	5	-

S.No.	Activities in GP		
	Name of Micro Watershed	Name of Gram Panchayat	Chari/Nala/khala rejuvenation (No.)
1	2	3	26
Division - Vikasnagar			
1	Sarnoka Khala	Kamla	29
2		Thaina	27
3	Jaidwar	Jaidwar	0
4		Maror	0
5	Sunindagad	Khatar	22
6	Dhawalgad	Koti	6
Division- Chinyalisaur			
7	Daskigad	Rikhangaon	3
8	Kyari	Andhiyari	12
9	Gairgad	Kyarda	3
10		Kandargaon	1
11	Dichligad	Kawagadi	1
Division - Champawat			
12	Saulagad	Forthi	10
13		Khaiskand	2
14		Kolidhek	4
15		Pau	5
16	Lohaghat	Naskhola	1
17		Gurmangal	2
18	Piligad	Khaykot malla	2
19	Amergad	Valson	3
20	Cheri	Chami	0
Division- Augustyamuni			
21	Kyunjagad	Kyunja	9
22	Surgad	Ghimtoli	22
23	Banyarigad	Roomsi	4
24		Jagoth	10
25	Pogtagad	Bijarakot	18
26	Chinkagad	Kotagi	-

Annexure 2a b c d: Questionnaires & Checklist

Consultancy for Baseline Survey and Mid-Term Impact Evaluation of Uttaranchal Decentralised Watershed Development Project

Gram Panchayat level questionnaire

Questionnaire identification form no. ☐☐☐☐☐☐☐☐

Gram Panchayat: _____ Micro-watershed: _____

Block: _____ District: _____

Revenue villages under the Gram Panchayat: 1_____ 2 _____

3 _____ 4 _____ 5 _____

Revenue villages selected in the survey: 1_____ 2 _____

3 _____ 4 _____ 5 _____

Date of Interview: _____

Name of the surveyor: _____ Signature: _____

Name of the supervisor: _____ Signature: _____

Instructions:

- Please use code wherever indicated. Circle '○' the appropriate code that corresponds to the given response.

Population details

1. Demographic profile:

Name of village under the GP	No. of households in the village	Total population of the village	Male population	Female population

2. Caste profile:

Name of village	Gen. Caste households	SC households	ST households	OBC households	Vulnerable Group households

Treatment area under watershed programme

3. Details of treatment area in the watershed:

S.No.	Revenue village	Arable land (Hectares)	Non-arable land (Hectares)	Total area (Hectares)	Proposed area to be treated in GPWDP (Hectares)	Actual area treated (Hectares)

Composition of GP and its administrative capacity

4. Composition of the GP:

Elected representatives in the GP	General Caste	SC	ST	OBC	Total	Additional Information			
						Women (from any caste)		VG (from any caste)	
						VG	Others	Female	Male
Gram Pradhan									
Ward members									
Other members									

Note: If Pradhan or ward members are from reserved ward, please indicate.

5. How many members are there in the Water and Watershed Committee of GP? Give details.

Total members	Men	Women	SC	ST	OBC	General	VG

6. Has the GP signed agreement with the WMD for participation in the project? **(Code: Yes-1, No-2)**

7. If yes, mention the date when it was signed. _____

8. Has a separate project account been opened by the GP, to manage project funds? **(Code: Yes-1, No-2)**

9. If yes, then give the following details
   a. Give details of the bank account (Name of the bank, branch and account no.)
   _____
   b. Who are the signatories of the account?
   _____

10. Has an account assistant been appointed to manage project account and keep project records? (Code: Yes – 1, No - 2)

11. If yes, mention his/her date of appointment. _____

12. Has the Gram Panchayat prepared an Annual Work Plan (AWP) for the current year? **(Code: Yes-1, No - 2)**

13. Has the GP received funds from WMD as per AWP? **(Code: Yes-1, No - 2)**

14. If yes, please mention the amount _____(Rs)

15. How much expenditure has been made so far in the project? _____ (Rs.)

16. Is project expenditure being done according to AWP? **(Code: Yes-1, No - 2)**

17. If no, please specify reasons

_____
_____
_____

18. Are monthly financial reports being submitted to Watershed Management Directorate (WMD) regularly?
(Code: Yes-1, No - 2)

19. If no, please specify the reasons

_____
_____
_____

20. Are annual financial reports being submitted to WMD regularly?
(Code: Yes-1, No - 2)

21. If no, please specify the reasons

_____
_____
_____

Procurement procedures

22. Has a community procurement plan been prepared by GP?
(Code: Yes-1, No - 2)

23. Has a Procurement Subcommittee (PC) been constituted at GP level?
(Code: Yes - 1, No - 2)

24. If yes, specify the composition of the PC:

S.No.	Name of member	Male/Female	Revenue village	SC/ST/OBC/General

25. Are procurement norms like inviting minimum 3 quotations, preparing comparative chart, taking technical sanctions followed in procuring the material?
(Code: Yes - 1, No - 2)

26. Evaluate the procurement procedure by circling '○' one of the following codes.
(Code: Satisfactory–1, Satisfactory to some extent–2, Not satisfactory–3)

27. Has any training been conducted on procurement procedures?
(Code: Yes - 1, No - 2)

28. If yes, give details:

S.No.	Subject of training	Date	No. of people attended	Institution giving training

29. Give the following details on the working of key functionaries:

Description	Before the project started	At present
How many days/month does the Panchayat Secretary attend office?		
How many days/month does the account assistant attend office?		

30. Attendance at Gram Sabha meetings:

S.No.	Description	Before the project started	At present
1	Frequency of Gram Sabha meetings		
2	Who convenes the Gram Sabha meetings?		
3	Are the meetings pre planned and dates decided in advance?	Code: Yes - 1, No - 2	Code: Yes – 1, No - 2
4	What is the mode of circulating information?		
5	Is information of the scheduled meetings circulated in advance to the members?	Code: Yes - 1, No - 2	Code: Yes - 1, No - 2
6	Average attendance in the meetings? (In percentage)	_____%	_____%
7	Do women and other vulnerable groups attend the meetings?	Code: Yes - 1, No – 2	Code: Yes - 1, No – 2
8	If yes, what is the composition of these meetings? (percentage participation of each group)	1.VG_____% 2.Women_____%	1.VG_____% 2.Women_____%
	Do they participate actively or voice their opinions/suggestions in the meeting/s?	Code: Yes - 1, No – 2	Code: Yes - 1, No – 2
	Are minutes of the meeting written and maintained?	Code: Yes - 1, No – 2	Code: Yes - 1, No – 2
	Who is responsible for maintaining the minutes of the meeting?		

31. Attendance at GP meetings:

S.No.	Details	Before the project started	At present
1	How many GP meetings take place in a year?		
2	What is the quorum of these meetings?		
3	Average attendance in these meetings (%age)	_____%	_____%
4	Do women/SC/ST/OBC/and other vulnerable groups attend the meetings?	Code: Yes - 1, No – 2	Code: Yes - 1, No – 2

Preparation of GPWDP

32. Has the GPWDP been prepared?
(Code: Yes - 1, No – 2)

33. How many households participated in preparing GPWDP?

_____ (Number)

34. How many activities in the GPWDP identified during PRA exercise address soil conservation measures, water resource management and fuel wood and fodder plans?

Total no. of identified activities	No. of soil and water conservation, forestry and water resource management activities, fuel wood and fodder plans

35. Has GPWDP been approved by Gram Sabha?
(Code: Yes - 1, No – 2)

36. What is the percentage of village members aware about GP budget and expenditure?
_____ (%age)

37. How are the village members made aware about the GP budget and expenditure? (Circle '○' the appropriate code)

Description	Code
a) Discussion in meetings	1
b) Displaying at public places	2
c) Contacting households	3
d) Through women motivator/ facilitator/ Account assistant/village incharge	4

38. Annual audits conducted:

S.No.	Description	Response
1	Are annual audits conducted?(yes/no)]	Code: Yes - 1, No - 2
2	If yes, are audit reports available?	Code: Yes - 1, No – 2
3	If yes, are these reports satisfactory?	Code: Satisfactory - 1, Not satisfactory - 2
4	If not satisfactory, then why? Describe in brief	

Staff deployed in GP for the project

39. Give details of the staff deployed in GP for the project

1 _____
2 _____
3 _____
4 _____
5 _____

40. If a village motivator has been designated give following details?

1. Date of joining: _____

2. Name: _____

3. Qualification: _____

41. Give the criteria on the basis of which she was selected?

_____
_____
_____
_____

42. Is the performance of the motivator satisfactory?
(Code: Yes - 1, No - 2)

43. What was the process of the selection of the Accounts Assistant?

_____
_____
_____
_____

44. Is the performance of Account Assistant satisfactory?
(Code: Yes - 1, No - 2)

45. Has administrative capacity of GP improved after the project? Circle the appropriate:

Indicators for increase in capacity	Code
Improvement of transparency in expenditure	1
Increase in active participation of Vulnerable Groups/BPL	2
Improvement in account keeping	3
Improvement in skills of village members	4
Others (Specify)	5

46. Has any NGO been selected for undertaking any activity like mobilization of the community?
(Code: Yes - 1, No - 2)

47. If yes, give the name of NGO

_____

48. Is the NGO satisfied with the work of the GP?
(Code: Not satisfactory -1, Satisfactory to some extent – 2, Satisfactory – 3)

Income generation activities and training under Gramya

49. Give details of income generation activities in the Gram Panchayat under Gramya

S.No.	Activity	Name of village	Name of the group for which activity has been undertaken	No. of beneficiaries	Amount invested (Rs.)

50. Give details of training details for income generation activities.

Subject of training	No. of members	Duration	Venue	Resource person/institute giving training	Any refresher training done (if yes, give details)

Status of beneficiary contribution for different activities

51. Has there been willingness among beneficiaries to give their contribution towards project activities?
(Code: Yes - 1, No - 2)

52. If no, what were the problems faced in collecting contribution?

Problem	Code
Lack of liquid money	1
Lack of time for labour contribution	2
Other (Specify)	3

53. Has GP and village level staff been trained in PRA techniques?
(Code: Yes – 1, No – 2)

54. Conflict resolution in villages:

S.No.	Description	Before the project started	At present
1	Have conflicts occurred between villages/GP or NGOs/any other?		
2	If yes, how are these resolved?		

Monitoring of the progress

55. How many monitoring reports of GPWDP have been submitted?

_____ (Number)

56. Action on the recommendations of last year's monitoring reports:

No. of monitoring reports submitted (Number)	No. of recommendations suggested (Number)	No. of recommendations operationalised (Number)

Post project operation and maintenance

57. Is an operation and maintenance fund created under the project to maintain the assets created after the project is over?
(Code: Yes - 1, No - 2)

58. If yes, give details

Who manages it	Bank where account for O&M fund has been opened	Amount (Rs.)

Feed back on the implementation process

59. What are the main problems in the implementation process?

_____

_____

_____

_____

_____

_____

60. Suggestions to improve these problems

_____

_____

_____

_____

_____

_____

Surveyed by (Name and signature) Checked by (Name and signature)

Consultancy for Baseline Survey and Mid-Term Impact Evaluation of Uttaranchal Decentralised Watershed Development Project

Household level questionnaire

Questionnaire identification form no. ☐☐☐☐☐☐☐☐

Name of head of the household: _____S/o or D/o:_____

Village: _____ Gram Panchayat: _____

Micro-watershed: _____

Block: _____ District: _____

Date of Interview: _____

Name of the surveyor: _____ Signature: _____

Name of the supervisor: _____ Signature: _____

INFORMED CONSENT FORM

My name is …….. , and I am working for an organization called "The Energy Resources Institute" (TERI), New Delhi. TERI has been selected by the Uttarakhand government to conduct a Baseline survey and Mid-Term impact evaluation of the Uttaranchal Decentralised Watershed Development Project (UDWDP). Through this survey we want to understand peoples‟ views and opinions about this project, which is known as „GRAMYA‟. The result of this study will help us in designing corrective measures for the improvement of this project and such future programmes. I want to inform that your village and you were randomly selected for the survey. The information provided by you would be assimilated with the information given by others. Your answers will be combined with answers from everyone else who is being interviewed so that we can understand what is happening in this village/GP as a whole and not just to you as an individual. I am going to ask some questions and want to assure you that your response will be kept confidential and your name will not be disclosed. You do not have to answer any questions that you do not want to answer, and you may end this interview at any time. I thank you for the time that you would take out for this interview.

Instructions:

- Please use code wherever indicated. Circle „O" the appropriate code that corresponds to the given response.

Household details

1. Name of the respondent ……
   (Relation with head of household)

2. Father"s/Husband"s name ……

3. Occupation:
   (Code: Agriculture – 1, Service – 2, Ex-service – 3, Retired from other services – 4, Labour – 5, Business – 6, Caste based occupation (Specify) – 7, Homemaker – 8, Student – 9, Others (Specify) – 10)

4. Age:
   (Code: 18 to 30 – 1, 31 to 40 – 2, 41 to 50 – 3, 51 to 60 – 4, 61 and above – 5)

5. Sex:
   (Code: Male - 1, Female – 2)

6. Religion:
   (Code: Hindu - 1, Muslim – 2, Christian – 3, Sikh – 4, Buddhist – 5 Any other (Specify) – 6)

7. Caste:
   (Code: Scheduled Caste (SC) - 1, Scheduled Tribe (ST) - 2, Other Backward Class (OBC) - 3, General - 4)

8. Does your family belong to a Vulnerable Group?
   (Code: Yes - 1, No - 2)

9. Is your house electrified?
   (Code: Yes – 1, No – 2)

10. Details of the household members:

S.No.	Name of family member	Gender	Age (Yrs)	Educational qualification (Code: Illiterate – 1, Literate – 2, Primary – 3, Junior High School – 4, High School – 5, Intermediate – 6, Graduate and above – 7, Less than 5 yrs old – 8)	Main occupation (Code: Agriculture – 1, Service – 2, Ex-service – 3, Retired from other services – 4, Labour – 5, Business – 6, Caste based occupation – 7, Homemaker – 8, Student – 9, Other (Specify) – 10)
1				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
2				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
3				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
4				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
5				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
6				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
7				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
8				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
9				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
10				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10
11				1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10

Note: Give details of only those members who stay in the village most of their time, or of those who keep frequenting the village even if for a short time as their family is residing in the village.

Awareness about the programme

11. Are you aware of the Uttaranchal Decentralised Watershed Development Project (UDWDP)/Gramya being implemented in your village?
(Code: Yes – 1, No – 2)

12. If yes, from whom did you get to know of it? (Circle all the appropriate sources)

Source	Code
a) Panchayat members	1
b) WMD Official/Gramya/MDT	2
c) Field NGO	3
d) Water and Watershed Committee	4
e) SHG/UG/RVC members	5
f) Friends/family members/relatives	6
g) Village motivator	7
h) Any other (Specify)	8

13. Do you know the objectives of the programme „Gramya" being implemented by the Watershed Management Directorate (WMD)?
(Code: Yes – 1, No – 2)

14. If yes, which of the following objectives are you aware of? (Circle all the appropriate answers)

	Objectives	**Code**
a)	Conservation, development and equitable distribution of natural resources	1
b)	Enhancing productivity of agriculture, horticulture and livestock	2
c)	Enhancing livelihood opportunities for women and vulnerable groups	3
d)	Institutional sustainability and social safeguards	4
e)	Skill enhancement and capacity building of women and vulnerable groups	5
f)	Improving the administrative capacity of Gram Panchayats	6
g)	Enhancing skills and knowledge for income generation	7
h)	Facilitating marketing of the products of the village community	8

15. Do you know about Gram Panchayat Watershed Development Plan (GDWDP)?
(Code: Yes – 1, No – 2)

16. If yes, out of the following what do you know about it? (Circle all the appropriate answers)

	Description	**Code**
a)	It is a project prepared for watershed development at the Gram Panchayat level	1
b)	It includes all activities that fall under watershed development	2
c)	It is an integrated development programme at the Gram Panchayat level	3
d)	It is a programme for conservation and development of natural resources, which is also aimed at the upliftment of women and vulnerable groups	4

17. Has any of your family members participated in the preparation of Gram Panchayat Watershed Development Plan (GPWDP)?
(Code: Yes – 1, No – 2)

18. If yes, give the following details:

Member	**Participation in planning (Number)**	**Participation in execution (Number)**	**Participation in planning and execution (Number)**
a) Male			
b) Female			

Note: In the questions that follow responses that are needed pertain both to the time before the project and the present. This information is important and necessary for the mid-term evaluation of the programme. The surveyor has to be very careful while trying to obtain the information for these questions so that the responses may be useful for the mid-term assessment. In case the respondent is not aware of the project and its activities, the surveyor has to seek answers for a 'before' scenario by giving reference of the year when project was started in the village.

19. Do you get information about the annual budget and expenditure of your Gram Panchayat? (Circle the appropriate)

Before the project started	At present
Code: Yes – 1, No – 2	Code: Yes – 1, No – 2

Agriculture

20. Please give the following details about your agricultural landholding:

Land holdings (in *Nalis*)	Before the project started				At present			
	Irrigated	Unirrigated	Barren	Total	Irrigated	Unirrigated	Barren	Total
a. Land owned								
b. Land leased in								
c. Land leased out								
d. Total operational landholdings (a+ b-c)								

21. Classification according to landholding (Circle the appropriate)

	Category	Code
a)	Landless	1
b)	Upto 0.2 ha or 10 *nalis*	2
c)	0.2 to 0.4 ha or 10 to 20 *nalis*	3
d)	0.4 to 0.6 ha or 20 to 30 *nalis*	4
e)	0.6 to 1 ha or 30 to 50 *nalis*	5
f)	More than 1 ha or 50 *nalis*	6

22. List and give details of the main improved variety crops that you grow:

a) Agricultural crops	**Area cultivated (in *Nalis*)**		**Yield (quintals/*Nali*)**	
	Before the project started	**At present**	**Before the project started**	**At present**
Paddy				
Wheat				
Mandua (Millets)				
Barley				
Chaulai (Amaranthus)				
Gahet (Pulse)				
Soyabean				
Rajmah (Pulse)				
Other (Specify)				
Vegetables				
b) Medicinal plants				
c) Floriculture				
d) Fodder species				

Note: The crops that are being cultivated along with the main crops (that is mixed cropping), the area of cultivation for those should be taken as the area in which such mixed cropping is being done. Also, specify in the table when such mixed cropping is being done.

23. List and give details of the main improved variety of horticulture crops that you grow:

Horticulture crops	Before the project started		At present	
	Number	Area (in *Nalis)*	Number	Area (in *Nalis)*

Note: Mention either the number or the area planted. The number of plants may be noted in cases where the plantation has not been done as an orchard, but planted in a scattered manner in small numbers in agricultural field or on homestead.

24. Details of land use practices and inputs:

Land use pattern	Before the project started	At present
a) Crop rotation (irrigated)		
b) Crop rotation (unirrigated)		
c) Type of fertilizer used for main crops	**Code: Chemical - 1, FYM - 2, Vermicompost - 3, Others (Specify) - 4**	**Code: Chemical - 1, FYM - 2, Vermicompost - 3, Others (Specify) - 4**
d) Type of pesticide used for main crops	**Code: Chemical - 1, Bio-pesticides - 2, Others (Specify) – 3**	**Code: Chemical - 1, Bio-pesticides - 2, Others (Specify) - 3**
e) Adoption of water saving technology	**Code: Tank - 1, Sprinkler - 2, Irrigation channel - 3, Others (specify) - 4**	**Code: Tank - 1, Sprinkler - 2, Irrigation channel - 3, Others (specify) - 4**
f) Use of improved farm equipment	**Code: Draught power - 1, Improved agri./horti. implements - 2, Small tractor - 3, Thrasher - 4, Chaff cutter - 5, Sprinkler - 6, Others (Specify) - 7**	**Code: Draught power - 1, Improved agri./horti. implements - 2, Small tractor - 3, Thrasher - 4, Chaff cutter - 5, Sprinkler - 6, Others (Specify) - 7**
g) Improved post harvest technology	**Code: Improved drying - 1, Improved grading - 2, Improved packaging - 3, Improved storage - 4, Others (Specify) - 5**	**Code: Improved drying - 1, Improved grading - 2, Improved packaging - 3, Improved storage - 4, Others (Specify) – 5**

25. Has there been any increase in the production and resultant values of the yield of agricultural/horticulture/ floriculture/ cash crops/off season vegetables cultivated with the use of improved practices and inputs?
(Code: Yes – 1, No – 2)

26. If yes, give details:

Crops	Cultivation using traditional practices and inputs		Cultivation using improved practices and inputs	
	Cost price (Rupees/Nali)	Selling price (Rupees/Nali)	Cost price (Rupees/Nali)	Selling price (Rupees/Nali)

Irrigation details

27. What are the available sources of irrigation for your household? (Circle all the appropriate answers)

S.No.	Irrigation source	Before the project started	At present
a)	River/Spring	1	1
b)	Canal/Channel	2	2
c)	Irrigation tank/ pond/ *chal-khal*	3	3
d)	Water harvesting structures	4	4
e)	Pump sets	5	5
f)	Any other (Specify)	6	6
g)	None	7	7

28. Has there been an increase in availability of water for irrigation for your farm due to the project? **(Code: Yes – 1, No – 2)**

29. If yes, then give the increase in area under irrigation or increase in frequency of irrigation owing to the increased availability of water.

Increase in area under irrigation	Area in which frequency of irrigation has increased

30. Do you pay any user charges for irrigation water? **(Code: Yes – 1, No – 2)**

31. If yes, mention the amount paid Rs……../

Livestock details

32. Please give details of the livestock you keep:

S.No.	Livestock	Local breed (Number)		Improved breed (Number)	
		Before the project started	At present	Before the project started	At present
a)	Cow				
b)	Buffalo				
c)	Bull				
d)	Sheep/Goat				
e)	Horse/mule/donkey				
f)	Young stock (of all)				
g)	Others (Specify)				

33. From where do you collect feed and fodder for livestock and how much is the quantity used?

S.No.	Source of livestock feed and fodder	Estimated quantity procured (Quintal/Year)	
		Before the start of the project	At present
a)	Fodder and grasses from your own agricultural/barren land/other land		
b)	Residue (e.g. hay, husk) from your own agricultural land		
c)	Feed produced on own land/purchased from market		
d)	Fodder from civil soyam land		
e)	Fodder from Van Panchayat land		
f)	Fodder from Reserved Forest land		
g)	Any other (Specify)		
	Grazing		
h)	Grazing on civil soyam land (days/year)		
i)	Grazing on forest land (days/year)		
j)	Any other (Specify)		

Note: Please include improved varieties of fodder grass planted under the project.

34. What is the type of fuel you use for cooking and heating purposes? Give usage in percentage (%).

S.No.	Source of fuel for cooking and heating	Before the project started (%)	At present (%)
a)	Fuelwood		
b)	Roots and stems of crops		
c)	Biogas		
d)	Cooking gas		
e)	Kerosene (stove)		
f)	Pine briquettes		
g)	Electricity (heater)		
h)	Solar equipments		
i)	Any other (Specify)		

35. Time taken for collecting fuelwood and fodder (for each round, and the total number of rounds in a year).

Category	Before the project started		At present	
	Per round (Hours)	Total rounds in a year (Number)	Per round (Hours)	Total rounds in a year (Number)
a) Fuelwood				
b) Fodder				

36. Give details of milk production in your household:

Livestock	Milk production (Litres/year)			
	Before the project started		At present	
	Local breeds	Improved breeds	Local breeds	Improved breeds
a) Cow				
b) Buffalo				

37. What are the various animal products that your household gets?

Animal Product	Quantity Produced		Quantity Sold (If any)	
	Before the project started	At present	Before the project started	At present
Milk and milk products (litres or Kgs/year) a) Milk b) Ghee c) d)				
Sale of livestock (Number/year) a) b) c) d)				
Wool (Kg/year)				
Poultry products a) Eggs (Number/ year) b) Hen/Cock (Number/year)				
a) Dung (Quintal/ year) b) Vermi-compost (Quintal/ year)				
Any other (Specify)				

38. Has cattle shed been made under the project for your household?
(Code: Yes –1, No – 2)

39. What are the benefits received by your household under the project for the improvement of the livestock you own? (Circle all the appropriate answers)

	Benefits	**Code**
a)	Construction of cattle shed	1
b)	Construction of manger	2
c)	Supply of chaff cutter	3
d)	Supply of fodder mini kit	4
e)	Availability of veterinary services	5
f)	Facility of NBC	6
g)	Increase in availability of water	7
h)	Fodder grass demonstration	8
i)	Any other (Specify)	9

Drinking water and sanitation

40. What is the main source of drinking water for your household? (Circle the appropriate)

Before the project started	At present
Code: Tap –1, Hand pump - 2, Tank - 3, Spring/river/pond - 4, Any other (Specify) - 5	Code: Tap -1, Hand pump - 2, Tank - 3, Spring/river/pond - 4, Any other (Specify) - 5

41. What is the type of ownership of the source of drinking water? (Circle the appropriate)

Before the project started	At present
Code: Private - 1, Public - 2, Private and public – 3	Code: Private - 1, Public - 2, Private and public – 3

42. How much time in a day do you take to fetch the required water for the household? (Circle the appropriate)

Before the project started		At present	
Summer	Other seasons	Summer	Other seasons
Code: Less than 1 hr – 1, 1 to 2 hrs – 2, 2 to 3 hrs – 3, More than 3 hrs – 4	Code: Less than 1 hr – 1, 1 to 2 hrs – 2, 2 to 3 hrs – 3, More than 3 hrs – 4	Code: Less than 1 hr – 1, 1 to 2 hrs – 2, 2 to 3 hrs – 3, More than 3 hrs – 4	Code: Less than 1 hr – 1, 1 to 2 hrs – 2, 2 to 3 hrs – 3, More than 3 hrs – 4

43. Has the availability of drinking water increased due to project interventions? **(Code: Yes – 1, No – 2)**

44. If yes, by how much? **(Up to 5% – 1, 5% to 10% – 2, More than 10% - 3)**

45. Do you pay any user charges/water cess for domestic water? **(Code: Yes – 1, No – 2)**

46. If yes, what is the amount paid? Rs…….

Extension and marketing

47. How and from where do the members of your household get extension services? (Circle all the appropriate answers)

Source	Before the project started	At present
a) Agriculture/horticulture/forest department	1	1
b) Other government departments	2	2
c) Own experience	3	3
d) Local resource person	4	4
e) Newspaper, radio, television etc.	5	5
f) Private companies/NGOs/Other institutions	6	6
g) Gramya	7	7
h) Village Development Officer	8	8
i) Any other (Specify)	9	9

48. Have you received any facility/support from the project for marketing of your produce? **(Code: Yes – 1, No – 2)**

49. If yes, give details: (Circle the appropriate)

Type of facility/support	Before the project started	At present
a) Direct sale of the produce	1	1
b) Through middlemen	2	2
c) Through local/main markets	3	3
d) Through cooperative societies/SHGs	4	4
e) Through improvement of transportation facility	5	5
f) Linking local institutions/groups to the market	6	6
g) Any other (Specify)	7	7

Participation in beneficiary groups/local institutions

50. Give the number of your household members who have membership to various beneficiary groups/local institutions.

Beneficiary group/Institution	Before the project started	At present
a) Water and Watershed Committee (WWC)	----	
b) Revenue Village Committee (RVC)	----	
c) Farmers' Interest Group (FIG)	----	
d) Vulnerable Group (VG)	----	
e) Self Help Group (SHG)		
f) Van Panchayat		
g) NGOs		
e) Water Users' group		
g) Federation		
h) Any other (Specify)		

51. What are the main benefits received by being part of these groups/institutions?

Benefits	Code
a) Improvement in livelihood of the household	1
b) Provides monetary support during contingencies	2
c) Capacity building	3
d) Better access to services like irrigation, seeds, fertilizers etc.	4
e) Improvement in economic condition of Vulnerable Groups	5
f) Any other (Specify)	6

52. What is the type of participation of your household members in various beneficiary groups/institutions?

Kind of participation	Before the project started	At present
a) Attend meetings	1	1
b) Voice concerns and opinions	2	2
c) Hold administrative positions	3	3
d) Working as project motivator	4	4
e) Undertaking any specific tasks (describe)	5	5
f) Any other (Specify)	6	6

53. What is your impression of the beneficiary groups/institutions in your village? (Circle the appropriate)

Beneficiary group/institution	Before the project started	At present
a) Water and Watershed Committee (WWC)	----	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
b) Revenue Village Committee (RVC)	----	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
c) Farmers' Interest Group (FIG)	----	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
d) Vulnerable Group (VG)	----	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
e) Self Help Group (SHG)	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
f) Van Panchayat	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
g) NGOs	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
e) Water Users' group	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
g) Federation	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**
h) Any other (Specify)	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**	**Code: Satisfactory – 1, Not satisfactory – 2, Don't know – 3**

Credit and indebtedness

54. Have you taken loan for agriculture/other activities?
(Code: Yes – 1, No – 2)

55. Has your household received any relief in timely repayment of loan due to the project activities?
(Code: Yes – 1, No – 2)

56. If yes, give details. (Circle the appropriate)

	Benefit	**Code**
a)	Ease in repayment with increase in income due to project	1
b)	Support due to Income Generation Activity done under the project	2
c)	Any other (Specify)	3

Time allocation of women members of the household

57. List out the number of hours spent daily on the following activities by any adult woman member of your household:

	Activity	Time spent (Hours)	
		Before the project started	At present
a)	Agriculture related		
b)	Other occupations (if any)		
c)	Domestic activities and time taken for personal chores		
d)	Livestock maintenance		
e)	Fuel and fodder collection		
f)	Fetching potable water		
g)	Study/ reading		
h)	Income generation activity / Other smaller tasks		
i)	Leisure/rest time		
j)	Participation in project activities (like participation in meetings)		
k)	Time spent on sleeping		
l)	Any other activity performed on a daily basis (Specify)		
	Total	**24**	**24**

Note: In question No. 10 put a circle against the name of the member, the details of whose daily routine are provided here.

Annual income and expenditure

58. Please describe your household expenditure (in Rupees per year).

Expenditure items	Expenditure (Rupees)	
	Before the project started	At present
a) Household expenditure (Food and beverage)		
1. Food		
2. Clothes		
3. Land revenue		
4. Medicine/health care		
5. Children's education		
6. Electricity, telephone, water, dish T.V. etc.		
7. Transportation		
8. Other household contingencies (Specify)		
9. Loan/Loan interest		
10. Festivals, family functions and rituals		
11. Savings (Including SHGs)		
12. Insurance (Including crop insurance and other kinds of insurance)		
13. Any other (Specify)		
b) Household expenditure on consumer goods		
1.		
2.		
3.		
c) Household farm expenditure (Agriculture+horticulture+ floriculture+medicinal plants+vegetables and cash crops etc.)		
1. Labor		
2. Fertilizers/Manure		
3. Insecticides and pesticides		
4. Seeds		
5. Agricultural equipment		
6. Irrigation		
7. Any other (Specify)		

Expenditure items	Expenditure (Rupees)	
	Before the project started	At present
d) Household expenditure on livestock		
1. Feed and fodder		
2. Health		
3. Any other (Specify)		
Total		

59. Please describe the household sources of cash income (in Rupees per year).

Source of income	Income (Rupees)	
	Before the project started	At present
a) Income from livestock products		
1.		
2.		
3.		
b) Income from livestock sale		
1.		
2.		
3.		
c) Income from sale of farm products (Agriculture+horticulture+ floriculture+medicinal plants+vegetables and cash crops etc.)		
1.		
2.		
3.		
4. Income from land lease		
5. Income from crop sharing		
6. Revenue from rental of farm equipment/machines (like thrasher, sprayer)		
7. Any other (Specify)		

Source of income	Income (Rupees)	
	Before the project started	At present
d) Income from forest products (including NTFP)		
1. Income from sale of fuel wood and fodder		
2.		
3.		
e) Non-farm source of income		
1. Business		
2. Service/pension		
3. Cottage industries		
4. Wage labor		
5. Money received from outside (like through money order etc.)		
6. Support from government schemes		
7. Debt (annual)		
8. Interest on savings		
9. Any other (Specify)		
Total		

60. List the assets of your household (give numbers).

Asset	Before the project started	At present
a) Farm equipment		
1.		
2.		
3.		
Improved farm equipment		
1.		
2.		
3.		
b) Non-farm related commercial equipment		
1. Handloom/power loom/spinning wheel		
2. Sewing machine		
3. Any other (Specify)		
c) Consumer durables		
1. Electric fan		
2. Radio/transistor		
3. Color television/Dish T.V.		
4. Washing machine		
5. Gas stove		
6. Telephone		
7. Mixer-grinder		
8. Mobile (Cell phone)		
9. Refrigerator		
10. Solar equipment		
11. Any other (Specify)		
d) Vehicles		
1. Bicycle		
2. Scooter/motorcycle		
3. Car		
4. Any others (Specify)		

Programme interventions

61. Is your household a beneficiary of any activity that has been undertaken under the project?
(Code: Yes – 1, No – 2)

62. If yes, which is/are the activities from which your household has benefited? (Circle all the appropriate answers)

	Activity	Code
a)	Demonstration on individual/private land	1
b)	Improvement of agricultural land	2
c)	Provision of irrigation facility	3
d)	Provision of fertilizer/manure, seeds, equipment	4
e)	Livestock related activity	5
f)	Horticulture activity	6
g)	Construction of cattle shed	7
h)	Participation in SHG	8
i)	Income Generation Activity for Vulnerable Group	9
j)	Livelihood related activity	10
k)	Any other (Specify)	11

63. Give details of the amount of cash benefit/s and amount of beneficiary contribution (cash/labour) in the above activities.

Activity (of which the household is a beneficiary)	Amount received in cash from the project (in Rs.)	Beneficiary contribution (in Rs)	
		Cash	Labour

64. Have you or any of your household members received any training under the project?
(Code: Yes – 1, No – 2)

65. If yes, give details:

Subject of training	Number of household members who participated	Duration of training (starting from and to)

66. What suggestions do you have to make the project more successful?

.....

.....

.....

.....

67. Are the women members of your household receiving any special benefits under the project?
(Code: Yes – 1, No – 2)

68. If yes, what are the benefits? (Circle all the appropriate answers)

	Benefit	**Code**
a)	Training and capacity building	1
b)	Agricultural extension	2
c)	Loan related	3
d)	Livestock related	4
e)	Additional Income Generation Activity	5
f)	Participation in SHG	6
g)	Additional employment	7
h)	Better availability of fuelwood and fodder (Reduction in time for collection)	8
i)	Reduction in time to fetch potable water	9
j)	Any other (Specify)	10

69. Has there been an increase in the income of the women members of the household due to the project activities?
(Code: Yes – 1, No – 2)

70. If yes, give details of increase in income (in Rupees).

Activity	Increase in income
a)	
b)	
c)	
d)	

71. If your household belongs to a Vulnerable Group, have you received any support in income generation? **(Code: Yes – 1, No – 2)**

72. If yes, give details.

Name of Income Generation Activity	Amount of financial aid (Rupees)
a)	
b)	
c)	
d)	

Surveyed by (Name and signature) Checked by (Name and signature)

Consultancy for Baseline Survey and Mid-Term Impact Evaluation of Uttaranchal Decentralised Watershed Development Project

Village level questionnaire

Questionnaire identification form no. ☐☐☐☐☐☐☐☐

Revenue Village: _____Gram Panchayat: _____Micro-watershed: _____

Block: _____ District: _____

GPS location of the village (center of the village):

North: _____ East: _____ Height above sea level (in feet): _____

Date of Interview: _____

Name of the surveyor: _____ Signature: _____

Name of the supervisor: _____ Signature: _____

Instructions:

- Please use code wherever indicated. Circle 'O'the appropriate code that corresponds to the given response

Village demography

1. Total population: _____
2. Gender composition of village population:

Male Pop.	Female Pop.

3. Total no. of households: _____

4. Village population composition by caste, religion and project identified groups:

	Caste				Religion			Groups identified under the project	
	SC	ST	OBC	General	Hindu	Muslim	Others	Vulnerable Groups	Transhumant Groups
Population									
Households									

5. Occupational structure:
   Divide the entire village population according to occupations.

S.No.	Occupation	No. of village members
a)	Agriculture	
b)	Service	
c)	Ex-service	
d)	Retired from other services	
e)	Wage labour	
f)	Business	
g)	Caste based occupation (Specify)	
h)	Homemaker	
i)	Student	
j)	Any other (Specify)	
	Total	

Note: Children below 5 years of age or old people may be included in the category 'Any other'.

Land use

6. Total area of the village (Hectares):

S.No.	Type of land	Area (Hectares)	
		Before the project started	At present
a)	Cultivated- Irrigated		
b)	Cultivated-Unirrigated		
c)	Horticulture land		
d)	Culturable wasteland		
e)	Barren agricultural land		
f)	Civil soyam land/*Khatvan*		
g)	Van Panchayat		
h)	Reserved forest		
i)	Other (Specify)		
	Total		

7. Classification of land holdings:

S.No.	Land category	No. of households
a)	Landless	
b)	Upto 0.2 ha/10 *nalis*	
c)	0.2 to 0.4 ha/10 to 20 *nalis*	
d)	0.4 to 0.6 ha/20 to 30 *nalis*	
e)	0.6 to 1.0 ha/30 to 50 *nalis*	
f)	Above 1.0 ha/50 *nalis*	

8. Number of absentee farmers in the village:

Before the project started	At present

Agriculture

9. Give the main improved variety crops grown in the village:

Crops	**Area (*Nalis*)**		**Yield (Quintals/*Nali*)**	
	Before the project started	**At present**	**Before the project started**	**At present**
a) Agriculture				
1. Paddy				
2. Wheat				
3. Mandua (Millets)				
4. Barley				
5. Chaulai (Amaranthus)				
6. *Gahet* (Pulse)				
7. Soyabean				
8. *Rajmah* (Pulse)				
9. Other (Specify)				
b) Medicinal plants				
c) Floriculture				

Note: The crops that are being cultivated along with the main crops (that is mixed cropping), the area of cultivation for those should be taken as the area in which such mixed cropping is being done. Also, specify in the table when such mixed cropping is being done.

10. Give the improved varieties of vegetables and horticulture crops grown in the village:

Vegetables/Horticulture crops	Before the project started		At present	
	Number	Area (*Nalis*)	Number	Area (*Nalis*)

Note: Mention either the number or the area planted. The number of plants may be noted in cases where the plantation has not been done as an orchard, but planted in a scattered manner in small numbers in agricultural field or on homestead.

11. What is the cropping pattern in the village?

Before the project started	At present

12. What is the area under organic farming (including vermicompost) in the village?

Area under organic farming (*Nalis*)	
Before the project started	At present

13. Give the number of farmers adopting improved farming techniques in the village:

Improved technique/improved input	No. of farmers who have adopted the improved technique/input	
	Before the project started	At present
a) Improved agricultural inputs		
1. Improved seeds		
2. Organic manure		
3. Bio-pesticides		
4. Land improvement		
5. Compost pit		
6.		
7.		
b) Vegetables/Cash crops/Off season vegetables		
1. Improved seeds		
2. Poly house		
3. Poly tunnel		
4.		
5.		
6.		
c) Horticulture		
1. Improved variety plants		
2. Horticulture mini-kits		
3. Homestead plantation		
4. Irrigation tank		
5.		
6.		
d) Floriculture		
1. Improved seeds/plants/bulbs		
2. Poly house		
3. Poly tunnel		
4. Irrigation tank		
5.		
6.		
e) Medicinal plants		
1. Seeds/plants		
2.		
3.		
4.		
5.		
6.		

14. Farm wages:

	Farm wage rate (Rupees per day)			
	Before the project started		At present	
	Govt. Schemes rate	Private rate	Govt. Schemes rate	Private rate
Male				
Female				

Irrigation

15. Give the sources of irrigation in the village:

S.No.	Irrigation source	Area irrigated (Nali)	
		Before the project started	At present
a)	River/Spring		
b)	Canal/Channel		
c)	Tank/pond/*Chal-khal*		
d)	Water harvesting structures		
e)	Pump sets		
f)	Any other (Specify)		

16. Give details of Water Users' groups in the village:

Name of Water Users' group	Nature of activity	Date of formation	Current functioning status
			Code: Defunct-1, Inactive – 2, Moderately active - 3, Active – 4
			Code: Defunct-1, Inactive – 2, Moderately active - 3, Active – 4
			Code: Defunct-1, Inactive – 2, Moderately active - 3, Active – 4
			Code: Defunct-1, Inactive – 2, Moderately active - 3, Active – 4

17. Are there disputes related to water sharing? If yes, give details in the table below.

Nature of dispute	Parties/persons/groups involved	Mechanism to resolve

Drinking water

18. Give the sources of drinking water in the village and availability:

S.No.	Sources of drinking water	Has availability of water increased after project intervention?
a)	Tap water	**Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4**
b)	Hand pump	**Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4**
c)	Tank	**Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4**
d)	Spring/ river/ pond	**Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4**
e)	Others (Specify)	**Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4**
		Code: No increase – 1, Up to 5% - 2, 5% to 10% - 3, Above 10% - 4

Afforestation

19. Give details of afforestation in the village during the last five years.

Name of the afforestation project	**Type of land (Circle the appropriate) (Code: Civil soyam land – 1, Van Panchayat – 2, Reserved forest – 3, Other (Specify) - 4)**	**Year of plantation**	**Area under plantation (Hectares)**	**No. of seedlings planted (with names of main species)**	**Survival percentage (Average)**	**Present grass/fodder production (Quintals/Ha)**	**Present fuelwood production (Quintals/Ha)**	**Management /Institutional mechanism**
a) Forest department project	1 2 3 4							
b) Gramya project	1 2 3 4							
c) Bio-carbon project	1 2 3 4							
d) Any other (specify)	1 2 3 4							

Fuelwood and fodder production

20. Give details of fuelwood and fodder production in the village.

S.No.	Type of land	Fuelwood production (Quintal/Ha)		Fodder production (Quintals/Ha)		Management/Institutional mechanism
		Before the project started	At present	Before the project started	At present	
a)	Cultivated- Irrigated					
b)	Cultivated-Unirrigated					
c)	Horticulture land					
d)	Culturable wasteland					
e)	Barren agricultural land					
f)	Civil soyam land/*Khatvan*					
g)	Van Panchayat					
h)	Reserved forest					
i)	Other (Specify)					

Livestock

21. Give the number of livestock in the village:

S.No.	Livestock	Local breed (Number)		Improved breed (Number)	
		Before the project started	At present	Before the project started	At present
a)	Cow				
b)	Buffalo				
c)	Bull				
d)	Sheep/Goat				
e)	Horse/mule/donkey				
f)	Young stock (of all)				
g)	Other (Specify)				

Health

22. Incidence of prevalent diseases among village members:

S.No.	Disease	No. of cases per year	
		Before the project started	At present
a)	Anaemia		
b)	Worm infestation		
c)	Tuberculosis		
d)	Women/children related ailments		
e)	Other (Specify)		

Enterprises/Income Generation Activities

23. Give details of enterprises/income generation activities (IGAs) in the village:

S.No.	Name of Enterprise/IGA	Date of Starting	Nature of activity	No. of persons engaged	Whether functioning at present
a)	Dairy				**Code: Yes – 1, No - 2**
b)	Medicinal plant processing				**Code: Yes – 1, No – 2**
c)	NTFP collection				**Code: Yes – 1, No – 2**
d)	Food processing/preservation				**Code: Yes – 1, No – 2**
e)	Pickle making				**Code: Yes – 1, No – 2**
f)	Handicrafts				**Code: Yes – 1, No – 2**
g)	Sewing/knitting/embroidery				**Code: Yes – 1, No – 2**
h)	Other (Specify)				**Code: Yes – 1, No – 2**

Market facility

24. Give the increase in value of products due to adoption of improved technology for grading, storage, processing and developing market facility under the project.

S.No	Item	Put a tick mark '√' against the improved technology adopted			Selling price	
		Grading	Storage and processing	Marketing	Before adoption of the improved technology	After adoption of the improved technology
a)	**Agriculture**					
	1. Paddy					
	2. Wheat					
	3. *Mandua* (Millet)					
	4.					
	5.					
b)	**Horticulture**					
	1. Mango					
	2. Apple					
	3. Orange					
	4.					
	5.					
c)	**Milk products**					
	1. Ghee					
	2. Cottage cheese					
	3. *Khoya*					
	4.					
d)	**Animal products**					
	1. Milk					
	2. Poultry					
	3. Eggs					
	4. Meat (goat and sheep)					
e)	**Fish**					
	1. Fish					
	2. Fingerlings					
	3.					
f)	**Handicrafts**					
	1. Baskets					
	2. Carpets					
	3.					
	4.					
	5.					

S.No	Item	Put a tick mark '√' against the improved technology adopted			Selling price	
		Grading	Storage and processing	Marketing	Before adoption of the improved technology	After adoption of the improved technology
g)	**Traditional occupation like blacksmith etc.**					
	1. Iron implements					
	2. Wood products					
	3.					
	4.					
	5.					
h)	**Nursery**					
	1. Plants					
	2.					
i)	**NTFP collection and selling like medicinal plants**					
	1.					
	2.					
	3.					
	4.					
j)	**Resin collection**					
k)	**Pine needle briquette making**					
l)	**Others, specify**					
	1.					
	2.					
	3.					
	4.					

New marketing strategies

25. Have any new marketing strategies been undertaken under the project? **(Code: Yes–1, No–2)**

26. If yes, give details:

S.No.	Name of marketing strategy	Product	Selling price (Rupees)	
			Before the project started	At present
a)	Starting periodical *haats*			
b)	Linking SHGs/VGs to market			
c)	Establishing cooperative societies			
d)	Other (Specify)			

Access to credit

27. Give the number of households that have access to credit/loan:

S.No.	Activities requiring credit	Before the project started		At present	
		Formal	Informal	Formal	Informal
a)	Income Generation Activities				
b)	Special functions (marriage etc.)				
c)	Cash crop farming				
d)	Fertilizer and pesticides				
e)	Purchase of improved variety seeds				
f)	Improvement of agricultural land				
g)	Purchase of farm machinery and equipment				
h)	Land purchase				
i)	Livestock purchase/treatment				
j)	Others (Specify)				

Common property resources

28. Give details of access to common property resources

S.No.	Common property resource	Benefit - sharing mechanism (Circle the appropriate) Code: No sharing – 1, Equal sharing between all households – 2, Unequal sharing – 3, Any other (Specify) - 4
a)	Civil-soyam land	1 2 3 4
b)	Van Panchayat	1 2 3 4
c)	Reserved Forests	1 2 3 4
d)	Other land types (Specify)	1 2 3 4
e)	Pond/lake /bawdi etc.	1 2 3 4
f)	Stream/*naula*	1 2 3 4
g)	Other CPR (Specify)	1 2 3 4

Representation and participation of village members in local institutions

29. Number of elected members in the Gram Panchayat from the village:

Elected representatives in the GP from the village	General Caste (Number)	SC (Number)	ST (Number)	OBC (Number)	Total	Other information			
						Women (Any caste)		Vulnerable Group (Any caste)	
						Vulnerable Group	Other	Women	Men
Gram Pradhan									
Ward Members									
Other (Specify)									

Note: If the Gram Pradhan or Ward members are from reserved Gram Panchayat/Ward, please specify.

30. Give the number of village members in the local institutions:

S.No.	Local institution	Number	
		Before the project started	At present
a)	Water and Watershed Committee (WWC)	---------	
b)	Revenue Village Committee (RVC)	---------	
c)	Farmers' Interest Groups (FIGs)	---------	
d)	Vulnerable Groups	---------	
e)	SHGs		
f)	Van Panchayat		
g)	Water Users' Groups		
h)	Federations		
i)	Others (Specify)		

31. Is there any conflict among the village level institutions?
(Code: Yes – 1, No - 2)

32. If yes,

What is the nature of the conflict/s?	How are the conflicts resolved?

33. Awareness of annual budget and expenditure of Gram Panchayat among village members:

S.No.	Description	Response (in Number)
a)	How many village members were aware about the Gram Panchayat annual budget and expenditure before the project started?	
b)	How many village members are aware about the Gram Panchayat annual budget and expenditure at present?	

34. How many households participated in the preparation of GPWDP (Gramya/Watershed programme)?

_____ (Number)

Self Help Groups

35. Details of Self Help Groups formed in the village:

Name of SHG	Date of formation	Nature of activity	No. of members	Current functioning status
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4
				Code: Defunct - 1, Inactive – 2, Moderately active - 3, Active – 4

36. Details of loan repayment by the members of Self Help Groups:

Name of SHG	No. of laonees	Total amount with the SHG (Rupees)	Amount distributed as loan (Rupees)	Amount of loan refunded (Rupees)

37. Have any training programmes been organized under the project for capacity building of the SHG members?
(Code: Yes – 1, No – 2)

38. If yes, give the following details:

Subject of training	No. of members trained	Date of training	Venue	Institution giving training	Effectiveness of the training
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3

Vulnerable Groups

39. Give details of Vulnerable Groups identified in the village:

Name of Vulnerable Group	Date when constituted	No. of members in	Support received under the project (like raw material and equipment etc.)	Financial assistance provided (Rupees)	Income Generation Activity undertaken	Type of linkage with market	Current functioning status
						Code: *Haat* – 1, Direct linkage with market – 2, Through Cooperative Society - 3	Code: Defunct - 1, Moderately active - 2, Active – 3
						Code: *Haat* – 1, Direct linkage with market – 2, Through Cooperative Society – 3	Code: Defunct - 1, Moderately active - 2, Active – 3
						Code: *Haat* – 1, Direct linkage with market – 2, Through Cooperative Society – 3	Code: Defunct - 1, Moderately active - 2, Active – 3
						Code: *Haat* – 1, Direct linkage with market – 2, Through Cooperative Society – 3	Code: Defunct - 1, Moderately active - 2, Active – 3
						Code: *Haat* – 1, Direct linkage with market – 2, Through Cooperative Society - 3	Code: Defunct - 1, Moderately active - 2, Active – 3

40. Are there any bank accounts opened for the VGs?
(Code: Yes – 1, No – 2)

41. If yes, how many VGs have opened bank accounts?

---------- (Number)

42. Have the members of VGs been provided any training for capacity building or skill-enhancement or taken for exposure visits?
(Code: Yes – 1, No – 2)

43. If yes, please give details:

Name of training/exposure visit	No. of members	Duration	Venue	Institution giving training	Effectiveness
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3
					Code: Not effective – 1, Marginally effective – 2, Effective - 3

Transhumant groups

44. Is there any seasonal migration of transhumant groups in the village?
(Code: Yes – 1, No – 2)

45. If yes, give the no. of such groups:

Before the project started		At present	
No. of groups	Total population	No. of groups	Total population

46. Have any activities been undertaken under the project for transhumant groups?
(Code: Yes – 1, No – 2)

47. If yes, what are the activities undertaken under the project for transhumant groups?

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48. Have these activities been beneficial for the transhumant groups?
(Code: Not effective - 1, Marginally effective - 2, Effective - 3)

Programme Interventions

49. Progress of activities identified under GPWDP for the village:

S.No.	Activites identified under the project	Unit	Total target	Total achievement	Effectiveness (Code: Not effective – 1, Marginally effective – 2, Effective - 3)
a)	**Agriculture related**				1 2 3
	1. Repair of risers/farm bunds/grass plantation on bunds	m^3			1 2 3
	2. Compact area demonstration	Hectare			1 2 3
b)	**Horticulture related**				
	1. Orchard development	Hectare			1 2 3
	2. Renovation of orchards	Hectare			1 2 3
	3. Top working of *Mehal* (*Pyrus passia*)	Hectare			1 2 3
	4. Demonstration of seasonal/off-seasonal vegetables	Hectare			1 2 3
	5. Poly house demonstration	Number			1 2 3
	6. Poly tunnel demonstration	Number			1 2 3
	7. Bio/vermi compost demonstration	Number			1 2 3
	8. Demonstration of fruit plantation on community land	Hectare			1 2 3
	9. Homestead plantation	Number			1 2 3
	10. Introduction and demonstration of improved crops of aromatic and medicinal plants	Number			1 2 3
	11. Distribution of mini-kits	Number			1 2 3
c)	**Livestock**				
	1. Breed improvement programme				1 2 3
	a. NBC	Number			1 2 3
	b. Para-vet programme	Number			1 2 3
	2. Health improvement programme				1 2 3
	a. Organisation of animal fairs/camps	Number			1 2 3
	b. Innoculation programme	Number			1 2 3
	c. Castration of bulls	Livestock number			1 2 3
	3. Stall feeding programmes				
	a. Construction of cattle shed	Number			1 2 3
	b. Construction of manger	Number			1 2 3
	c. Chaff cutter distribution	Number			1 2 3
	4. Fodder production programme				
	a. Fodder crop demonstration	Hectare			1 2 3
	b. Grassland development	Hectare			1 2 3
	c. Napier/other fodder grass plantation	1000 running mtrs			1 2 3

S.No.	Activites identified under the project	Unit	Total target	Total achievement	Effectiveness (Code: Not effective – 1, Marginally effective – 2, Effective - 3)
	d. Nursery demonstration	Number			1 2 3
	e. Fodder/grass nursery maintenance	Number			1 2 3
d)	**Afforestation**				
	1. Advance soil work	Hectare			1 2 3
	2. Plantation	Hectare			1 2 3
	3. Silvi-pasture				
	a. Advance soil work	Hectare			1 2 3
	b. Plantation	Hectare			1 2 3
	4. Fuelwood plantation				
	a. Advance soil work	Hectare			1 2 3
	b. Plantation	Hectare			1 2 3
	5. Bamboo/agave plantation				1 2 3
	a. Advance soil work	Hectare			1 2 3
	b. Plantation	Hectare			1 2 3
e)	**Energy conservation**				
	1. Bio-gas plant	Number			1 2 3
f)	**Drainage line treatment and soil conservation**				
	1. Construction of vegetative check dam	Hectare			1 2 3
	2. Construction of dry stone check dam	m^3			1 2 3
	3. Construction of crate-wire check dam	m^3			1 2 3
	4. Land slide treatment	Hectare			1 2 3
g)	**On-farm activities**				
	1. Vegetative treatment	Hectare			1 2 3
	2. Construction of spurs	m^3			1 2 3
	3. River bank protection	m^3			1 2 3
	4.Construction of cross-barriers	m^3			1 2 3
	5. 1:6 CC mortar work	m^3			1 2 3
h)	**Water harvesting**				
	1. *Gul*/channel construction for irrigation	Kms			1 2 3
	2. Irrigation tank	Number			1 2 3
	3. Roof harvesting tank	Number			1 2 3
	4. Village pond	Number			1 2 3
	5. Construction/repair of wells	Number			1 2 3
	6. Potable water supply pipeline	Kms			1 2 3
	7. Rejuvenation of pond/*naula*/*khala*	Number			1 2 3
i)	**Road construction programme**				
	1. Improvement of village roads	Kms			1 2 3
	2. Construction of bridges	Number			1 2 3

50. Are the suggested activities of the project compatible with indigenous practices? **(Code: Yes – 1, No – 2)**

51. If no, state the activities of Gramya that in your opinion are not compatible with indigenous practices?

1. _____
2. _____
3. _____
4. _____

52. Mention the problems faced by the community during implementation of various interventions of Gramya.

1. _____
2. _____
3. _____
4. _____

53. Any suggestions for improvement of the programme?

1. _____
2. _____
3. _____
4. _____

Surveyed by (Name and signature) Checked by (Name and signature)

उत्तराखण्ड विकेन्द्रीकृत जलागम प्रबन्धन परियोजना (ग्राम्या) के प्रभावो का अंतिम रूप से आंकलन करने के लिए परामर्श सेवा

अतिरिक्त प्रश्न परिवार स्तरीय

प्रश्नावली चिन्हीकरण प्रपत्र संख्या : .....

परिवार के मुखिया का नाम : .....पुत्र/पुत्री : .....

(प्रश्न 22 का सन्दर्भ लें।)

सलंग्नक 1 – मुख्य बोई/ उगाई जाने वाली उन्नत किस्म की कृषि फसलों का विवरण दे।

फसलें	**क्षेत्रफल (नाली)**				**औषत उत्पादन (कुं0/नाली)**			
	परियोजना के आरम्भ से पूर्व		**अंतिम आंकलन के समय**		**परियोजना के आरम्भ से पूर्व**		**अंतिम आंकलन के समय**	
	सिंचित	**असिंचित**	**सिंचित**	**असिंचित**	**सिंचित**	**असिंचित**	**सिंचित**	**असिंचित**
(अ)**कृषि फसलें**								
धान								
गेहूं								
मडुवा								
मक्का								
तोडिया,								
मसूर,सरसों								
गहत								
सोयाबीन								
राजमा								
अन्य (विवरण दें)								
(अ) मिश्रित								
(ब) शुद्व								
(आ) **सब्जियां**								
आलू								
मटर								
टमाटर								
फूलगोभी								
बंदगोभी								
शिमलामिर्च								
फासबीन								
अदरक								
अन्य								
(ब)**औषधीय पौधे**								
अस्वगंधा								
सतावरी								
चिरायता								
गिलोय								

फसलें	क्षेत्रफल (नाली)				औषत उत्पादन (कुं0/नाली)			
	परियोजना के आरम्भ से पूर्व		अंतिम आंकलन के समय		परियोजना के आरम्भ से पूर्व		अंतिम आंकलन के समय	
	सिंचित	असिंचित	सिंचित	असिंचित	सिंचित	असिंचित	सिंचित	असिंचित
मीठीतुलसी								
(स) पुष्प खेती								
(द) चाराघास								
हाइब्रिड नेपियर								
जई								
बरसीन								
अन्य किस्में								

नोटः– जो फसलें किसी मुख्य फसल के साथ मिश्रित रूप में उगाई जाती है उसका क्षेत्रफल मुख्य फसल के उस क्षेत्रफल के बराबर माना जाएगा जितने मे वह मिश्रित रूप से उगाई गई है।

सलंग्नक 2 – परियोजना के कार्यकलाप जिन से आपके परिवार को प्रत्यक्ष लाभ हुआ हो उसका विवरण निम्न प्रकार दें?

(प्रश्न 61 व 62 का सन्दर्भ लें।)

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
अ	**कृषि सम्बन्धी कार्य**					
	1. पुस्ता मरम्मत/खेतों की मेंड पर घासरोपण	क्यूबिक मी0				
	2. कम्पैक्ट एरिया प्रदर्शन	हैक्टर				
ब	**उद्यान सम्बन्धी कार्य**					
	1. उद्यान विकास कार्यक्रम	हैक्टर				
	2. उद्यानों का जीर्णोद्धार	हैक्टर				
	3. मेहल टॉप वर्किंग	हैक्टर				
	4. मौसमी /गैर मौसमी सब्जियों का प्रदर्शन	हैक्टर				
	5. पॉली हाउस प्रदर्शन	संख्या				
	6. पॉली टनल प्रदर्शन	संख्या				
	7. बायो/वर्मी कम्पोस्ट प्रदर्शन	संख्या				
	8. सामूहिक क्षेत्र में फलों के पेड़ों के रोपण का प्रदर्शन	हैक्टर				
	9. घरबाड़ी कार्यक्रम	संख्या				
	10. उन्नत फसलों और औषधीय एवं सुगधिंत पौधो का प्रदर्शन एवं उनका इन्ट्रोडक्शन	संख्या				

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
	11. मिनीकिट वितरण	संख्या				
स	**पशुपालन**					
	1. **नस्ल सुधार कार्यक्रम**					
	अ. प्राकृतिक प्रजनन केन्द्र	संख्या				
	ब. पैरा वैट कार्यक्रम केन्द्र	संख्या				
	2. **स्वास्थ्य सुधार कार्यक्रम**					
	अ. पशु मेले/कैम्प का आयोजन	संख्या				
	ब. टीकाकरण कार्यक्रम	संख्या				
	स. साडो का बधियाकरण	पशुधन संख्या				
	3.खूटे पर खिलाने के कार्यक्रम					
	अ. गौशाला निर्माण	संख्या				
	ब. नॉद निर्माण	संख्या				
	स. चैफ कटर वितरण	संख्या				
	3. **चारा उत्पादन कार्यक्रम**					
	अ.चारा फसल प्रदर्शन	हैक्टर				
	ब.चारागाह विकास	हैक्टर				
	स. नेपियर/चाराघास रोपण	1000 रनिंग मी0				
	द. पौधशाला प्रदर्शन	संख्या				
	य. चारा/घास पौधशला रख–रखाव	सख्या				
द	**वनीकरण**					
	1. अग्रिम मृदा कार्य	हैक्टर				
	2. वृक्षारोपण	हैक्टर				
	सिल्वी पास्चर					
	अ. अग्रिम मृदा कार्य	हैक्टर				
	जलौनी लकड़ी हेतु वनीकरण					

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
	अ. अग्रिम मृदा कार्य	हैक्टर				
	ब. वनीकरण	हैक्टर				
	बॉस रोपण/अगेव प्लान्टेशन					
	अ. अग्रिम मृदा कार्य	हैक्टर				
	ब. रोपण/प्लान्टेश्न	हैक्टर				
य	**उर्जा संरक्षण**					
	1. बायो गैस प्लांट	संख्या				
र	**ड्रेनेज लाईन ट्रीटमेंट एवं भूमि संरक्षण**					
	1. वेजिटेटिव चैक डैम का निर्माण	संख्या				
	2. ड्राईस्टोन चैक डैम का निर्माण	मी0क्यूब				
	3. क्रेटवायर चैक डैम का निर्माण	मी0 क्यूब				
	4. लैन्ड स्लाईड ट्रीटमेंट	हैक्टर				
ल	**ऑन फार्म कार्यक्रम**					
	1. वैजिटेटिव ट्रीटमैन्ट	हैक्टर				
	2. स्पर का निर्माण	मी0 क्यूब				
	3. नदी के किनारों की सुरक्षा	मी0 क्यूब				
	4. क्रॉस बेरियर का निर्माण	मी0 क्यूब				
	5. 1:6 सी0सी0 मोर्टार कार्य	मी0 क्यूब				
व	**वाटर हारवेस्टिंग**					
	1. सिचांई हेतु गुल निर्माण	कि0 मी0				
	2. सिंचाई के टैक	संख्या				
	3. रूफटॉप हारवेस्टिंग टैक	संख्या				
	4. ग्रमीण तालाब	संख्या				
	5. कुँए का निर्माण/खोदना/मरम्मत	संख्या				

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
	6. पोर्टबल वाटर सप्लाई पाईप लाईन	कि0 मी0				
	7. तालाब/नौला/खाले का जीर्णोद्धार	संख्या				
श	**सड़क निर्माण कार्यक्रम**					
	1. ग्रामीण सड़को का सुधार	कि0 मी0				
	2. पुल का निर्माण	संख्या				

(प्रश्न 71 व 72 का सन्दर्भ लें।)

सलग्नंक 3 – जो एकल रोजगार परक कार्यक्रम निर्बल वर्ग के व्यकियों के लिए योजना के अन्तर्गत किये गये है उनमें से आपको या आपके परिवार के किसी अन्य सदस्य को निम्न में से कौन से कार्यक्रम में सहायता मिली है। विवरण दे?

क्रं सं	उद्यम का नाम	आरम्भ करने की तिथि	म0/पु0	प्राप्तसहायता राशि(रू0में)/उपकरण	वर्तमान स्थिति सकेंतः चालू 1 मृत 2	लाभ की स्थिति सकेंतः– लाभकारी – 1 अलाभकारी – 2	यदि लाभकारी तो वर्षिक लाभ रू0 में।
1	बैंण्ड						
2	बेकरी						
3	नाई						
4	मधुमक्खीपालन						
5	लोहार गिरी						
6	बढ़ई गिरी						
7	चर्मकार का काम						
8	दुग्ध उत्पादन						
9	रेशाकार्य (बांस, रिंगाल, भीमल)						
10	मत्स्य पालन						
11	फल संरक्षण						
12	घराट						
13	बकरी पालन						
14	प्रा.प्रजनन हेतु, नर बकरी, घोड़ा आदि						
15	मिस्त्री गिरी						
16	दाई						
17	पौधशाला						
18	बेमौसमी सब्जी, फसल उत्पादन						
19	प्लम्बर						
20	मुर्गी पालन						

क्रं सं	उद्यम का नाम	आरम्भ करने की तिथि	म0/पु0	प्राप्तसहायता राशि(रू0में)/उपकरण	वर्तमान स्थिति सकेंतः चालू 1 मृत 2	लाभ की स्थिति सकेंतः– लाभकारी – 1 अलाभकारी – 2	यदि लाभकारी तो वर्षिक लाभ रू0 में।
21	विभिन्न प्रकार की दुकानें						
22	आटा/मसाले पीसने की मशीन						
23	पौटरी/मूर्ति निर्माण						
24	सिलाई कढ़ाई						
25	टेन्ट हाउस						
26	टिन का कार्य						
27	वाटर पंप						
28	बुनाई–कढ़ाई						

नोटः– जो गतिविधिया लागू हो उसकी वर्तमान स्थिति अंतिम कॉलम के अनुसार अलग–अलग आय अर्जक गतिविधियों के लिए अंकित की जाए।

अ0 प्रश्न 1 :– क्या आपके परिवार को चीड़ पत्ती से बने कोयले को प्रयोग में लाने के लिए कोई स्टोव मिला है?
(सकेंत हां–1 नही–2)

अ0 प्रश्न 2:– यदि हां तो निम्न विवरण दें।

1. उक्त को माह में कितने दिन उपयोग में लेते हैं .....
2. कोयला कंहा से प्राप्त करते है। .....
3. अब तक कितना कोयला इस्तेमाल कर चुके है। .....कु0 में।
4. कोयला किस प्रयोजन हेतु उपयोग किया गया। .....

उत्तराखण्ड विकेन्द्रीकृत जलागम प्रबन्धन परियोजना (ग्राम्या) के प्रभावो का अंतिम रूप से आंकलन करने के लिए परामर्श सेवा

अतिरिक्त प्रश्न ग्राम स्तर

प्रश्नावली सूचकांक फार्म संख्या : .....

राजस्व ग्राम : ..... ग्राम पंचायत : .....सूक्ष्म जलागम : .....

(सन्दर्भ प्रश्न 23 देखें)

सलंग्नक–1:– ग्राम के रोजगार परक कार्यो जो निर्बल वर्ग समूहों द्वारा योजना के अन्तर्गत किए गए का विवरण दें।

क्रं सं	उद्यम का नाम	प्रारम्भ तिथि	कार्यरत व्यक्ति		प्राप्तसहायता राशि(रू0में)/उपकरण	वर्तमान स्थिति (सकेंतः– चालू – 1 मृत – 2)	लाभ की स्थिति (सकेंतः– लाभकारी – 1, अलाभकारी – 2)	यदि लाभकारी तो वर्षिक लाभ .रू0 में।
			म0	पु0				
1	बकरी							
2	बैण्ड़							
3	मधुमक्खी पालन							
4	लोहार गिरी							
5	मोमबत्ती बनाना							
6	बढ़ई गिरी							
7	केटरिंग							
8	सांस्कृतिक कार्यक्रम							
9	चर्मकार का कार्य							
10	दुग्ध विकास							
11	रेशाकार्य–रिंगाल, भीमल आदि							
12	फल संरक्षण							
13	बकरी पालन							
14	घोड़ा (व्यवसाय)							
15	झगोरा एवं आटा मिल							
16	मिस्त्री गिरी							

क्रं सं	उद्यम का नाम	प्रारम्भ तिथि	कार्यरत व्यक्ति		प्राप्तसहायता राशि(रू0में)/उपकरण	वर्तमान स्थिति (सकेंतः– चालू – 1 मृत – 2)	लाभ की स्थिति (सकेंतः– लाभकारी – 1, अलाभकारी – 2)	यदि लाभकारी तो वर्षिक लाभ .रू0 में।
			म0	पु0				
17	एक्सपेलर(तेल निकालना)							
18	ग्रेडिंग व पैकिंग							
19	मुर्गी पालन							
20	पौट्री (बर्तन बनाना)							
21	सौदर्य प्रसाधन							
22	सोयाबीन प्रसंस्करण							
23	बेमौसमी सब्जी उत्पादन							
24	सिलाई कढ़ाई							
25	टेन्ट हाउस							
26	केशर मशीन							
27	यात्री लाज							
28	बुनाई – कढ़ाइ							
29	मुर्गी पालन							

नोटः– जो गतिविधियां लागू हो उसकी वर्तमान स्थिति अंतिम कॉलम के अनुसार अलग–अलग आय अर्जक गतिविधियों के लिए अंकित की जाए।

(सन्दर्भ पूर्व प्रश्न सख्यां 24)

सलंग्नक–2:– परियोजना के अन्तर्गत उत्पाद की मूल्य वृद्वि (जैसे ग्रेडिंग, पैकेजिंग, प्रोसेसिंग आदि) से सम्बन्धित कार्यकलाप

क.सं	उत्पाद का नाम	कियाकलाप	मात्रा (मूल्य वृद्वि कियाकलाप के बाद)	प्रोसेसिंग केन्द्र या स्थान का नाम	ट्रेड मार्क (यदि कोई हो।)	विक्रय मूल्य	
						प्रोसेसिंग से पूर्व	प्रोसेसिंग के बाद
अ	**सब्जी** 1. टमाटर 2. बन्दगोभी 3. आलू 4. हरी मिर्च/ शिमला मिर्च 5. अन्य (नाम)						
ब	**फल** 1. आम 2. सेब 3. आडू 4. माल्टा/नांरगी 5. कागजी 6. अन्य (सब्जी)						

क.सं	उत्पाद का नाम	कियाकलाप	मात्रा (मूल्य वृद्वि कियाकलाप के बाद)	प्रोसेसिंग केन्द्र या स्थान का नाम	ट्रेड मार्क (यदि कोई हो।)	विक्रय मूल्य	
						प्रोसेसिंग से पूर्व	प्रोसेसिंग के बाद
स	**मसाले** 1. धनिया 2. हल्दी 3. मिर्च (लाल) 4. अन्य (नाम)						
द	**अनाज** 1. मक्का 2. अन्य (नाम)						
य	**दालें** 1. सोयाबीन 2. अन्य (नाम)						
र	**मिलेट** 1. बाजरा 2. झगोरा 3. काकून 4. मंडुवा 5. अन्य (नाम)						
ल	**अन्य** 1. बुरांश 2. अन्य (नाम)						

(सन्दर्भ पूर्व प्रश्न सख्यां 25 व 26)

सलंग्नकः–3–. ग्राम्या परियोजना के कियान्वयन के फलस्वरूप ग्राम में तैयार उन्नत किस्म के ताजे/ प्रोसेस्ड कृषि/ उद्यान उत्पादों का उचित मूल्य प्राप्त करने के लिए डी.एस.ए या एफ. आई. जी. आदि के माध्यम से बाजार से जो सम्बन्ध स्थापित हुए है उनका विवरण दिया जाए।

क्रं सं.	संस्था जिससे सम्बन्ध स्थापित हुए	किसके माध्यम से सम्बन्ध बने	उत्पाद का नाम	मात्रा	मूल्य
1.	मदर डेरी				
2.	आढ़ती (विवरण दें)				
3.	हिमालयन ट्रेडिंग कम्पनी अल्मोंडा				
4.	जियो फ्रेश गुजरात				
5.	जी.एम.बी.एन.				
6.	आरगेनिक बोर्ड देहरादून				
7.	एस. ओ.एस. अल्मोड़ा				
8.	मेले/ शरदोत्सव (विवरण सहित)				
9.	स्थानीय हाट (नाम दें)				
10.	विक्री केन्द्र/ रिटेल की दुकान (नाम दें)				
11.	अन्य (नाम दें)				

(सन्दर्भ प्रश्न सख्यां 49)

सलग्नक–4 – ग्राम में जी0पी0डब्लू0डी0पी0 (ग्राम्या) के अनुसार चिनहित कुल गातिविधियों की समीक्षा का विवरण?

क. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
अ	**कृषि सम्बन्धी कार्य**					
	1. पुस्ता मरम्मत/खेतों की मेंड पर घासरोपण	क्यूबिक मी0				
	2. कम्पैक्ट क्षेत्र प्रदर्शन	हैक्टर				
ब	**उद्यान सम्बन्धी कार्य**					
	1. उद्यान विकास कार्यक्रम	हैक्टर				
	2. उद्यानों का जीर्णोद्धार	हैक्टर				
	3. मेहल टॉप वर्किंग	हैक्टर				
	4. मौसमी /गैर मौसमी सब्जियों का प्रदर्शन	हैक्टर				
	5. पॉली हाउस प्रदर्शन	संख्या				
	6. पॉली टनल प्रदर्शन	संख्या				
	7. बायो/वर्मी कम्पोस्ट प्रदर्शन	संख्या				
	8. सामूहिक क्षेत्र में फलों के पेड़ों के रोपण का प्रदर्शन	हैक्टर				
	9. घरबाड़ी कार्यक्रम	संख्या				
	10. उन्नत फसलों और औषधीय एवं सुगधिंत पौधो का प्रदर्शन एवं उनका इन्ट्रोडक्शन	संख्या				
	11. मिनीकिट वितरण	संख्या				
स	**पशुपालन**					
	1. **नस्ल सुधार कार्यक्रम**					
	अ. प्राकृतिक प्रजनन केन्द्र	संख्या				
	ब. पैरा वैट कार्यक्रम/केन्द्र	संख्या				
	2. **स्वास्थ्य सुधार कार्यक्रम**					
	अ. पशु मेले/कैम्प का आयोजन	संख्या				
	ब. टीकाकरण कार्यक्रम	संख्या				
	स. सांडो का बधियाकरण	पशुधन संख्या				
	3.खूटे पर खिलाने के कार्यक्रम					
	अ. गौशाला निर्माण	संख्या				
	ब. नॉद निर्माण	संख्या				
	स. चैफ कटर वितरण	संख्या				

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
	3. **चारा उत्पादन कार्यक्रम**					
	अ. चारा फसल प्रदर्शन	हैक्टर				
	ब. चारागाह विकास	हैक्टर				
	स. नेपियर/चाराघास रोपण	1000 रनिंग मी0				
क्र. सं.	**योजना काल हेतु चिन्हित गतिविधियों का नाम**	**ईकाई**				
	द. पौधशाला प्रदर्शन	संख्या				
	य. चारा/घास पौधशला रख–रखाव	सख्या				
द	**वनीकरण**					
	1. अग्रिम मृदा कार्य	हैक्टर				
	2. वृक्षारोपण	हैक्टर				
	सिल्वी पास्चर					
	अ. अग्रिम मृदा कार्य	हैक्टर				
	जलौनी लकड़ी हेतु वनीकरण					
	अ. अग्रिम मृदा कार्य	हैक्टर				
	ब. वनीकरण	हैक्टर				
	बॉस रोपण/अगेव प्लान्टेशन					
	अ. अग्रिम मृदा कार्य	हैक्टर				
	ब. रोपण/प्लान्टेश्न	हैक्टर				
य	**उर्जा संरक्षण**					
	1. बायो गैस प्लांट	संख्या				
र	**ड्रेनेज लाईन ट्रीटमेंट एवं भूमि संरक्षण**					
	1. वेजिटेटिव चैक डैम का निर्माण	संख्या				
	2. ड्राईस्टोन चैक डैम का निर्माण	मी0 क्यूब				
	3. क्रेटवायर चैक डैम का निर्माण	मी0 क्यूब				
	4. लैन्ड स्लाईड ट्रीटमेंट	हैक्टर				
ल	**ऑन फार्म कार्यक्रम**					
	1. वैजिटेटिव ट्रीटमैन्ट	हैक्टर				
	2. स्पर का निर्माण	मी0 क्यूब				
	3. नदी के किनारों की सुरक्षा	मी0 क्यूब				
	4. क्रॉस बेरियर का निर्माण	मी0 क्यूब				
	5. 1:6 सी0सी0 मोर्टार कार्य	मी0 क्यूब				
व	**वाटर हारवेस्टिंग**					
	1. सिचांई हेतु गुल निर्माण	कि0 मी0				
	2. सिंचाई के टैक	संख्या				
	3. रूफटॉप हारवेस्टिंग टैक	संख्या				

क्र. सं.	परियोजना के कार्यकलाप	ईकाई	मात्रा	प्राप्त धनराशि	अंशदान	
					नकद	श्रम
	4. ग्रमीण तालाब	संख्या				
	5. कुँए का निर्माण/खोदना/मरम्मत	संख्या				
	6. पोर्टबल वाटर सप्लाई पाईप लाईन	कि0 मी0				
	7. तालाब/नौला/खाले का जीर्णोद्धार	संख्या				
श	**सड़क निर्माण कार्यकम**					
	1. ग्रामीण सड़को का सुधार	कि0 मी0				
	2. पुल का निर्माण	संख्या				

अतिरिक्त प्रश्न 1 – आपके ग्राम में परियोजना के फलस्वरूप जो उन्नत उत्पाद प्राप्त हो रहे है उनके बारे में निम्न जानकारी दें।

क्रं सं	परियोजना से प्राप्त सुविधा का प्रकार	किसानों की सख्यां	उत्पाद का नाम	उत्पाद की मात्रा	उत्पाद का मूल्य
1.	बजार सुविधा के लिए मौका				
2	प्राइवेट सेक्टर उद्योगियो से सम्बन्ध				
3.	उत्पाद बढ़ाने हेतु आवश्यक सूचना व तकनीक उपलब्ध होना				
4.	किसानों को एक बार वित्तीय सहयोग देना				
5.	किसानो के उत्पादों के भण्डारण, प्रोसेसिंग व व्यापार के लिए संसाधन जुटाने हेतु व्यक्तिगत उद्यमियों को एक बार वित्तीय सहयोग देना				
6.	उत्पादों की मूल्य वृद्वि, व्यापार व बाजार से सम्बन्ध स्थापित करने हेतु किसी विषेषज्ञ/एजेन्सी द्वारा किसी प्रकार की सेवा या सुविधा प्राप्त होना				
7.	अन्य (विवरण सहित)				

अ0 प्रश्न 2 – ग्राम्या परियोजना की गांव में व्यय की गई कुल धनराशि में से कितनी राशि निर्बल वर्गों, भूमिहीनों तथा अनुसूचित जाति/जनजाति के लिये किये गए कार्यो पर व्यय की गई? अलग–अलग विवरण निम्न प्रकार दें।

व्यय की गई कुल धनराशि (रू0)				
सामुहिक संसाधनों पर	**व्यक्तिगत संसाधनों पर**	**निर्बल वर्गों के लिए किए कार्यों पर**	**भूमिहीनों के लिए किए गए कार्यों पर**	**अनुसूचित जाति / जनजाति के लिए किए गए कार्यों पर**

अ0 प्रश्न 3 – आपके गांव में चीड़पत्ती से कोयला बनाने की विधि बताने के लिए क्या कोई प्रदशर्न किया गया हैं? (सकेंत हां–1 नही–2)

अ0 प्रश्न 4 – यदि हां तो निम्न विवरण दें।

प्रदर्शन की तिथि	स्थान	भाग लेने वाले ग्रामवसियों की संख्या		निर्मित कोयले की मात्रा (कुन्तल)	उपयोग		बिक्री से प्राप्त धनराशि (रू0 में)
		पुरूष	महिला		गांव में	गांव से बाहर	

अ0 प्रश्न 5 – क्या आपके गांव में चीड की पत्ती से कोयला बनाने का कार्य किया जा रहा है? (सकेंत हां–1 नहीं–2)

अ0 प्रश्न 6– यदि हां तो निम्न विवरण दें।

कार्य प्रारम्भ की तिथि	कार्य में लगे कुल व्यक्तियों की सं0		निर्बल वर्ग के व्यक्तियों की संख्या	उत्पादन (कु0) प्रतिवर्ष	उपयोग की विधि	अर्जित धनराशि (रू0 में)
	पु0	म0				

अ0 प्रश्न 7 – क्या आपके गांव में महिला आम सभा होती है। (सकेंत हां–1 नही–2)

अ0 प्रश्न 8 – यदि हां तो निम्न विवरण दें?

अ) कब से हो रही है।

ब) वर्ष में कितनी बार होती है।

स) बैठक में औसत उपस्थिति क्या रहती है।

अ0 प्रश्न 9– ग्राम की सीमा के अन्दर यदि कोई लैण्ड स्लाइड 50 नाली या उससे अधिक भूमि को प्रभावित करता हो की जी.पी.एस. रीड़िग लैड स्लाइड़ के मध्य में लेकर निम्न प्रकार दर्शाऐं।

क्रं सं	देशान्तर	अक्षांस	समुद्र तल से ऊचाई

उत्तराखण्ड विकेन्द्रीकृत जलागम प्रबन्धन परियोजना (ग्राम्या) के प्रभावो का अंतिम रूप से आंकलन करने के लिए परामर्श सेवा

अतिरिक्त प्रश्न ग्राम पंचायत स्तरीय

प्रश्नावली सूचकांक फार्म संख्या : .....

ग्राम पंचायत : .....सूक्ष्म जलागम : .....

(सन्दर्भ प्रश्न सख्यां 58)

सलग्नंक–1

राजस्व ग्राम का नाम	श्रृजित समूहिक संसाधन का नाम	श्रृजित धनराशि अथवा चक्रीय कोष (रू0)	लेखा संख्या तथा बैंक का नाम	रख रखाव हेतु बनाई गई योजना का संक्षिप्त विवरण

अतिरिक्त प्रश्न 1. क्या उच्च मूल्य की फसलें उगाने, बेमौसमी सब्जियों के उत्पादन आदि हेतु ग्राम पंचायत स्तर पर समूह बनाकर उनके लिए एग्री बिजनेस प्लान बनाए गए है?
(सकेंत हां–1 नही–2)

अ0 प्र0 2– यदि हां तो निम्न विवरण दें।

कं सं	किया कलाप का नाम	समूह का नाम	बाजार से सम्बन्ध स्थापित हुआ या नहीं	प्रशिक्षण का विवरण
अ.	***उच्च मूल्य की फसल का नाम*** 1. अदरक 2. मक्का 3. सोयाबीन 4. लहसुन 5. हल्दी 6. अन्य (नाम सहित)			
ब.	***बेमौसमी सब्जी*** 1. आलू 2. टिमाटर 3. मटर 4. फ्रासबीन 5. शिमला मिर्च 6. बन्दगोभी 7. अन्य (विवरण सहित)			

कं सं	किया कलाप का नाम	समूह का नाम	बाजार से सम्बन्ध स्थापित हुआ या नहीं	प्रशिक्षण का विवरण
स.	*अन्य (विवरण दें)* 1. फल 2. मिलेट 3. दालें			

अ0 प्रश्न 3 – परियोजना के उदेश्यों की पूर्ति हेतु समान प्रकार के कार्य करने वाली सरकारी/गैर सरकारी संस्थाओं के साथ विशेषकर एग्री बिजनेश के उद्देश्य से निम्न में से किन संस्थाओं से ग्राम पंचायत में सहयोग/ सम्बन्ध स्थापित किए गए हैं।

कं सं	संस्था का नाम	प्रयोजन	सहयोग से लाभ
1.	जीटी जेड		
2.	जी टी जेड–रेड		
3.	नार्वाड		
4.	उरेड़ा		
5.	जिला प्रशासन		
6.	डी आर डी ए		
7.	एम एच वी		
8.	टी एस डी सी		
9.	कृषि विभाग		
10.	हिमालयन ग्रामीण विकास समिति		
11.	विवेकानन्द पर्वतीय कृषि अनुसन्धान संस्थान अल्मोड़ा		
12.	एस जी के प्राईवेट लि0 दिल्ली		
13.	जीयो फ्रेश		
14.	अन्य (नाम दें)		

अ0 प्रश्न 4– क्या आप की ग्राम सभा में परियोजना के अन्तर्गत किसी बहु उद्देयश्यीय केन्द्र की स्थापना हुई है।
(सकेंत हां–1 नही–2)

अ0 प्रश्न 5– यदि स्थापना हुई है तो निम्न विवरण दें।

राजस्व ग्राम का नाम	बहुउद्देश्यीय केन्द्र का स्थापना वर्ष व लागत	उपयोग जिसमें लिया जा रहा है। सही पर गोलाकिंत करें।	परियोजना समाप्ति पर प्रस्तावित उपयोग । सही पर गोलाकिंत करे।
		1.एफ आईजी मीटिंग **2.प्रदर्शन** **3.कार्यशालाऐं** **4.अन्य (विवरण सहित)**	**1.ग्रेड़िग** **2.पैकिंग** **3.उत्पादों के मूल्य वृद्वि हेतु** **4.अन्य (विवरण सहित)**
		1.एफ आईजी मीटिंग **2.प्रदर्शन** **3.कार्यशालाऐं** **4.अन्य (विवरण सहित)**	**1.ग्रेड़िग** **2.पैकिंग** **3.उत्पादों के मूल्य वृद्वि हेतु** **4.अन्य (विवरण सहित)**

राजस्व ग्राम का नाम	बहुउद्देश्यीय केन्द्र का स्थापना वर्ष व लागत	उपयोग जिसमें लिया जा रहा है। सही पर गोलाकिंत करें।	परियोजना समाप्ति पर प्रस्तावित उपयोग । सही पर गोलाकिंत करे।
		1.एफ आईजी मीटिंग **2.प्रदर्शन** **3.कार्यशालाऐं** **4.अन्य (विवरण सहित)**	**1.ग्रेड़िग** **2.पैकिंग** **3.उत्पादों के मूल्य वृद्वि हेतु** **4.अन्य (विवरण सहित)**
		1.एफ आईजी मीटिंग **2.प्रदर्शन** **3.कार्यशालाऐं** **4.अन्य (विवरण सहित)**	**1.ग्रेड़िग** **2.पैकिंग** **3.उत्पादों के मूल्य वृद्वि हेतु** **4.अन्य (विवरण सहित)**

अ0 प्रश्न 6 – क्या आपकी ग्राम पंचायत में ग्राम्या कार्यक्रमों के प्रचार प्रसार हेतु किसी प्रकार की गतिविधि योजना काल में की गई?
(संकेत हां–1 नहीं–2)

अ0 प्रश्न 7 – यदि हां तो निम्न में से क्या गतिविधि अपनाई गई।
(अ) हमारा अखबार का प्रकाशन (अखबार की प्रति प्राप्त की जाए।)
(ब) प्रचार सामग्री का विवरण (सामग्री प्राप्त करें।)
(स) कठपुतली प्रदर्शन
(द) नाटक/सिनेमा आदि का मंचन (संख्या दें।)
(य) अन्य (विवरण दें।)

अ0 प्रश्न 8– क्या आपकी ग्राम पंचायत में परियोजना कार्यो सम्बन्धी प्रशिक्षण दिया गया?
(सकेंत हां–1 नही–2)

अ0 प्र0 9– यदि हां तो निम्न विवरण दें।

प्रशिक्षण का नाम	संस्था जिसने प्रशिक्षण दिया	प्रशिक्षार्थियों की संख्या	
		महिला	पुरूष
(अ) कृषि व उद्यान सम्बन्धी प्रशिक्षण व प्रदर्शन	विवेकानन्द पर्वतीय कृषि अनुसंधान संस्थान अल्मोड़ा		
(ब) पशुधन एवं आय अर्जक गतिविधियां	गोविन्द वल्लभ पंत कृषि विश्व–विद्यालय पंतनगर		
(स) वन पंचायत एंव वनीकरण	उत्तराखण्ड वन अकादमी हल्द्वानी		
(द) वित्त एवं प्रक्योरमेंट सम्बन्धी	डी एस जाज एण्ड कं. चण्डीगढ़		
(य) आरगेनिक खेती	सूपा वायोटेक		
(र) वांस व रिंगाल कार्यक्रम	उत्तराखण्ड बांस व रेसा विकास बोर्ड देहरादून		
(ल) जड़ी बूटी व सगंध पौध	सी मैप की फील्ड़ इकाई पंतनगर		
(व) क्षेत्र प्रदर्शन सम्बन्धी कार्य	कृषि विज्ञान केन्द्र (सम्बन्धित जनपद)		
(स) अन्य (विवरण सहित)	अन्य (विवरण सहित)		

अ0 प्रश्न 10 – परियोजना काल में ग्राम पंचायत के अन्तर्गत विभित्र गैर सरकारी संस्थानों द्वारा प्रदन्त सहयोग/सहायता का विवरण?

गैर सरकारी संस्था का नाम	कार्यक्रम जिसमें सहयोग दिया	सहयोग की गुणवत्ता व मूल्यांकन (प्रभावी/संतोषजनक/ असंतोषजनक)
कागास		
हार्क		
जनकल्याण समिति		
अन्य (नाम सहित)		

अ0 प्रश्न 11 –ग्राम में लाभार्थीयों का चयन किस प्रकार से किया गया?
अ) ग्राम सभा की खुली बैठक में
ब) किसी अन्य प्रकार से (विवरण दें।)

अ0 प्रश्न 12 – क्या लेखा मामलों में हस्ताक्षर हेतु किसी महिला को भी नामित किया गया है। (सकेंत हां–1 नही–2)

अ0 प्रश्न 13 – यदि हां तो कब से। महिला का नाम भी दें।

Annexure 3: Details of Sampled and Control GPs

Annexure 3a - Demographic profile of the sampled project GPs

S.No	GP	Households	Population	Male	Female	General	SC	ST	OBC	BPL
1	Andhiyari	75	436	214	222	53	22	0	0	26
2	Banelagaon	128	695	345	350	128		0	0	78
3	Bhent	121	730	370	360	103	18	0	0	32
4	Chami	80	470	250	220	50	30	0	0	43
5	Daslikhet	102	550	285	265	2	50	0	50	78
6	Dhargaid	103	567	285	282	53	50	0	0	24
7	Dini talli	240	1600	810	790	113	125	0	2	161
8	Dungri	110	603	306	297	57	53	0	0	13
9	Falyati	60	360	185	175	58	2	0	0	28
10	Forti	295	1490	760	730	247	42	0	6	98
11	Gadsyari	110	582	265	317	85	25	0	0	40
12	Gaid	157	890	463	427	115	42	0	0	33
13	Gairkhet	190	1130	560	570	108	82	0	0	85
14	Ghandalu	97	473	256	217	95	2	0	0	42
15	Ghimtoli	286	1487	809	678	264	35	1	0	196
16	Gudmangal	90	410	238	172	81	9	0	0	30
17	Haweel Kulwan	125	750	390	360	73	52	0	0	72
18	Hedakhan	86	500	260	240	77	3	0	8	31
19	Jagot	132	822	480	342	71	61	0	0	24
20	Jaidwar	76	397	199	198	0	34	42	0	37
21	Jajoli	250	1100	584	516	157	71	0	22	151
22	Kamla	98	507	265	242	0	41	48	0	27
23	Kandaargaon	102	418	227	181	85	17	0	0	18
24	Kawagadhi	96	622	310	312	85	11	0	0	27

S.No	GP	Households	Population	Male	Female	General	SC	ST	OBC	BPL
25	Khaikot Malla	130	680	355	325	110	20	0	0	42
26	Kharkoli	51	274	149	125	45	6	0	0	21
27	Khatar	65	693	367	326	0	23	42	0	24
28	Kheskande	197	1105	562	543	185	12	0	0	107
29	Kolitek	200	1100	580	520	150	50	0	0	97
30	Kothaghi	221	1249	637	612	171	50	0	0	109
31	Koti	64	709	377	332	39	25	0	0	35
32	Kyarda	111	672	342	330	78	33	0	0	61
33	Kyunja	235	1187	572	615	158	77	0	0	149
34	Maror	65	444	233	211	0	18	0	47	25
35	Nagdhar	86	466	256	210	72	14	0	0	22
36	Nai	105	700	340	360	92	9	0	4	60
37	Naskhola	140	497	260	237	48	92	0	0	32
38	Naugaon Akheria	145	470	240	230	115	30	0	0	37
40	Pau	160	900	470	430	138	22	0	0	81
41	Pipli Nigalti	123	580	309	271	117	6	0	0	82
42	Purkot	78	425	213	212	78	0	0	0	46
43	Rikhangaon	65	515	560	255	52	12	0	0	31
44	Rumsi	188	991	525	466	164	24	0	0	16
45	Silalekh	110	720	370	350	73	29	0	8	60
46	Simalkanya	121	700	364	336	94	27	0	0	69
47	Thaina	77	263	157	106	0	19	58	0	23
48	Valson	195	735	362	373	171	24	0	0	82
49	Vijaypur	200	1150	600	550	150	0	50	0	67
50	Vijrakot	279	1354	655	699	249	30	0	0	110

HH: Households

Annexure 3b: Demographic composition of the sampled households in the sampled project GPs

Division	GP	# of HH	HH GEN	HHSC	HH ST	HH OBC	HH VG
Augustmuni							
	Ghimtoli	16	14	2			9
	Kyunja	8	6	2			4
	Rumsi	15	13	2			8
	Vijrakot	32	30	2			14
	Jagot	16	6	10			10
	Kothagi	13	11	1		1	7
Subtotal		100	80	19	0	1	52
Bageshwar							
	Falyati	8	6	2			5
	Gairkhet	16	7	9			10
	Haweel Kulwan	8	6	2			4
	Purkot	8	8				5
Subtotal		40	27	13	0	0	24
Champawat							
	Chami	8	5	3			2
	Forti	24	18	4		2	9
	Gudmangal	22	15	7			7
	Khaikot Malla	16	15	1			5
	Kheskande	16	14	2			9
	Naskhola	24	14	9		1	14
	Pau	8	6	2			4
	Kolitek	8	7	1			5

Division	GP	# of HH	HH GEN	HHSC	HH ST	HH OBC	HH VG
	Balso	21	20	1			8
Subtotal		147	114	30	0	3	63
Chinyalisaur							
	Andhiyari	9	7	2			5
	Kandaargaon	16	14	2			10
	Kyarda	16	9	7			11
	Rikhangaon	32	26	6			17
	Kawagadi	8	6	2			3
Subtotal		81	62	19	0	0	46
Almora							
	Gadsyari	24	20	4			12
	Pan	16	10	6			7
	Vijaypur	8	7	1			3
	Naugaon Akhoria	8	7	1			4
	Bhaint	8	4	4			5
Subtotal		64	48	16	0	0	31
Gairsain							
	Dhargaid	16	8	8			7
	Dungri	15	12	3			5
	Gaid	24	18	6			10
Subtotal		55	38	17	0	0	22
Pauri							
	Ghandalu	16	16				11
	Kharkoli	8	6	2			4
	Nagdhar	15	11	4			5

Division	GP	# of HH	HH GEN	HHSC	HH ST	HH OBC	HH VG
Subtotal		39	33	6	0	0	20
Nainital							
	Dini Talli	8	4	4			5
	Hedakhan	8	8				6
	Nai	8	7	1			5
	Silalekh	8	6	2			6
	Simalkanya	23	14	9			17
Subtotal		55	39	16	0	0	39
Pithoragarh							
	Banelagaon	16	16				11
	Jajoli	24	16	8			17
	Pipli Nigalti	24	24				12
	Daselakhet	16	5	7		4	13
Subtotal		80	61	15	0	4	53
Vikasnagar							
	Jaidwar	24		12	1	11	13
	Kamla	24		13	11		13
	Khatar	23		5	18		8
	Koti	16	1	2	10	3	8
	Maror	16		5		11	8
	Thaina	16		4	11	1	7
Subtotal		119	1	41	51	26	57
Grand Total	**50**	**780**	**503**	**192**	**51**	**34**	**407**

VG refers to a subset of category C as given and identified in the GPWDP

Annexure 3C: List of Control GPs

S. No.	District	Development Block	MWS	GP	Revenue Village
1	Dehradun	Kalsi	Gariagad	Surau	Surau
2	Dehradun	Kalsi	Gariagad	Surau	Kharaya
3	Dehradun	Kalsi	Kalsi	Panjiya	Chapnu
4	Dehradun	Kalsi	Kalsi	Panjiya	Panjiya
5	Tehri Garhwal	Thauldhar	Gochugad	Abali	Abali
6	Tehri Garhwal	Thauldhar	Gochugad	Abali	Sabli
7	Tehri Garhwal	Jaunpur	Dewangarh	Bail	Bail Malla
8	Tehri Garhwal	Jaunpur	Dewangarh	Bail	Bail Talla
9	Uttarkashi	Chinyalisaud	Kyara	Anol	Anol
10	Uttarkashi	Chinyalisaud	Kyara	Anol	Hadiyadi
11	Rudraprayag	Agastmuni	Dangi	Dangi	Dangi Malla
12	Rudraprayag	Agastmuni	Dangi	Dangi	Dangi Talla
13	Rudraprayag	Agastmuni	Jakholi	Falai	Falai
14	Rudraprayag	Agastmuni	Jakholi	Falai	Chamrada
15	Bageshwar	Kapkot	Faldgad	Pakar	Pakar
16	Bageshwar	Kapkot	Faldgad	Pakar	Batla
17	Bageshwar	Garur	Gomati River	Parkoti	Parkoti
18	Bageshwar	Garur	Gomati River	Parkoti	Raintoli
19	Champawat	Pati	Ranigad	Gosani	Gosani
20	Champawat	Pati	Ranigad	Gosani	Pardhyani
21	Champawat	Champawat	Lohawati	Chaura Rajpura	Chaura Dumkhori
22	Champawat	Champawat	Lohawati	Chaura Rajpura	Lamkaniya
23	Champawat	Barakot	Pundiya ke gad	Natheda	Natheda
24	Champawat	Barakot	Pundiya ke gad	Natheda	Bhanar
25	Champawat	Pati	Ranigad	Tyarso	Tyarso

S. No.	District	Development Block	MWS	GP	Revenue Village
26	Champawat	Pati	Ranigad	Sirmoli	Sirmoli
27	Nainital	Okhalkanda	Kwaitgad	Pantoli	Pantoli Malli
28	Nainital	Okhalkanda	Kwaitgad	Pantoli	Khujati
29	Nainital	Okhalkanda	Pasiyagad	Jhadgaon	Jhadgaon Talla
30	Nainital	Okhalkanda	Pasiyagad	Jhadgaon	Jhadgaon Malla

Annexure 3d : Demographic profile of sampled control GPs

GP	HH	Population	Male	Female	HH-Gen	HH-SC	HH-ST	HH-OBC	HH-BPL
Anol	91	594	286	308	65	12	0	14	50
Bail	51	343	167	166	0	15	0	36	28
Choda Rajpura	165	900	470	430	122	43	0	0	100
Dangi	199	935	445	490	109	60	0	30	141
Falai	102	530	234	296	65	37	0	0	41
Gosani	248	1650	880	770	207	21	0	20	75
Jhadgaon	220	1400	695	705	220	0	0	0	148
Natheda	95	510	255	255	95	0	0	0	62
Panjiya	75	675	338	337	0	36	39	0	38
Pankad	109	570	270	300	94	0	0	15	62
Pantoli	136	820	415	405	133	1	0	2	82
Parkoti	165	780	494	486	155	10	0	0	24
Sawali	92	702	360	342	78	14	0	0	48
Sirmoli	70	520	270	250	55	15	0	0	50
Surau	79	695	322	373	0	30	49	0	36
Tyarso	102	574	319	255	78	24	0	0	61

HH: Households

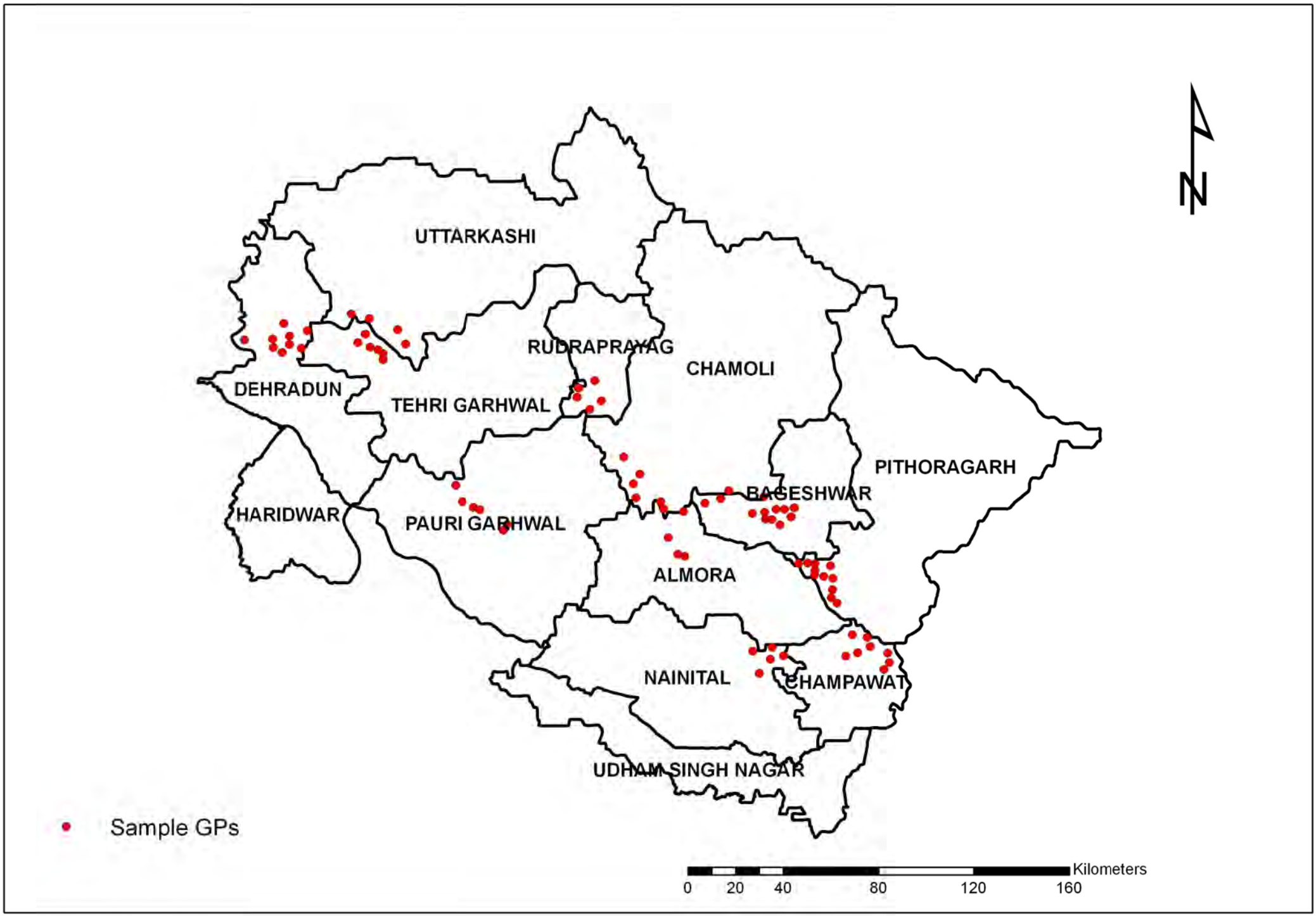
Annexure 4: Economic Analysis computation (Forestry)

Annexure 4

Forestry: Computation of benefits (r=8%)

Year	Timber (t/ha)	Fuelwood (t/ha)	Timber value (Rs)	Fuelwood value (Rs)	Costs (Rs/ha)	Present value - Timber (Rs)	Present value - Fuelwood (Rs)	Present value cost (Rs)
1	0	0.00	0.00	0.00	17000.00	0.00	0.00	36500.00
2	0	0.00	0.00	0.00	13500.00	0.00	0.00	0.00
3	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0	5.03	0.00	7537.50	0.00	0.00	3491.32	0.00
11	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0	6.65	0.00	9976.70	0.00	0.00	3145.07	0.00
16	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0	7.44	0.00	11152.84	0.00	0.00	2392.82	0.00
21	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0	7.56	0.00	11336.93	0.00	0.00	1655.40	0.00
26	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	484.58	7.57	2616741.82	11357.39	0.00	260044.82	1128.67	0.00

Annexure 5: Location of sampled GPs


UTTARKASHI
RUDRAPRAYAG
CHAMOLI
DEHRADUN
TEHRI GARHWAL
PITHORAGARH
BAGESHWAR
HARIDWAR
PAURI GARHWAL
ALMORA
NAINITAL
CHAMPAWAT
UDHAM SINGH NAGAR
N
Sample GPs
Kilometers
0 20 40 80 120 160

Annexure 6: GP level land use changes

Annexure 6 GP level land use changes

GPs	agri (irrigated land before)	agri (irrigated land after)	agri (unirrigated land before)	agri (unirrigated land after)	horti_ before	horti_ after	cult_wastel and_before	cult_wa steland _after	noncult_w asteland_ before	noncult_wast eland_after	civilsoyam_ before	civilsoyam _before	van panchayat before	van panchayat after
Andhiyari	92.82	92.82	99.61	99.61	0.00	0.00	129.13	129.13	142.55	142.55	0.00	0.00	0.00	0.00
Banelagaon	4.44	5.67	29.56	28.27	0.00	0.00	11.55	11.55	7.22	7.22	14.00	14.00	140.72	140.72
Bhent	0.00	0.28	81.23	80.95	0.00	0.00	10.16	10.16	0.00	0.00	5.00	5.00	60.00	60.00
Chami	0.00	0.00	95.55	95.55	1.00	1.00	14.28	14.28	5.02	5.02	82.61	82.61	10.18	10.18
Daslikhet	0.00	3.00	29.27	26.27	0.00	0.00	7.00	7.00	6.30	6.30	18.73	18.73	4.27	4.27
Dhargaid	0.00	0.24	28.41	28.09	0.00	0.00	6.25	6.24	0.00	0.00	9.11	9.11	22.80	22.80
Dini Talli	5.00	9.00	68.02	64.02	3.00	8.00	18.32	13.32	7.03	7.03	28.37	28.37	55.08	55.08
Dungri	12.12	12.32	34.96	34.94	0.00	0.00	12.13	12.13	0.00	0.00	7.63	7.63	10.57	10.57
Falyati	0.78	0.50	32.28	32.56	0.00	0.00	4.38	4.38	5.00	5.00	15.00	15.00	20.00	20.00
Forti	0.00	0.46	113.28	113.28	0.00	0.00	39.24	39.24	0.00	0.00	13.94	13.94	93.69	93.69
Gadsyari	22.19	24.79	91.05	88.45	3.11	7.11	42.96	38.96	0.00	0.00	0.00	0.00	222.18	222.18
Gaid	0.00	0.80	46.02	45.22	0.00	0.00	3.51	3.52	0.00	0.00	5.55	5.55	106.73	106.73
Ghairkhet	36.59	42.93	22.29	15.57	0.00	0.00	35.66	35.66	58.44	58.44	49.31	49.31	150.92	150.92
Ghandalu	11.47	12.47	114.70	113.70	0.30	2.30	24.35	22.35	17.33	17.33	0.00	0.00	48.50	48.50
Ghimtoli	1.00	1.60	120.29	119.29	0.00	0.00	234.30	234.30	0.00	0.00	0.00	0.00	59.00	59.00
Gudmangal	0.00	2.80	92.32	89.92	2.32	2.32	22.24	22.24	9.95	9.95	14.27	14.27	105.20	105.20
Haweel Kulwan	4.90	13.60	35.46	26.76	0.00	0.00	50.00	50.00	7.32	7.32	30.00	30.00	17.46	17.46
Hedakhan	15.60	24.60	29.99	20.99	2.24	4.24	40.00	38.00	5.00	5.00	15.67	15.67	47.98	47.98
Jagot	10.23	10.39	60.39	60.23	3.74	3.74	9.00	9.00	30.25	30.25	0.00	0.00	40.86	40.86
Jaidwar	17.26	17.56	93.52	93.22	0.00	0.00	38.28	38.28	33.94	33.94	400.06	400.06	160.00	160.00
Jajoli	0.36	0.76	29.43	29.21	4.94	4.94	177.06	177.06	0.00	0.00	0.00	0.00	87.31	87.31
Kamla	0.00	1.60	70.88	69.08	0.40	0.40	316.69	316.69	0.00	0.00	0.00	0.00	144.77	144.77
Kandargaon	0.00	0.00	32.06	32.06	0.00	0.00	8.35	8.35	0.00	0.00	0.00	0.00	0.00	0.00
Kandargaon	0.00	0.20	6.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00	0.00

Annexure 6 GP level land use changes

GPs	agri (irrigated land before)	agri (irrigated land after)	agri (unirrigated land before)	agri (unirrigated land after)	horti_ before	horti_ after	cult_wastel and_before	cult_wa steland _after	noncult_w asteland_ before	noncult_wast eland_after	civilsoyam_ before	civilsoyam _before	van panchayat before	van panchayat after
kawagadhi	17.49	17.69	25.11	25.11	0.00	0.00	39.48	39.28	0.00	0.00	0.00	0.00	7.78	7.78
Khaikot Malla	7.44	25.66	65.88	49.66	0.00	0.00	17.69	15.69	46.09	46.09	62.58	62.58	230.89	230.89
Kharkoli	0.00	0.10	87.00	86.90	0.00	0.00	75.26	75.26	0.00	0.00	89.66	89.66	0.00	0.00
Khatar	10.78	11.68	60.70	59.80	0.04	0.06	15.41	15.39	0.00	0.00	179.67	179.67	59.17	59.17
Kheskande	17.58	18.10	142.42	142.42	0.10	0.10	66.24	66.24	8.20	8.20	1.80	1.80	15.00	15.00
Kolitek	1.03	1.03	40.98	40.98	4.10	4.10	10.20	10.20	0.00	0.00	5.00	5.00	75.85	75.85
Kothaghi	35.50	35.50	79.51	79.51	0.00	0.00	58.39	58.39	0.00	0.00	0.00	0.00	295.61	295.61
Koti	32.90	33.50	54.39	53.79	11.10	11.10	26.39	26.39	137.06	137.06	0.00	0.00	57.69	57.69
Kyarda	0.18	0.18	73.06	73.06	0.00	0.10	4.90	3.20	3.40	3.40	0.00	0.00	5.50	5.50
Kyunja	22.74	23.14	45.54	45.14	1.48	1.48	25.14	25.14	0.00	0.00	0.00	0.00	75.65	75.65
Maror	4.22	5.82	52.90	52.60	9.90	10.30	4.83	4.53	1.12	0.12	62.00	62.00	220.83	220.83
Nagdhar	3.34	3.72	20.20	19.82	0.00	0.00	16.71	16.71	0.00	0.00	6.37	6.37	13.32	13.32
Nai	5.00	18.00	28.04	14.04	3.04	9.10	6.00	1.00	2.58	1.58	1.08	1.08	50.00	50.00
Naskhola	0.00	2.70	63.98	61.58	0.00	0.00	12.58	12.58	0.00	0.00	0.30	0.30	63.98	63.98
Naugaon Akheria	35.64	46.64	22.44	11.44	6.93	8.50	11.96	10.39	0.00	0.00	0.00	0.00	135.70	135.70
Pan	2.00	4.00	108.97	106.97	12.50	16.50	15.00	11.00	0.00	0.00	9.34	9.34	97.12	97.12
Pau	0.00	0.64	38.64	38.64	3.16	3.16	10.00	10.00	11.70	11.70	6.00	6.00	184.02	184.02
Pipli Nigalti	16.10	16.10	97.92	97.92	0.00	0.00	120.04	120.04	17.43	17.43	9.31	9.31	7.33	7.33
Purkot	7.50	15.01	50.00	42.50	0.00	0.00	30.00	30.00	8.38	8.38	10.00	10.00	44.47	44.47
Rikhan gaon	2.54	2.74	57.59	57.39	1.80	3.33	36.20	34.68	0.00	0.00	0.00	0.00	5.94	5.94
Rumsi	4.96	5.56	66.05	65.44	0.00	0.00	237.19	237.19	0.00	0.00	0.00	0.00	47.33	47.33
Silalekh	0.00	23.00	101.78	75.78	28.58	49.90	27.53	8.59	2.03	2.63	3.83	3.83	49.93	49.93
Simal kanya	5.64	20.22	36.43	21.87	2.44	4.44	20.31	18.31	6.80	6.80	21.05	21.05	8.11	8.11
Thaina	2.78	3.68	62.00	61.10	0.00	0.30	190.09	189.79	0.00	0.00	0.00	0.00	86.33	86.33

Annexure 6 GP level land use changes

GPs	agri (irrigated land before)	agri (irrigated land after)	agri (unirrigated land before)	agri (unirrigated land after)	horti_ before	horti_ after	cult_wastel and_before	cult_wa steland _after	noncult_w asteland_ before	noncult_wast eland_after	civilsoyam_ before	civilsoyam _before	van panchayat before	van panchayat after
Valson	0.00	8.50	187.56	179.06	0.00	5.00	148.73	143.73	46.86	46.86	51.10	51.10	85.14	85.14
Vijaypur	114.08	114.08	0.00	0.00	0.00	4.00	54.50	50.50	0.00	0.00	0.00	0.00	254.14	254.14
Vijrakot	27.01	27.03	69.71	69.65	0.00	0.00	62.59	62.59	0.00	0.00	0.00	0.00	103.76	103.76

Annexure 7: Agribusiness Details

Annexure 7

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	**Divisions**	**GP**	**No. of FIGs**	**Members**			**Federation to which affiliated**	**Name of Produce marketed**	**Quantity marketed (Tons)**	**Value (Lakhs Rs)**
				Male	**Female**	**Total**				
1	Chinyalisaur	Rikhangaon	2	_	_	20	Daskigad Krishi Vyapar Bahuudeshiya Swayat Sahkarita	Tomato, Capsicum, French been, Pea, Potato, ginger	230	24.6
2	"	Kandargaon	2	_	_	19	Nagraja Fal Evam Sabji Utpadak Association	Potato, French bean, Rajma, ginger, Gahat	64	5.04
3	"	Kawagadhi	4	_	_	36	"	Potato, pea, onion, garlic, french beans, ginger, tomato, capsicum, cabbage	269	21.09
4	"	Andhiyari	2	_	_	20	Nagrungad Krishi Vyapar Bahuudeshiya Swayat Sahakarita	Potato, pea, onion, garlic, ginger, capsicum	175	23.69
5	"	Kyarda	3	_	_	54	Nagraja Fal Evam Sabji Utpadak Association	French bean, Rajma, ginger and other veg.	62.38	6.52
6	Augustmuni	Rumsi	1	3	12	15	Agastya Krishi Utpadam Avam Bipran Swayat Sahakarita	Cabbage, Reddish, pea, garlic, tomato, ginger, French bean, lady finger	28.98	4.29
7	"	Jagot	2	9	18	27	"	Potato, malta, nimboo, tomato, Onion, ginger, french bean, ladyfinger	17.01	1.54
8	"	Kyunja	3	11	25	36	Mandakini Ghati Mahilla Uthan Sawayat Sahakarita	Ginger, Onion, Cabbage, lady finger, french bean, turmeric, tomato	47.87	8.57
9	"	Ghimtoli	4	21	27	48	Shiv Shankar swayat Sahakarita	Potato, Cabbage, Rajma, Reddish, Tomato	119.37	18.49

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	Divisions	GP	No. of FIGs	Members			Federation to which affiliated	Name of Produce marketed	Quantity marketed (Tons)	Value (Lakhs Rs)
				Male	Female	Total				
10	"	Kotaghi	2	5	25	30	Alakananda Utpadan Evam Vipanan Swayat Sahakarita	Cabbage, Lady finger, wheat, pea, onion, Reddish, french bean , cauliflower	14.37	2.31
11	"	Vijrakot	No FIG Formed							
12	Gairsain	Gaid	5	107	62	169	Fal Avam masal Utpadak Swayat Sahakarita Gairsain	Ginger, turmeric, coriander, tomato, pea, capsicum, brinjal, marrow, french beans , rajma, potato, malta	44.8	1.43
13	"	Dungri	3	17	39	56	"	Turmeric, coriander, ginger, tomato, onion, Arbi, potato, malta	17	2.59
14	"	Dhargaid	1		29	29	"	turmeric, ginger, c grinder, Malta, Potato	1.61	0.25
15	PNGO (Gharwal)	Ghandalu	2	_	_	18	Gramya kisan Bahuudehsiya Swayat Sahkari samiti,Ghanalu	Potato, chilli, ginger, onion, capsicum. Processing center at Ghandalu making soup, pickles, puree, juices etc. and packing spices, dals etc.	3	2.75
16	"	Kharkoli	1	_	_	19	not federated	not functional		
17	"	Nagdhar	2	_	_		not federated	only one FIG of Devsthal RV functional to some extent		
18	PNGO (Almora)	Bhent	3	_	_	54	Pandit GB Pant Swayat Sahakarita	Agribusiness activities at low scale and not properly recorded.	1.4	0.15
19	"	Gadsyari	2	_	_	28	Ma Mansa Devi Krishak Mahasangh Swayat Sahakarita	"	2.5	0.5
20	"	Naugaon	6	_	_	96	"	"	7.5	1.5

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	Divisions	GP	No. of FIGs	Members			Federation to which affiliated	Name of Produce marketed	Quantity marketed (Tons)	Value (Lakhs Rs)
				Male	Female	Total				
		Akheria								
21	"	Vijaypur	5	_	_	54	Ma Doonagiri Krishak Mahasangh Swayat Sahakarita	Not recorded and members not contributing to revolving fund	22.75	2.27
22	"	Pan	4	_	_	45	"	"	18.2	1.82
23	Gangolihaat	Jajoli	2	21	6	27	Kalika Devi Sahayats Samuh	Tomato, Capsicum, milk French been, Pea, Potato, ginger, Turmeric, cabbage, cauliflower	46	1.97
24	"	Daslikhet	1	12		12	Gupteshwar Mahadev Kisan Sangh	Amaranthus, finger, millets, burnyad, soya bean, lintel milk etc.	27	8.2
25	"	Pipli Nigalti	1	14	3	17	Kalika Devi Sahayats Samuh	Amrenthsus, finger, millet, paddy, burnyard millet, soya been, cabbage, tomato, capsicum , lintel etc.	68	17.8
26	"	Banelagoan	1	12	3	15	"	Tomato, pea, cabbage, capsicum, ginger, potato, turmeric, paddy, soybean, amranthsu etc.	100	24.25
27	Bageshwar	Haweel Kulwan	1	16	3	19	Gomatighati Swayat Sahakarita Samiti	Cabbage, cauliflower, reddish, pea, tomato, brinjal, capsicum, potato, onion	30.01	48.58
28	"	Gairkhet	1	18	1	19	Sarya Ghati Swayat Sahakarita Samiti	As above and brinjal marrow, ginger, garlic, lady finger	14.35	23.59
29	"	Falyati	No FIG formed and no agribusiness efforts reported.							
30	"	Purkot	"							

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	Divisions	GP	No. of FIGs	Members			Federation to which affiliated	Name of Produce marketed	Quantity marketed (Tons)	Value (Lakhs Rs)
				Male	Female	Total				
31	Nainital (Haldwani)	Silalekh	3	58	1	59	Paharpani Utpadak Evam Vipran Self Reliant Coopertative	Turmeric, ginger, tomato, capsicum, cabbage, pea, french bean , radish , potato	25.075	4.57
32	"	Dini Talli	2	31	0	31	"	Turmeric, ginger, tomato, capsicum, cabbage, pea, french bean , radish , potato	21.865	3.98
33	"	Simalkanya	1	30	3	33	"	Turmeric, ginger, tomato, capsicum, cabbage, pea, french beans , radish , potato	14.583	2.09
34	"	Nai	No FIG Formed							
35	"	Hedakhan	No FIG Formed							
36	Vikasnagar	Koti	1	10	_	10	Tamsa Ghati Fal Evam Sabji Utpadak Samiti tuniya-koti		21.02	1.65
37	"	Marod	2	25	_	25	Pragatishil Fal Evam Sabji Utpadak Krishak Samiti Nainbhag		37.8	2.78
38	"	Jaidwar	3	41	_	41	not federated		75.77	6.15
39	"	Thaina	2	22	_	22			49.78	5.77
40	"	Kamla	2	22	_	22			52.58	4.07
41	"	Khatar	2	20	_	20			50.26	3.08

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	Divisions	GP	No. of FIGs	Members			Federation to which affiliated	Name of Produce marketed	Quantity marketed (Tons)	Value (Lakhs Rs)
				Male	Female	Total				
42	Lohaghat (Champawat)	Pau (Sui)	1	12	_	12	Shiv Swayatya Sahkarita Ltd Pau	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	7	1.23
43	"	Kheskande	2	22	_	22	Shiv Swayatya Sahkarita Ltd Pau	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	6	1.1
44	"	Forti	1	13	_	13	Shiv Swayatya Sahkarita Ltd Pau	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	3	0.54
45	"	Kolitek	1	12	_	12	Shiv Swayatya Sahkarita Ltd Pau	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	1.5	0.27
46	"	Khaikot Malla	1	20	_	20	Jhumadhari Swayatya Sahkarita Ltd. PatanPatani	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	4	0.73

Agribusiness Details for Sample Villages selected for Final Impact Assessment										
S.No.	Divisions	GP	No. of FIGs	Members			Federation to which affiliated	Name of Produce marketed	Quantity marketed (Tons)	Value (Lakhs Rs)
				Male	Female	Total				
47	"	Gudmangal	1	15	_	15	Jhumadhari Swayatya Sahkarita Ltd. PatanPatani	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander, Peach, Pears, Plumes, Nut, Lemon, Malta, Orange	3	0.49
48	"	Naskhola	2	22	_	22	Jhumadhari Swayatya Sahkarita Ltd. PatanPatani	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander, Peach, Pears, plumes, Nut, Lemon, Malta, Orange	2	0.27
49	"	Chami	1	13	_	13	_	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	1.5	0.23
50	"	Valson	1	18	_	18	_	Tomato, Capsicum, Cabbage, Chilli, Brinjal, French bean, Cauliflower, Okra, Radish, marrow, Pea, Onion, Garlic, Rai, Palak, Mathi, Turmeric, Coriander,	1	0.16
Total			95			1382			1809.83	292.95

Source: TERI Primary survey 2011; and reports of DSAs and DPDs

Annexure 8: Photographs

Photographs

Photo 1: Training of supervisors and field enumerators at Wildlife Institute of India, Dehradun

Photo 2: Group Discussion at Village Valso of Barakot Block, District: Champawat

Photo 3: Poly house beneficiary at village Gangolighat, District: Pithoragarh

Photo 4: Irrigation tank at Nai village, District: Nainital

Photo 5: Pine Briquette Machine, Jojoli Village, Pithoragarh District, Gangolihat Block

Photo 6: VG Member of Valso involved in basket making